

Record carrier in card form and method of producing it

Description

The subject matter of the invention is a record carrier in card form bearing a relief according to the preamble to principal claim 1, as well as a method for producing it.

Record carriers for visually readable data, such as those used for credit cards, identity cards and the like, are provided with a transparent covering film, such as a transparent polyvinyl chloride or polyester film, for example, in order to protect the recorded data. This transparent covering film on the one hand prevents the data recorded on the record carrier (text, images, logos, patterns, national emblems and the like) from becoming illegible or unidentifiable as a result of dirt or wear from normal use, and on the other hand ensures in simple fashion and at low cost that the data cannot be altered or corrupted. Particularly in the case of the record carriers in card form which are popular today, such as identity cards, credit cards, cheque cards and the like, there is a basic need to protect these to the maximum degree against corruption, reproduction and/or total counterfeit. It should also be possible for any attempted counterfeit to be detected reliably and without any costly testing methods and, as far as possible, with no need for additional testing means or equipment.

To make counterfeit difficult or impossible, the information carrier can be secured by various measures employing known techniques used in the printing of securities and banknotes, for example in the form of a paper-laminated identity card of which the card insert consists of a watermark paper, which may be printed in several colours with so-called guilloches, as is known, for example, in the case of cheque cards. These security or authenticity characteristics, such as the printing of guilloches on banknotes, can be produced only by implementing expensive procedures and are therefore very difficult to imitate, although this does not rule out attempted counterfeit in this respect. Furthermore, the covering film can be removed, thus allowing data to be altered.

DE-B-3 248 748 describes an identity card with alphanumeric characters which are provided in embossed form to be used as a printing plate. The whole of this identity card, i.e. the back, middle layer and covering film, is stamped in such a way that all three layers are moulded in the same shape, with the result that the moulded shape of the top layer closely matches that of the bottom layer.

According to GB-A-2 132 136, which also describes an identity card, a covering film is also provided on the substrate. However, the gently undulating contours of the surface of the substrate merely provide an enlarged representation of the patterns produced by the laser inscription.

In a similar vein, an identity card is also known from FR-A-2 450 164 with a photo-sensitive layer which has a transparent covering layer on it. In this case also, the function of the transparent covering film is to enlarge the reproduced image of the security imprint.

Finally, a further development is known from DE-PS 29 070 004 in the form of an identity card, consisting of two covering films, of which at least one is transparent, and a card insert made from an opaque material, in particular paper, which is provided with visually identifiable information which is applied by means of a laser beam through the transparent covering film to the insert. Due to the effect of the laser beam, the substrate under the transparent covering film is blackened and, due to the partial destruction of the substrate material corresponding to the recorded information, the possibility of corruption through removal of the covering film can largely be avoided.

Even in this case, however, corruption and forgery cannot be ruled out. To provide greater security against counterfeit, this state of the art also describes how, depending on the power of the laser beam used to record the information, the upper covering film can also be fused, so that a matching covering relief is formed over the trace of the information, which is manually readable.

Even identity cards produced in this way with two-dimensional information, for example in the form of a photo, can nevertheless be forged, and a commonly used method of doing so involves replacing the photo from a stolen or found identity card with someone else's photo. This can be done quite cheaply with most normal identity cards. Even in the case of the identity cards described above, on which the relevant information has been recorded on the card insert by means of a laser beam and which have as an additional security feature a matching covering relief which is produced during the recording process, impressed forgeries cannot easily be distinguished from genuine cards. There is therefore still a need to prevent forgeries of this type also.

The object of the present invention is therefore to provide even greater security against forgery for record carriers in card form of the above-mentioned generic type.

This object is achieved by the characterising features of the record carrier in card form according to principal claim 1.

The subject matter of the invention is therefore a record carrier in card form, bearing a relief with a substrate and at least one transparent covering film, the substrate being provided with information which can be detected through the covering film by means of a laser beam which passes through the covering film, which is characterised in that the transparent covering film bears the relief, which overlaps the information area at least partially and is applied before the information is recorded, this relief producing an optical lens effect and thus modifying the characteristics of the information that is to be recorded by means of the laser beam.

The subclaims relate to preferred embodiments of the subject matter of the invention.

The subject matter of the invention also involves a method for producing the record carrier according to the invention, which is characterised in that a transparent covering film provided with the relief which produces an

optical lens effect is bonded on to the substrate with the aid of a lining sheet provided with a negative relief pattern produced by engraving, or else a flat covering film, after it has been bonded on, is provided with the relief with the optical lens effect by embossing, after which the information is recorded through the covering film onto the substrate at least partially in the area underneath the relief by means of a laser beam.

According to the invention, the above-mentioned attempts at forgery are prevented in that, at a suitable place, i.e. in the area of the card in which essential information, such as a photo of the card owner, is to be subsequently recorded by means of a laser beam, a relief is imparted to the transparent covering film and thereby to the surface of the card. This relief is preferably in the form of a raised pattern of lines or dots, i.e. in the form of convex lines or dots, which therefore form an optical lens system on the surface of the covering film of the record carrier in card form, which, during the subsequent recording of the information by means of a laser beam through the covering film provided in this way with the relief, brings about a modification of the laser beam which alters the substrate surface, thereby altering the characteristics of the information. When this relief is applied in the form of a raised pattern of convex lines, when the information is recorded by means of a laser beam, i.e. when the photo of the card owner is recorded (for which no separate operation would be required), intensive blackening is produced in the area of the relief, surrounded by adjacent lighter areas, a condition which will be described in more detail below.

This modification of the information recorded by means of the laser beam on the substrate remains visible even if, for example, the original relief becomes worn and/or is replaced by another, so that a forgery operation of this type can be readily identified. Furthermore, this modification of the information recorded by means of the laser beam on the substrate cannot be carried out at a later stage, since in this case the areas which have already been blackened can in fact no longer be eradicated. Thus, the present theory represents a substantial improvement in terms of security against forgery and therefore significant progress.

The relief disposed on the transparent covering film according to the invention may advantageously be in the form of a raised pattern of convex lines or dots, which may or may not cover the whole surface. Cylindrical patterns of lines of this type which cover the whole surface are, for example, known from post cards with a stereo or double image effect. This, however, involves a totally different type of technique, since the cylindrical pattern of lines is intended to provide separate views of two images present on the same surface, but cannot possibly be employed to modify the characteristics of the visual information and thus protect it against any attempts at forgery.

In a particularly preferred embodiment of the invention, the pattern of lines or dots covering the whole surface is provided in the form of lines, concentric circles, a two-dimensional inscription and/or a two-dimensional logo, for example, in the form of guilloche patterns, such as those found on banknotes or cheque cards. However, it is even more preferable to provide this relief in the form of a pattern of lines or dots which does

not cover the whole surface, i.e. in the form of letters, a monogram, a defined pattern of guilloches, a stamp and/or a national emblem or a logo made up of lines, disposed in such a way that it partially overlaps the card owner's photo which has been recorded by means of the laser beam, similar to the patterns applied to conventional personal identity cards and passports today using ink stamps or embossed marks. If this photo is recorded by the laser beam onto the substrate of the record carrier in card form through the imparted relief, the lens effect of the pattern of convex lines or dots causes a modification of the matrix of dots which forms the photo, thus providing an identity card which is extremely secure against forgery and which, due to the modified characteristics of the recorded image pattern, can be neither reproduced nor modified at a later stage.

To explain these conditions, the invention will be described in more detail below with reference to the appended drawings, where:

- Fig. 1 shows an enlarged partial sectional view of an embodiment of the record carrier in card form according to the invention,
- Fig. 2 shows a diagram which elucidates the information modification effect achieved according to the invention,
- Fig. 3 shows a graph depicting the blackening curve obtained with the aid of the embodiment shown in Fig. 2,
- Fig. 4 shows a diagram depicting the effect when viewed of the modification of the recorded information.

As shown in Fig. 1, the record carrier in card form according to the invention comprises a substrate 1 made of a material which readily absorbs the laser radiation used and may, for example, consist of an opaque material such as paper, plastic containing filler or the like, but may also be a transparent material which is similarly absorbent. On its surface, the substrate 1 has a transparent covering film 2, for example in the form of a bonded transparent polyvinyl chloride or polyester film. If necessary, the underside of the substrate 1 can also be provided with a transparent covering film of this type.

A relief 3, in the form of three cylindrical lenses, is imparted to the upper side of the covering film 2, as can be seen from the view shown.

On the substrate 1 or on the interface between substrate 1 and covering film 2, information is recorded by means of a laser beam through the transparent covering film 2 and the relief 3 on top it, as indicated by the reference numbers 4, 5 and 6 in Fig. 1.

These conditions are shown on an even larger scale in Fig. 2, where the vertical, downward-pointing arrows are intended to represent incident laser radiation. As shown in diagrammatic form in Fig. 2, the laser beams are refracted due to the optical lens effect of the relief 3 and concentrated in area 5. In the areas 6, no laser radiation reaches the interface between the substrate 1 and the transparent covering film 2. In the areas where there is no relief 3, no laser beam concentration occurs, so that here the substrate material or photosensitive material located at the

interface between the substrate and the covering film is blackened to a slightly lesser extent. Fig. 3 shows the blackening effect achieved with the aid of this arrangement, where distance is shown in relative length units along the X-axis, and blackening intensity along the Y-axis, similarly in relative units. It is evident that a particularly marked blackening effect occurs in area 5, whereas normal blackening is produced in areas 4 and no blackening in areas 6, despite the fact that laser radiation is applied evenly to this area of the record carrier in card form, as can be seen from Fig. 2.

As shown in Fig. 3, characteristic modification and alteration of the recorded information density occurs, due entirely to the relief 3 which is present on the covering film 2. Even following the removal or alteration of the relief 3 on the surface of the covering film, this characteristic modification of the recorded information remains, thus providing a high degree of security against forgery. Furthermore, as shown in Fig. 4, when the record carrier in card form bearing an inscription of this type is viewed, image phenomena are produced which differ in each case according to the chosen direction of view, i.e. the angle between the surface of the record carrier in card form and the direction of view. While the relief appears black when viewed at an angle of 90° , as indicated by the black arrow A, it appears lighter or even white when viewed from a different angle, for example when the angle of view is 70° (arrow B), in which case the unmodified area 6 moves into the field of view due to the optical lens effect of the relief 3. This effect is dependent on the refractive index of the transparent covering film 2, the bending radius of the relief 3 and the thickness of the transparent covering film 2, and is easily explained by the imagery laws of linear optics. Thus, according to the invention, either the intensity of the radiation at the interface between the transparent covering film 2 and the substrate 1 or the local separation of the light and dark zones can be specifically determined within certain limits by selecting the thickness of the transparent covering film 2 accordingly.

In the practical application of this effect, for example, in the case of the above-mentioned record carriers in card form, where their information is recorded onto the card using a high-power laser, a deeply penetrating change (blackening) occurs on the transparent covering layer due to the special interaction with the card material, although this has little or no influence on the described effect. However, the depth of this blackening can essentially be determined in any specific desired direction through appropriate selection of the composition of the individual layers.

The effect according to the invention as described above can also be achieved with record carriers in card form comprising a transparent single-layer or multi-layer material which is capable of absorbing to an adequate extent the laser radiation used to record the information and is designed in such a way that the blackening caused by the laser radiation occurs within the transparent material. This also has the effect of modifying the characteristics of the information recorded by means of the laser beam due to the relief provided according to the invention on the covering layer of the record carrier in card form.

By providing the raised relief 3 on the covering film 2, or on an overall transparent record carrier, the present invention thus permits the modification of the characteristics of the information recorded through this relief with the result that, due to the different blackening or non-blackening, this information disappears when viewed from the side, an effect which cannot be produced through subsequent modification of the card.

A further subject matter of the invention involves a method of producing the above-mentioned record carrier in card form according to claim 1, in which, in order to bond the transparent covering film 2 onto the substrate 1, a lining sheet is used which is provided with the desired relief pattern produced by engraving, or else a flat covering film, after it has been bonded on, is provided with the relief 3 by embossing, after which the information is recorded through the covering film onto the substrate 1 at least partially in the area underneath the relief by means of a laser beam. The method of recording the information by means of a laser beam is known, for example, from the afore-mentioned specification DE-PS 29 07 004.

Patent claims

1. Record carrier in card form bearing a relief with a substrate and at least one transparent covering film, the substrate being provided with information which can be detected through the covering film by means of a laser beam which passes through the covering film, characterised in that the transparent covering film (2) bears the relief (3), which overlaps the information area at least partially and is applied before the information is recorded, this relief producing an optical lens effect and thus modifying the characteristics of the information that is to be recorded by means of the laser beam.
2. Record carrier in card form according to claim 1, characterised in that the relief (3) is in the form of a raised pattern of lines or dots.
3. Record carrier in card form according to claim 2, characterised in that the relief (3) is in the form of a raised pattern of convex lines or dots.
4. Record carrier in card form according to claim 3, characterised in that the relief (3) is in the form of cylindrical lenses.
5. Record carrier in card form according to at least one of the previous claims, characterised in that the cylindrical lenses are in the form of a pattern of lines covering the surface.
6. Record carrier in card form according to at least one of the previous claims, characterised in that the pattern of lines or dots covering the surface is in the form of lines, concentric circles, a two-dimensional inscription and/or a two-dimensional logo.
7. Record carrier in card form according to at least one of the previous claims, characterised in that the relief (3) is in the form of a pattern of lines or dots which does not cover the surface.
8. Record carrier in card form according to claim 7, characterised in that the relief (3) is in the form of letters, a monogram, a guilloche, a stamp, a national emblem or a logo made up lines.
9. Record carrier in card form according to at least one of the previous claims, characterised in that the characteristics of the information are modified by interference phenomena between the pattern of lines or dots of the relief (3) and the matrix of the information recording.



10. Method for the manufacture of the record carrier in card form according to the previous claims, characterised in that a transparent covering film (2) provided with the relief (3) which produces an optical lens effect is bonded on to the substrate (1) with the aid of a lining sheet provided with a negative relief pattern produced by engraving, or else a flat covering film, after it has been bonded on, is provided with the relief (3) with the optical lens effect by embossing, after which the information is recorded through the covering film onto the substrate (1) at least partially in the area underneath the relief by means of a laser beam.

