

METHOD FOR PRODUCING MULTILAYER SECURITY PRODUCTS

The invention relates to a method for producing multilayer security products consisting of at least one card and at least one polymer film which is applied to at least one side of said card and is supplied as a rollstock product provided with at least one security feature.

DE 199 07 940 A1 discloses an embodiment of a method for producing security products in which the plastic raw material produced and supplied as a rollstock product is first cut into sheets. The individual sheet acts as a carrier for a fixed number of pieces. Certain sheets need to be printed on, depending on their application. Subsequently, the individual sheets need to be arranged above one another in an accurately fitting manner and then fixed in place. Once disposed in this manner, the sheet layers are joined together in a laminating press. An assembly of a security product is thus accomplished. Through a subsequent stamping process, the cards are obtained one by one from the sheet and constitute finished security products, ready for the following process of personalisation.

This method has the disadvantage that the stacking of the layers above one another in an accurately fitting manner and the subsequent laminating operation performed by a laminating press are time-consuming, due to the discontinuous nature of the process.

DE 199 07 940 A1 further discloses a method for producing a multilayer security product. Unlike the method mentioned above, this method suggests that the carrier material to be coated is supplied on a roll, is unrolled therefrom and, after printing, is laminated on one side or on both sides with respective covering films. In doing so, a highly accurate laminating process is provided in order to connect the rollstock material of the printed and coated web of the carrier material and the film. The laminating film, in turn, is unrolled from a roll, such that the two unrolled webs may be mutually laminated together in a single process step. It is thus possible to enable a continuous production process. This continuous process requires that both the security features incorporated into the covering film or the covering composite film and the security features disposed in the carrier material are uniformly spaced apart from one another. In addition, the lining process requires precise feeding of the individual webs. Furthermore, this method is limited to the production of security products in which the security product consists of a bendable plastic material capable of being unrolled from a roll. This method is not practicable for processing cards that cannot be wound upon a roll.

The invention is therefore based on the object of proposing a method for producing multilayer security products consisting of at least one card and at least one polymer film that is applied to at least one side of said card and is supplied as a rollstock product provided with at least one security feature, in which method a short production time for producing individual security products may be achieved and an exact association of individual cards with the polymer film is enabled, which is necessary particularly in cases in which the individual pieces of the card have, as such, been pre-personalised.

This object is achieved, according to the invention, by a method for producing a multilayer security product in which a rolled web of the polymer film and at least one strip having an n-fold number of pieces is fed to, and lined in, a lining station, in which method, prior to lining, a control mark formed on the polymer film which is associated with the at least one security feature to be applied to the respective card is retrieved, or in which a reference mark associated with the piece or the strip is retrieved, or in which both the control line and the reference mark are retrieved, and in which a feed rate or a feed direction, or both, of the rolled web of the polymer film and the strip are adjusted relative to each other for precise alignment.

In this method according to the invention, a working process based on the principles of "Round upon Flat" is performed. This method permits to consecutively feed strips having an n-fold number of pieces to a lining station. Transportation is effected along a plane of transport and the strips are processed in this plane of transport within the lining station, such that the feeding is effected according to a "Flat"-type principle. The polymer film is unrolled from a roll and fed to the lining station. The polymer film may also be a composite film composed, for example, of a central functional polymer and of protective films disposed on both sides thereof. The application of the polymer film liner is effected via a cylinder, i.e. according to a "Round"-type principle, such that a "Round upon Flat"-type principle is put into practice. This approach makes it possible for the strip, which is fed according to said plane, to be adjustable with respect to the lining position both in the X-direction, i.e. the direction of transport, and in the Y-direction, i.e. in the direction extending crosswise with respect to the direction of transport, and for the strip to be adjustable in an analogous manner, such that an accurate positioning of the two with respect to each other is made possible. This is of importance in cases in which the individual pieces of the card are, as such, pre-personalised, for example by means of a photograph, a document number, or the like. In the course of the production process, at least one of the laminate films of a

cardstock-type laminate may, for example, be subject to such personalisation prior to lamination. By this combined feeding of individual strips and the polymer film, it is possible to enhance the processing rate as compared with an embodiment in which the individual layers are stacked above one another within the laminating press in a stationary manner. Additionally, this method of the invention has the advantage over a "Round-Round"-operating principle that the positioning of the polymer film and the security features contained therein relative to the respective pieces may be controlled in an easier and more precise manner and that a more rapid processing with respect to the number of pieces per strip is enabled.

According to a preferred configuration of the invention, provision is made for the strip in question to be produced with a number of pieces of $n > 1$. Preferably, provision is made for each strip to provide a number of pieces ranging between three and twenty, and to have, in particular, four or five pieces. The strips are preferably cut from sheets, with provision being made for one sheet to be cut into four strips having each five pieces, or into five strips having each four pieces. This arrangement of a plurality of pieces preferably disposed in a strip one after another has the advantage that the pieces within the strip are already provided in a defined order, such that it is easily possible, particularly in the case of a pre-personalisation of the individual pieces within the strip, to establish a correlation with polymer films which, in turn, may be pre-personalised or personalised. Instead of providing the laminated sheets which are separated into strips prior to lining with the pre-personalised or personalised polymer film, it is also possible to provide laminated strips provided with corresponding, individualised pieces. Thus, preference is given to a method generally referred to as strip lamination. In this case, the cardstock-type laminate is not laminated in a sheet form comprising a plurality of strips, but rather the individual laminate films that are to undergo lamination are from the outset provided as strips (in which case they may be cut from an individual sheet) or as a roll. In this case, processing of pre-personalised laminate films may be carried out in an easier manner, since these may be fed in the form of a roll. This approach permits, in addition, to predefine a fixed succession of strips which corresponds to the succession in the personalisation of a polymer film. Subsequent to the lamination, the edges of the strip laminate may preferably be trimmed, such that, for example, a neat contact edge may be formed.

According to another preferred configuration of the invention, provision is made for the at least one strip having the n -fold number of pieces to be separated from a sheet, prior to the

lining operation with the pre-personalised or personalised polymer film, in particular through stamping or cutting. This separation into strips makes it possible to predetermine the succession of a number n of pieces placed on a strip, which represents a lower degree of complexity as compared to arranging the pieces one after another for subsequent lining with a polymer film. Thus, rather than having to feed each individual piece to a lining station, a plurality of pieces, disposed together on one strip, may jointly be fed to a lining station. Therefore, the production process is simplified and, moreover, can be accomplished within a shorter period of time.

According to a further preferred configuration of the invention, provision is made, subsequent to the lining of the at least one strip with the polymer film, for the edges of the strip-shaped laminate thus formed to be trimmed. This processing step may be part of a quasi-continuous strip lamination process.

According to a further preferred configuration of the invention, provision is made for the separation of the strips from the sheet to take place in such a manner, prior to the lining with the polymer film, that on one end of the strip an area that is not provided with any pieces, hereinafter referred to as a piece-free space, will remain. This piece-free space has the function of what may be called a discharge zone which is particularly advantageous during the bonding of the polymer film onto the strip. The pieces disposed on the strip are preferably evenly spaced from one another. The piece-free space may prevent the adhesive from spilling and flowing into the machine when the polymer film is compressed during the subsequent lining operation. Provision is in particular made for the adhesive used for gluing the polymer film onto the strip to be coated in such a manner that the strip is not coated in its entirety but that any remainder of the adhesive is received in the discharge zone or in the piece-occupied space. Depending on the length of the strip, provision is preferably made for a space ranging from about 2 % to about 30 %, in particular 2 % to 10 %, to be left free at the end of each strip, which may correspond, for example, to a space of between 1 cm and 5 cm, preferably between 2 cm and 3 cm.

Preferably, the strips designed to form a contact edge are cut from the sheet or from the strip-shaped laminate in a defined manner so as to form accurately-shaped edges. This may allow increased precision in positioning the strips with respect to the positioning tape or transport tape in preparation of their lining with a polymer film.

According to a further preferred configuration of the invention, provision is made for a plurality of strips to be arranged in a predefined succession one behind another. This will ensure that an association with the possibly personalised polymer film to be applied, which is preferably provided with at least one security feature, is effected in a precise manner. A simplified and nonetheless precise association of the respective pieces may in particular be effected in a case in which a pre-personalised laminate film is incorporated into the strips.

According to a further preferred configuration of the invention, provision is made for a defined distance to be set between the at least two strips disposed one behind another which are preferably disposed on a common positioning tape or transport tape. This makes it possible to pre-set high processing rates for the lining operation since the predefined distances between the individual strips with respect to each other are known. This distance may also be taken into consideration, in particular, when the security features on the polymer film are created.

Provision is preferably made for the distance between the strips to be set in such a manner that the distance separating the last piece of the preceding strip from the first piece of the following strip is equal to the distance separating the pieces within the respective strips from one another. This makes it possible for the distance between one piece and the next piece to be virtually set to an identical amount, disregarding the number of pieces applied per strip and the number of strips arranged one behind another. Thus it is possible to achieve a continuous lining process at a high web speed. It will readily be understood that the at least one security feature provided for the respective piece is applied to the polymer film at a corresponding distance, such that only one single adjusting operation at the beginning of a lining process is required in order to align the reference mark formed on the strip or the reference mark of the pieces with a control mark formed on the polymer film.

If a discharge zone for the adhesive is used, the distance of the pieces between individual strips is obviously greater than the distance of the pieces within one strip. In this case, this changing distance is taken into account, according to a preferred configuration, in the production of the polymer film. During the lining process, the distance between the individual strips should in this case remain invariable.

However, a preferred approach consists in readjusting the distance between the individual strips. In this manner, variations which may be present in the materials, such as warping in

the polymer film and/or the strips, and in their respective distances from each other, may be compensated for. To this purpose, reference marks and/or control lines which mark a certain position in the feed direction of the strip and, preferably, of the polymer film, may be determined and aligned with each other. This measurement is taken into consideration when the strip is placed on the transport tape.

Preferably, provision may be made for two or more strips to be provided side by side on the transport tape. These are then arranged at a defined distance from one another and the pieces are preferably aligned so as to be on the same level. Rather than using two or more strips, a preferred approach consists in using just one broad strip carrying a corresponding number of parallel pieces.

Alternatively, provision may be made for the individual strips not to be arranged on a common positioning tape but to be individually placed on a transport tape, in particular a vacuum transport tape or a transport tape provided with grippers, and to be accurately positioned with respect to each other. The positioning may be effected, for example, by means of a gripper or a feeder, and may alternatively be performed by a further transport tape delivering the strips as needed. By adapting the speed, the distance in the feed direction may be adjusted.

In a further preferred configuration of the method, provision is made for the security feature or the security features for a given piece to be applied to the polymer film at a distance which corresponds to the distance between the number n of pieces on the respective strip. Owing to this configuration, the polymer film does not need to be retrieved with respect to each individual security feature or each individual control line or control mark to ensure that these will be correctly positioned relative to the pieces on the strip but that only one retrieving operation of a control line or control mark is required for a predefined number of security features which corresponds to the number of pieces on a strip. Thus, it is possible to perform at least one continuous lining process with regard to the number of pieces present on the respective strip before a new retrieval of the corresponding reference line and control line is performed in order to accurately align and position the strip and the polymer film relative to each other. In this manner, the processing speed may be successfully enhanced. At the same time, it may be ensured that the respective security features within the group are accurately positioned with respect to the piece. It will be understood that the term 'security

feature' as used herein is not limited to one single security feature but may include a group of several individual features which together form one security feature.

Provision is further preferably made that before the polymer film and the at least one strip are joined together, a protective film is removed from the polymer film, and preferably an adhesive, in particular a UV-curable adhesive, is applied to the at least one strip or to the polymer film or to both of them. Thus, it may be ensured that the polymer film will remain protected against external influences as long as possible.

Provision is further preferably made that subsequent to the lining of the polymer film and the at least one strip a protective film is removed from the polymer film and subsequently a scratch-resistant protective coating and/or an abrasion protection coating is preferably applied. Although in the following description reference will be made to scratch resistance only, this is to be understood as meaning scratch resistance and/or abrasion protection. This process step permits to prevent the outer surface of the polymer film from suffering damage during the lining operation. The subsequent application of the scratch-resistant protective layer protects the polymer film. The scratch-resistant protective coating may be applied in the form of a lacquer, a film, or the like.

Provision is further preferably made for the piece together with the at least one polymer film laminated thereon to be separated from the strip by punching so as to be given its final format. Owing to the successive process steps described hereinbefore and the punching-out subsequent to the application of the polymer film, an accurate edge geometry of the pieces may be obtained. Furthermore, it is possible, by means of this production process, to solve the problem of edge termination known to occur with state-of-the-art techniques. To this effect, the polymer film is applied in excess to the piece in the course of the lining process. The subsequent punching out permits to obtain a final format having a rim with a neat terminal edge. A scratch-resistant protective lacquer or a scratch-resistant protective film may be applied prior to, or subsequent to, the punching operation.

Provision may further preferably be made for at least one personalisation feature to be applied to, or incorporated into, the card, at least before the latter is lined with the polymer film. Thus, this processing step may be directly incorporated into the continuous production process.

According to a further preferred configuration of the method, provision is made for the security card to be produced from at least one layer of rigid plastic material, preferably from among the group comprising polycarbonate. In particular, bisphenol A polycarbonate may be employed for this purpose. Alternative materials which may equally be used to form rigid cards include PET (polyethylene glycol terephthalate), PMMA (polymethylmethacrylate), TPU (thermoplastic polyurethane elastomer), TPE (thermoplastic elastomer), PE (polyethylene), PP (polypropylene), PI (polyimide) or poly-trans-isoprene, ABS (acrylonitrile butadiene styrene), PVC (polyvinyl chloride) and copolymers of such polymers. Furthermore, combinations between PC and TPE or the like are equally preferably possible.

Provision is further preferably made for the polymer film by which a piece is to be lined, for example its functional polymer, to consist of photopolymers, silver halide films, dichromate gelatine, or the like.

Provision is further preferably made for the security feature or the security features to be incorporated into the polymer film in the form of a hologram, in particular a volume hologram.

The invention, as well as other advantageous embodiments and developments thereof, will be described and explained in the following with reference being made to the examples shown in the drawings. The characteristics issuing from the description and the drawings may be applied according to the present invention either individually or as a plurality of features taken in any combination. In the drawings:

- Figure 1 is a perspective view of a security product;
- Figure 2 is a schematic top view of a positioning tape that receives strips having a plurality of pieces;
- Figure 3 is a schematic top view of a polymer film for application as a liner onto a piece;
- Figure 4 is a schematic representation illustrating the production of multilayer security products; and

Figure 5 is a further schematic representation illustrating the production of multilayer security products.

Figure 1 is a perspective view of a security product 11 consisting of at least one card 13 and at least one polymer film 14 applied to at least one side of said card 13 and produced as a rollstock product. In view of an economic production of a card 13 of this type, provision is made for a number $n > 1$ of pieces 12 to be grouped together in one strip 18 so as to be coated, during a lining process represented in Figure 4 or Figure 5, with at least one polymer film 14.

A piece 11 of this type may be employed as an identity card, a passport, an identification card, an access authorisation means, a driving licence, a personalisation data page of a book-like document of value, or the like. A security card 11 of this type may also be realised without any personalisation data, while still having security features. The polymer film 14 designed to be used for the security product 11 may be refined, individualised and/or personalised. This may be achieved, among other possibilities, by holographic exposure, as described in EP 0 896 260 A1.

Figure 2 represents an arrangement of, for example, two strips 18 disposed on a positioning tape 20 for subsequent lining with a polymer film 14. A plurality of pieces 12, disposed side by side and one behind another in a predetermined succession, are contained within a sheet, in particular a sheet-shaped laminate, not represented in greater detail. Strips 18 containing, for example, four or five pieces 12 are separated from this sheet-shaped laminate by a cutting operation. These pieces 12 are preferably spaced apart from each other by a predetermined, particularly uniform, distance and are disposed in a row one behind another and may be positioned behind one another in a lengthwise or crosswise orientation. Most preferably, they are applied in such a manner that the distance of the strips is made to coincide with the polymer film that is to be applied in a lining process. These strips 18 are applied to the positioning tape 20 and are connected with each other, such that an endless track of strips 18 disposed one behind another is formed by the positioning tape 20. This positioning tape 20 may be a foil or the like which ensures that the distance between the individual strips 18 is maintained during transport, despite possible strains that may occur. Instead of providing a positioning tape 20, it is possible to provide a flexible connection between the strips 18 in such a manner that it is automatically produced in the course of the lamination process, in particular in the case of a strip lamination, in that foils

fed from the roll remain un laminated in their middle portions. In addition to being applied to the positioning tape 20, the strips 18 may be flexibly joined together later on, for example by means of adhesive elements. The adjustment of the distance between the individual strips 18 may in all cases be effected for example by means of a gripper system operable to transport and individually position the joined strips 18.

At least one reference mark 19 is provided on the strip 18. Preferably, three reference marks 19, realised as register marks, are applied in order to permit a detection of the position of the strip 18 and an alignment in an x-direction and/or a y-direction relative to the transport direction, before the lining process with the polymer film 14 is performed.

As an alternative to the positioning of the strips 18 behind one another on a positioning tape 20 as described hereinabove, provision may be made for these strips 18 to be directly placed onto a transport tape 21, which is represented in Figure 4, and for said strips to be aligned with respect to each other in an analogous manner to that employed upon their placing onto the positioning tape 20 as the individual strips are being placed behind one another. The transport tape 21 is preferably formed as a vacuum tape and is provided, in particular, as an endless tape. This transport tape 21 may equally serve for receiving the positioning tape 20 carrying the strip 18, or otherwise the flexibly interconnected strips 18, disposed thereon.

Figure 3 represents a top view of the polymer film 14, which is supplied as a rollstock product. A first embodiment provides any desired succession of security features, each security feature preferably having a control line 23 associated therewith. A discrete retrieval of the control line 23 formed on the polymer film 14 permits precise feeding and positioning of each of the security features on the polymer film 14 with respect to the corresponding piece 12. Preferably, provision is made for a group of security features corresponding in their number to the group of pieces 12 on the strip 18 to be spaced apart from each other by the same distance. In addition, provision may be made for the distance between the individual groups of said security features to correspond to the distance between the individual strips 18.

The polymer film 14 may in addition be provided with reference marks 22 which coincide in their disposition with the reference marks 19 formed of strip 18. Each of the corresponding reference marks 19, 22, or register marks, may be visually detected, at least prior to the

lining process, thus making it possible for the polymer film to be aligned both in the x-direction, i.e. the transport direction, and in the y-direction, and to be adjusted so as to accommodate the feeding position of the strips 18. Coinciding reference marks 19, 22 then ensure that any security features formed on the polymer film 14 will be disposed in the correct position on a card 13. In addition, the polymer film 14 is provided with control lines 23 which are individually retrieved for detecting the position of each of the corresponding security features.

Figure 4 is a schematic representation of the production process for the security product 11. In the course of a separate production process, the individual strips 18 are placed in a storage magazine 24 where they are provided in stacks, ready for the lining operation. Subsequently, the strips 18 move to a transfer station where they are placed upon the transport tape 21 which may, for example, be configured as a vacuum tape. Preferably, the transport tape 21 is realised as an endless tape. To this purpose, the strips 18, which are placed in a defined succession, e.g. in the storage magazine 25 or in an feeder, are individually dropped and positioned. In doing so, the distance by which the strips 18 are spaced from one another is matched with the polymer film 14. If so required, the strips 18 are flexibly interconnected prior to the lining process. If so required, the strips 18 are interconnected at the end of the process.

The pieces 12 on a given strip 18 may have been personalised or individualised in advance. A personalisation of this type may, for example, comprise a photograph created by way of some printing technology or photographic exposure. Further personalisation information such as a name, a document number, a signature etc. may also be incorporated. As an alternative, such personalisation steps may also be effected, either in part or in their entirety, at a later stage. The strips 18 are fed one by one to a lining station 31 via the transport element 21. At the same time, the polymer film 14, which is supplied as a rollstock product, is unrolled from a roll 32. A first protective film 33 is removed and rolled up. Once the protective film 33 has been removed from the polymer film 14, the latter is coated with an adhesive, a process which may take place for example in a gluing station 37 not shown herein but positioned upstream of the lining station 31. The gluing station 37 may also be used to equally, or alternatively, coat the strips 18 with an adhesive. Preferably a liquid adhesive, in particular a UV-curing adhesive may be used for this purpose. Alternatively, other adhesives may be used, such as, for example, thermoreactive adhesives, thermoplastic adhesives, pressure-sensitive adhesives, moisture-curing adhesives, two-

component systems, or the like. It is possible in particular, by way of example, to apply a thermoplastic layer, which may again be supplied from a roll. Subsequently, the polymer film 14 is pressed against the strip 18, with the adhesives disposed therebetween. In cases in which the strips and the polymer film 14 are personalised, an appropriate advance of the polymer film 14 may permit to achieve the right starting position for the lining process to be performed in an accurate manner with respect to the pieces. The exertion of pressure avoids the formation of air bubbles between the layers. This may also be achieved, when liquid adhesives are used, by applying an excess quantity of adhesive to the strip 18 which is then squeezed out as pressure is exerted, for example by means of a cylinder. The adhesive that has been squeezed out may be collected and re-used. Preferably, however, some space is provided at the end of strip 18 which is not occupied by any individual pieces, such that a discharge zone is created for the liquid adhesive to run to during the lining operation.

The application of the adhesive may, for example, be effected via a pressure process and be performed in a structured manner, such that areas having varying degrees of adhesion are created. As an alternative, different adhesives having different adhesive forces may be used, and even adhesive-iris-transitions may be employed. This is, in particular, an obstacle to a non-destructive removal of a hologram. Furthermore, it may be envisaged to overmold the polymer film prior to, or subsequent to, the gluing operation, i.e. to provide it with predetermined breaking points. The overmolding of the polymer film may be effected prior to gluing, since the upper surface of the protective film continues to hold together the supplied polymer film, i.e., the multilayer film.

In a case in which a UV adhesive is employed, this is immediately followed by the UV-curing thereof. In this respect, many UV systems are known to attack the holographic coating to such a degree that the perception of the holograms is impaired in that, for example, the wavelengths and/or wave angles of the reconstruction waves are modified. These modifications, however, are inconvenient as far as machine-readable features are concerned in which, for example, the accuracy of a holographic reconstruction is verified with respect to its diffraction angles. If such modification is to be kept as small as possible, the curing time must be minimised in accordance. In any case, it is important for the UV curing to be performed within a defined time interval. The setting of the time interval for UV curing depends on a number of factors such as the beginning and the end of the stretch of UV exposure, the physical distances between the contacting of the polymer film 14 and the adhesive and the beginning of the stretch of UV exposure, and on both factors taken in

combination with the travel speed of the transport tape 21. In a case in which a modification of the hologram is undesirable, the physical distance between the contacting of the polymer film and the adhesive, on the one hand, and the beginning of the stretch of UV exposure, on the other, is to be minimised. The length of the stretch of UV exposure depends on the transport speed and on the UV capacity of the UV lamps installed in the stretch of UV exposure. It may in some cases become necessary to use special cold UV lamps in order to avoid excessive transmission of heat onto the composite structure consisting of polymer film, adhesive, and strip.

Certain UV gluing systems make it possible to start UV curing even before the beginning of the lining process. In the case of a coating of the strips 18, the UV lamp would be placed upstream of the lining station. The lining operation will then take place on the adhesive while the curing reaction thereof has already been started.

Apart from the UV adhesives, the other adhesives mentioned above may equally be employed. In particular, heated cylinders may be used in combination with thermal adhesives. Hybrid forms of adhesives, provided with both, a UV-curing component and a thermal component, may equally be provided. In such cases, a UV pre-gluing process may first be performed and be followed, either immediately or at a different point in time, by a post-crosslinking reaction taking place in a stretch of heat exposure.

Before the polymer film 14 is applied as a liner onto the strip 18, the control line 23 and/or the reference marks 22 on the polymer film 14 are preferably retrieved by a reading device 34. In addition, a further reading device 35 may be used to retrieve the reference mark 19 of the corresponding strip 18 in order to subsequently make the strip 18 and the polymer film 14 match with each other in the x-direction and in the y-direction. An adjustment of this type may be performed, for example, through the activation of vacuum suckers or through the displacement of transverse axes required for longitudinal transportation purposes. In a case in which the system consists of a plurality of transport tapes 21 differing in their respective travel speeds, the positioning in the direction of travel may also be effected by a change of the transport tape 21.

After the alignment of the strips 18 and the polymer film 14, said polymer film 14 and a respective strip 18 may be glued together in the lining station 31 by the exertion of pressure, as described above, so as to form a composite structure 36. After this, the composite

structure 36 leaves the lining station 31 which may also comprise a stretch of heat exposure for post-crosslinking.

Subsequently, a further protective layer 38 present on the upper surface of the polymer film 14 is removed and wound onto a roll 39. Next, the composite structure passes through a heating station 40, before it reaches a further station 41, where a scratch-resistant layer or an anti-scratch film is applied.

According to a first embodiment, the strip-shaped composite structure is thereafter separated into individual strips in a punching or cutting station 43 and the latter are stacked one above another in a storage magazine 44. Furthermore, provision may be made for the individual pieces in the strip 18 to be stamped out in the stamping station 43 so as to be given their final format and for the security products 11 thus obtained to be stacked one above another in a common storage magazine 44.

Due to the disposition of the pieces 12 on the strip 18 it is possible for the polymer film 14 to be applied as a liner to the pieces 12 with an oversize with respect thereto, such that the following punching operation for obtaining the security product 11 will yield a neat edge. Thus, the security products 11 succeed in solving the problem of edge termination which is known to occur with state-of-the-art security products 11.

As an alternative, provision may be made for the stamping out of the pieces 12 from the strip 18 to take place as a first step after the removal of the further protective film 38 and for the application of a scratch-resistant protective coating to be effected subsequently. Furthermore, provision may alternatively be made for the further layer 38 to be removed upstream of the lining station 31 and for a scratch-resistant protective film to be applied, such that said scratch-resistant protective film is applied to the polymer film 14 before the latter passes the lining station 31. Furthermore, provision may be made for the polymer film 14 to be intrinsically provided with a scratch-resistant protective coating, for example in the form of a lacquer or a film, arranged between the protective film 38 and the actual functional polymer and remaining on the functional polymer when the protective film 38 is removed, such that the utilisation of a further station designed for applying the composite scratch and/or abrasion protection layer may be dispensed with.

Figure 5 is an alternative embodiment of the method for producing a security product 11, differing from Figure 4. This production process differs from the production process described in Figure 4 in that in view of the lining of the strips 18 with the polymer film 14 the individual strips 18 are pre-positioned in a predetermined succession on the positioning tape 20, as represented and described in Figure 2. Instead of the positioning tape 20, another flexible connection between the strips 18 may alternatively be used, as described hereinabove. By means of a fold formed in a free area of the positioning tape 20 between two strips 18, it is possible to provide a stacked arrangement of the strips 18. This stacked arrangement is picked up from a storage magazine 25 and, via a transport tape 21, is moved through the lining station 31 and through any other stations that may be present and finally arrives at the storage magazine 44. In this process, provision may be made for the transport tape 21, which may again be realised as a vacuum tape, to use vacuum means for holding the positioning tape 20 in place for transportation. Alternatively, grippers acting on the positioning tape 20 and/or on the strips 18 may be provided on the transport tape 21. The individual processing steps follow the same order as described in the production process according to Figure 4. The same is true, by analogy, of the final processing or separation of the pieces 12 in the production of the security products 11.

Further optionally provided stations may include, for example, a heating station 40, which may be passed, and a further station 41 in which a scratch-resistant layer or a scratch-resistant protective film is applied.

Claims

1. A method for producing multilayer security products (11) consisting of at least one card (13) and at least one polymer film (14) which is applied to at least one side of said card (13) and is supplied as a rollstock product provided with at least one security feature, characterised in that
 - a rolled web of the polymer film (14) and at least one strip (18) having an n-fold number of pieces (12) are fed to, and lined in, a lining station (31),
 - prior to lining, a control line (23) formed on the polymer film (14) which is associated with the at least one security feature to be applied to the respective piece (12) is retrieved, or a reference mark (19) associated with the piece (12) or the strip (18) is retrieved, or both the control line (23) and the reference mark (22) are retrieved, and
 - a feed rate or a feed direction, or both, of the rolled web of the polymer film (14) and the strip (18) are adjusted relative to each other for precise alignment.
2. The method as claimed in claim 1, characterised in that the respective strip (18) is produced with a number n of pieces (12), with $n \geq 1$, in particular $n > 3$, and $n \leq 20$, and preferably comprises between four and five pieces.
3. The method as claimed in claim 1, characterised in that, prior to the lining with the preferably pre-personalised or personalised polymer film (14), the at least one strip (18) is separated from a sheet in particular through stamping or cutting.
4. The method as claimed in claim 1, characterised in that subsequent to the lining of the at least one strip (18) with the polymer film (14), the edges of the strip-shaped laminate thus formed are trimmed.
5. The method as claimed in claim 1, characterised in that the strips (18) are separated in such a manner that on one end of the strip (18) a piece-free space will remain.

6. The method as claimed in claim 1, characterised in that the strips (18) designed to form a contact edge are cut from the sheet or from the strip-shaped laminate in a defined manner.
7. The method as claimed in claim 1, characterised in that at least one strip (18) having a number of pieces (12) of $n > 1$ which are arranged one behind another or side by side or both, is separated.
8. The method as claimed in claim 1, characterised in that a plurality of strips (18) are arranged in a predefined succession one behind another.
9. The method as claimed in claim 8, characterised in that a defined distance is set between the at least two strips (18) disposed one behind another which are preferably disposed on a common positioning tape (20) or transport tape (21), with the distance between the two strips disposed one behind the other being set in such a manner that the distance separating the last piece (12) in the preceding strip (18) from the first piece (12) in the following strip (18) is equal to the distance separating the pieces (12) within the respective strips (18) from one another.
10. The method as claimed in claim 8, characterised in that for setting the distance between two strips (18) at least reference marks (19) of the two strips (18) are retrieved and the setting of the distance of the two strips (18) is re-adjusted.
11. The method as claimed in claim 1, characterised in that a defined distance is set between at least two strips (18) arranged side by side which are preferably disposed on a common positioning tape (20) or transport element (21).
12. The method as claimed in claim 1, characterised in that the security feature or the security features for a given piece (12) is applied to the polymer film (14) at a distance which corresponds to the distance between the number n of pieces (12) in the respective strip (18).
13. The method as claimed in claim 1, characterised in that before the polymer film (14) and the at least one strip (18) are joined together, a protective film (33) is removed from the polymer film (14), and preferably an adhesive, in particular a UV-curable

adhesive, is applied to the at least one strip (18) or to the polymer film (14) or to both of them.

14. The method as claimed in claim 1, characterised in that subsequent to the lining of the polymer film (14) and the at least one strip (18) a protective film (38) is removed from the polymer film (14) and subsequently a scratch-resistant protective coating is preferably applied.
15. The method as claimed in claim 1, characterised in that the piece (12), together with the at least one polymer film (14) applied as a liner, is separated from the strip (18) by punching so as to be given its final format.
16. The method as claimed in claim 1, characterised in that a protective lacquer is applied to the at least one strip (18) and subsequently a punching operation is performed.
17. The method as claimed in claim 1, characterised in that at least prior to the lining operation with the polymer film (14) at least one personalisation feature is applied to, or incorporated into, the card (13).
18. The method as claimed in claim 1, characterised in that the card (13) is produced from at least one layer of rigid plastic material, preferably from among the group comprising PC (polycarbonate), in particular bisphenol A polycarbonate, PET (polyethylene glycol terephthalate), PMMA (polymethylmethacrylate), TPU (thermoplastic polyurethane elastomer), TPE (thermoplastic elastomer), PE (polyethylene), PP (polypropylene), PI (polyimide) or poly-trans-isoprene, ABS (acrylonitrile butadiene styrene), PVC (polyvinyl chloride) and copolymers of such polymers.
19. The method as claimed in claim 1, characterised in that the polymer film (14) by which the at least one card (13) is to be lined is made of photopolymers, silver halide films, dichromate gelatine.