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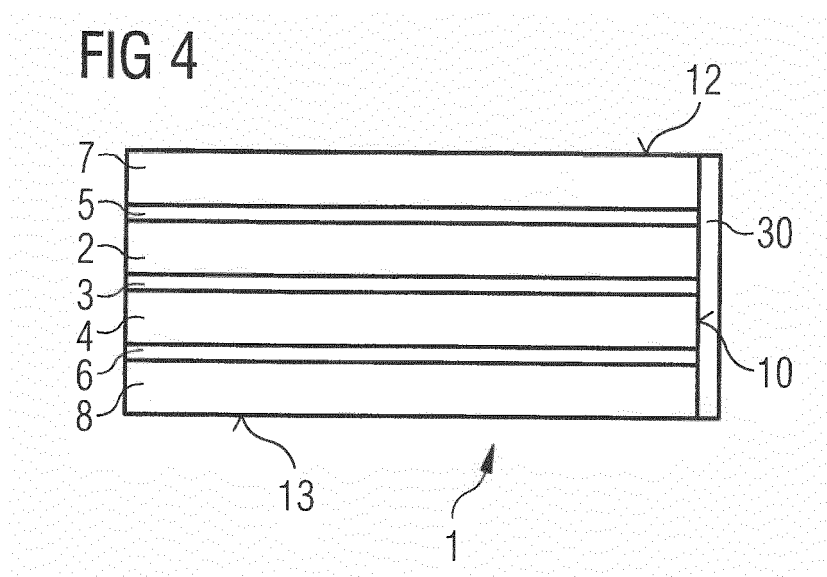
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(54) **METHOD FOR MANUFACTURING A CARD BODY, CARD BODY, SEPARATING TOOL AND APPARATUS FOR MANUFACTURING A CARD BODY**

(57) The invention relates to a method for manufacturing a multilayer card body (1), in particular for a portable data carrier, with improved properties in that the side surface of the card body is sealed during separation or after it has been separated from a laminated sheet. Further, the invention relates to a card body (1), manufactured according to the method. Besides, the invention

relates to a corresponding separating tool (20). Moreover, the invention relates to an apparatus for manufacturing a multilayer card body (1). The invention has the essential step of the side surface (10) being sealed by using mechanical or laser engrailed edges or micro-structuring; this step is not shown in the figures.



Description

[0001] This invention relates to the manufacture of a multilayer card body. In particular, the invention relates to the manufacture of card bodies for portable data carriers in the credit card or chip card format. Further, the invention relates to a card body, manufactured according to the method. Besides, the invention relates to a separating tool for separating card bodies from a multilayer laminated sheet. Furthermore, the invention relates to an apparatus for manufacturing a card body.

[0002] Card-shaped portable data carriers in the credit card format are widespread. They are used in particular as payment cards or identification cards or, in smaller formats, as authentication cards or memory cards. Most of the cards are equipped with a magnetic strip and/or a microprocessor as well as a data interface for reading devices which enable data-processing tasks to be carried out with the help of the card.

[0003] By a common manufacturing method, the cards are thus constructed from a plurality of layers which are interconnected by lamination. The layers typically consist of polymers. Commonly used polymers are in particular PVC, polycarbonate or polymers based on polyester. It is also known to manufacture cards from paper.

[0004] After laminating a number of at least two superposed layers into a laminated sheet, the cards are cut, milled or punched out in a punching process. The cards produced in this way have relatively weak mechanical properties as the side surface of the cards is frequently pre-damaged by the punching process. Usually delamination of the layers starts in the corners of the cards. That is why commonly, after punching the cards out of the laminated sheet, a delamination test like a peel strength test is carried out to determine if the layers at the side surface are pre-damaged or not. After determining a pre-damage, the none laminated card material has to return to the beginning of the manufacturing process and an adhesive is used for sealing the card.

[0005] The object of the invention is to provide an improved method for manufacturing a card having good mechanical properties and preferably offering an increased lifespan and durability of the card. Further, it is to provide a corresponding card.

[0006] This object is achieved by a method for manufacturing a multilayer card body, a multilayer card body manufactured by the method, a separating tool and an apparatus for manufacturing a multilayer card body having the features of the independent claims. In the dependent claims, advantageous embodiments and modifications are given.

[0007] According to one aspect of the invention, a method for manufacturing a multilayer card body, in particular for a portable data carrier, is provided. The method has the following steps:

- laminating together at least the first layer and the second layer to form a laminated sheet,

- separating the multilayer card body from the laminated sheet, the multilayer card body having a top surface, a bottom surface and a side surface, and
- sealing the side surface of the multilayer card body during the separating step or as a step following the separating step, wherein no test for determining delamination of the layers at the side surface is performed prior to the sealing step.

[0008] With the method according to the invention, a procedure to seal the side surface of the card body is presented which increases the mechanical properties of the product and the method could be integrated into the production flow which enables a faster procedure as known in the state of the art. Further, returning the card to the beginning of the manufacturing process as is done in the state of the art is omitted.

[0009] The manufactured cards can readily satisfy in particular the requirements set by ISO 7810 and are advantageously suited for chip cards. Preferably, a cover layer of polymers, preferably of PVC, is applied to at least one outer side of the card body structure, and such cover layer or layers may be sealed together with the aforementioned first and second layers.

[0010] Preferably, an adhesive, in particular an adhesive lacquer, is applied to at least one side of at least one of the first and second layers for the step of lamination. Further preferably, a graphical pattern is disposed to at least one side of at least one of the first and second layers so that the graphical pattern points outwardly and thus faces away from the first layer and second layer. Further preferably, at least one of a third layer and fourth layer are disposed on at least one of the first layer and second layer. The third layer and fourth layer may form cover layers of the multilayer card body.

[0011] In a preferred embodiment, when sealing the side surface of the card body, the card body is sealed from the side surface side such that delaminated layers at the side surface are bonded together. As a result, the layers of the multilayer card body are fixed together alongside the sealed side surface of the card body. In particular, the side surface side of the card body is sealed circumferentially.

[0012] In a preferred embodiment, the side surface is sealed by generating heat in the side surface, in particular ultrasonic-generated heat.

[0013] Preferably, a separating tool is adapted to generate the heat so that, as a consequence of heat development, the side surface of the card body is sealed, by heated parts of the separating tool. This allows performing both steps simultaneously, namely, the step of separating and the step of sealing.

[0014] Alternatively, a separate heat source is adapted to generate the heat so that as a consequence of heat development, the side surface of the card body is sealed by means of the heat source. The heat source can be e. g. a heat lamp or a laser. This allows performing the step of sealing as a step following the separating step without

performing a delamination test beforehand.

[0015] In a further preferred embodiment, the side surface is sealed by destroying and, thereby, activating capsules which are present within or between at least one of the first layer and second layer. This also allows performing both steps simultaneously, namely, the step of separating and the step of sealing. Preferably, the capsules are filled with an adhesive, wherein the adhesive is set free from the capsules at the edge of the layers, due to the separating step. Preferably, destroying the capsules is performed with the separating tool.

[0016] In a further preferred embodiment, the side surface is sealed by applying a sealing material to the side surface. In doing so, sealing of the side surface is achieved in an easy and cost-effective way. Preferably, the sealing material is an adhesive, a varnish or a solvent that is applied to the side surface of the multilayer card body. This allows performing the step of sealing as a step following the separating step without performing a delamination test beforehand.

[0017] In a further preferred embodiment, the side surface is sealed by subjecting the side surface to UV radiation or IR illumination. As a result, sealing of the side surface of the multilayer card body is achieved in a fast and cost-effective way.

[0018] In a further preferred embodiment, the side surface is sealed by subjecting the side surface to laser radiation. In doing so, sealing of the side surface of the card body is achieved in a precise way. Preferably, the laser radiation starts a bonding process by activating components within at least one of the first layer and second layer, or by activating components of further layers applied to at least one of the first layer and second layer. In particular, at least one further layer comprising said components may be a pattern printed on one or both of the first and second layers.

[0019] In a further preferred embodiment, the side surface is sealed by using mechanical or laser engrailed edges or micro-structuring. Preferably, the separating tool is adapted to create such mechanical engrailed edges or micro-structuring. As an alternative, a separating tool may be provided to create the mechanical or laser engrailed edges or micro-structuring.

[0020] According to a second aspect of the invention, a multilayer card body manufactured by the method as mentioned above is provided.

[0021] Such multilayer card body has improved mechanical properties and offers an increased lifespan and durability as compared to state of the art card bodies. According to a third aspect of the invention, a separating tool for sealing a side surface of a multilayer card body during separation of the multilayer card body from a laminated sheet is provided. The separating tool is adapted to perform one of:

- producing heat for sealing the side surface and
- destroying capsules within at least one of a first layer and a second layer of the multilayer card body or

between the first layer and second layer.

[0022] With the separating tool, a card body having a sealed side surface can be manufactured, wherein a peel strength test to determine whether or not the layers at the side surface are pre-damaged is not necessary.

[0023] According to a fourth aspect of the invention, an apparatus for manufacturing a multilayer card body is provided. The apparatus comprises:

- a lamination device adapted to laminate together at least a first layer and a second layer to form a laminated sheet,
- a separation device adapted to separate a multilayer card body from the laminated sheet, the multilayer card body having a top surface, a bottom surface and a side surface, and
- a sealing device adapted to seal the side surface of the multilayer card body, wherein the sealing device is either integrated in the separating device so that sealing occurs during separation, or the separating device is arranged subsequent to the sealing device so that sealing occurs subsequent to the separation and without a device for performing a test for determining delamination of the layers at the side surface before the sealing device.

[0024] With the apparatus, a card body having a sealed side surface can be manufactured, wherein a peel strength test to determine whether or not the layers at the side surface are pre-damaged is not necessary.

[0025] In a preferred embodiment the sealing device comprises a separating tool, in particular a die cutting or the separating tool as mentioned above.

[0026] With reference to the drawings, an exemplary embodiment of the invention will hereinafter be explained in more detail.

[0027] There are shown:

FIG. 1 a flowchart of the manufacture of a card body,

FIG. 2 a cross section through a multilayer card body manufactured according to a first embodiment of the method,

FIG. 3 a cross section through a multilayer card body manufactured according to a second embodiment of the method,

FIG. 4 a cross section through a multilayer card body manufactured according to a third embodiment of the method,

FIG. 5 a cross section through a multilayer card body manufactured according to a fourth embodiment of the method,

FIG. 6 a cross section through a multilayer card body

manufactured according to a fifth embodiment of the method,

FIG. 7 a cross section through a multilayer card body manufactured according to a sixth embodiment of the method, and

FIG. 8 a separating tool for punching out the card body.

[0028] For the following description, it will be assumed by way of example that a card body is manufactured for a portable data carrier in the form of a chip card with conventional outer dimensions according to ISO standard 7810. However, the method can also be used in the same manner for manufacturing portable data carriers with other dimensions. For example, they can be manufactured as portable data carriers in the SIM-card format or portable data carriers serving, e.g. together with a housing, as a USB stick.

[0029] The method is illustrated as a flowchart in Fig. 1. It commences with a step 100 by making available two layers 2, 4 e.g. of thin paper or of plastic material. Expediently, the layers are provided in sheet form or as a web. Later the two layers 2, 4 form the structure of a multilayer card body 1 for a data carrier to be manufactured, as is represented in the following Fig. 2 to Fig. 7.

[0030] In the arrangement as shown e.g. in Fig. 2, preferably a graphical pattern 5, 6 is respectively applied to at least one side of the layers 2, 4 e.g. by a screen printing or offset printing or by means of digital printing. The graphical pattern 5, 6 may comprise flat areas, structures and/or alphanumeric characters. The graphical patterns 5, 6 may be of different configuration. The printing step may be executed with conventional printing parameters and printing inks as are used for printing chip cards and credit cards.

[0031] Further, preferably, there is applied to one, expediently to both, respectively other sides of the layers 2, 4 a thin film of an adhesive 3 for supporting the subsequent lamination in step 300. The adhesive 3 is preferably provided in the form of an adhesive lacquer. The application of the adhesive 3 may be effected e.g. by screen printing. Where the layers 2, 4 are of thermoplastic material and lamination occurs under the influence of heat, the adhesive may be omitted.

[0032] In this arrangement, two further layers, namely a third layer 7 and a fourth layer 8, are provided. The layers 7, 8 preferably consist of a common polymer, e.g. PVC or PETG. Expediently, the layers 7, 8 are transparent or semi-transparent.

[0033] The layers 7, 8 can be provided as foils which will be laminated with the other layers 2, 4. Alternatively, they can also be applied in the form of a lacquer layer, e.g. by a suitable printing method. If the finished data carrier is to possess a magnetic strip, one of the layers 7, 8 may expediently be equipped with the magnetic strip.

[0034] In a step 200 all layers, namely the layers 2, 4

and the layers 7, 8, are brought together. In doing so, the layers 7, 8 are disposed as cover layers to the first layer 2 and second layer 4 so that the layers 2 and 4 are lying between the cover layers 7, 8. The layers 2, 4 and the cover layers 7, 8 are disposed one above the other in a sandwich arrangement.

[0035] Expediently, if the portable data carrier to be manufactured is a chip card, a cavity may be provided in the card body 1 for inserting a chip module therein.

[0036] The layers 2, 4, 7, 8 are laminated into a laminated sheet in the following step 300. Lamination is done by conventional laminating methods for manufacturing chip cards or credit cards.

[0037] After the step 300 is performed, there is obtained a planar, multilayer laminated sheet which has two layers 2, 4 bearing a graphical pattern 5, 6 on their respective outer sides. The two layers 2, 4 are covered on both sides with a transparent or translucent cover layer 7, 8. The upper surfaces 12, 13 of the laminated sheet correspond to the final upper surfaces 12, 13 of the finished multilayer card body 1.

[0038] In the following step 400, a card body 1 having the final outer contour of the multilayer card body 1 is separated from the planar laminated sheet. The card body 1 is expediently done by punching the card out by using a separating tool, but can also be done by cutting or milling.

[0039] In step 500, the side surface 10 of the card body 1 is sealed either during the separating step 400 or as a step following the separating step 400, wherein no test for determining delamination of the layers at the side surface 10 is performed prior to the sealing step 500.

[0040] In a subsequent step 600, the outer surface may be finished. For instance, hot-stamped elements can be applied to the card body 1 by a conventional hot-stamping method.

[0041] The card body 1 present thereafter can finally be personalised in a step 700. This may be done for example by applying personal data in a thermal transfer process and/or by notching; other personalisation methods known per se can likewise be used.

[0042] Each card body 1 according to Fig. 2 to Fig. 7 comprises two polymer layers 2, 4. An adhesive 3 is applied between the two layers 2, 4. Graphical patterns 5, 6 are arranged on an outer side of each of the two layers 2, 4. Over the graphical patterns 5, 6, there is respectively applied a transparent cover layer 7, 8 on both sides. The side surface side 10 of the card body 1 is sealed circumferentially.

[0043] Fig. 2 and Fig. 3 show respective cross sections through a multilayer card body 1, wherein the side surface 10 is sealed during the separating step 400.

[0044] Instead, Fig. 4 to Fig. 7 show respective cross sections through a multilayer card body 1 manufactured according to a method, wherein the side surface 10 is sealed in a step following the separating step 400, wherein no test for determining delamination of the layers at the side surface 10 is performed prior to the sealing so

that the step of sealing directly follows the step of separation. Thus, no further step lies between the step 400 and step 500. In other words, a test, i.e. a peel strength test, is not necessary to determine if the side surface 10 is pre-damaged or not, since the side surface 10 of any card body 1 is sealed.

[0045] In the embodiment shown in Fig. 2, the side surface 10 is sealed by generating heat in the side surface 10 by means of a separating tool 20 as shown in Fig. 8. The separating tool 20 is adapted to generate heat so that as a consequence of the heat development the card body 1 is sealed from the side surface 10 side such that delaminated layers at the side surface 10 are bonded together. In one variant, the heat is generated using ultrasonic waves.

[0046] Fig. 3 shows a second cross section through the multilayer card body 1. The side surface 10 is sealed by destroying and, thereby, activating capsules 14 within the card layers. The capsules 14 are activated when being destroyed as a result of the separating step 400. Preferably, the capsules are filled with an adhesive. As a consequence of the destruction of the capsules 14, the adhesive is set free at the edge of the layers so that the card body 1 is sealed from the side surface 10 side such that delaminated layers at the side surface 10 are bonded together.

[0047] Fig. 4 shows a third cross section through the multilayer card body 1. The side surface 10 is sealed by applying a sealing material 30 to the side surface 10. The sealing material 30 is, e.g. an adhesive 30. As alternatives, the side surface 10 may be sealed by applying a varnish or a solvent to the side surface 10. Like the adhesive 30, the varnish is adapted to seal the side surface 10. The solvent may cause a chemical reaction at layer interfaces at the side surface 10. The card body 1 is sealed from the side surface 10 side such that delaminated layers at the side surface 10 are bonded together.

[0048] Fig. 5 shows a fourth cross section through the multilayer card body 1. The side surface 10 is sealed by generating heat in the side surface 10. A heat source 40 is adapted to generate heat so that as a consequence of heat development the card body 1 is sealed from the side surface 10 side such that delaminated layers at the side surface 10 are bonded together. In particular the heat source is a heat lamp or a laser. In one variant, the generated heat is generated using ultrasonic waves.

[0049] Fig. 6 shows a fifth cross section through the multilayer card body 1. The side surface 10 is sealed by subjecting the side surface 10 to IR illumination 50. As a reaction of the IR illumination 50, the card body 1 is sealed from the side surface 10 side such that delaminated layers at the side surface 10 are bonded together. As alternatives, the side surface 10 may be sealed by UV radiation 60 or laser radiation 70. Preferably, the laser radiation 70 is adapted to cause a micro-welding effect. The radiation may either induce heat into the material or cause a chemical bonding reaction or both.

[0050] Fig. 7 shows a sixth cross section through the

multilayer card body 1. The side surface 10 is sealed by subjecting the side surface 10 to laser radiation 70 to start a bonding process by activating printed components 15 of the graphical pattern 5, 6. Preferably, the layers are made of a material which is permeable to the laser radiation to enable activation of the components 15.

[0051] Preferably, the components 15 comprise capsules which are destroyed and activated by the laser radiation. Expediently, the capsules are filled with an adhesive. As a consequence of the destruction of the capsules, the adhesive is set free at the edge of the layers such that delaminated layers at the side surface 10 are bonded together. The laser radiation is preferably applied from the side surface 10 side.

[0052] Alternatively, the components 15 comprise a chemical composition, which is activated by laser application. As a consequence of activating reactants of the chemical composition, the card body 1 is sealed such that delaminated layers at the side surface 10 are bonded together.

[0053] Fig. 8 shows a separating tool 20. The separating tool 20 is used for sealing the side surface 10 of a multilayer card body 1 during the separating step 400 of the card body 1 from a laminated sheet. The separating tool 20 is adapted to generate heat for sealing the side surface 10. The separating tool 20 has a hot region 25 which extends over a separation area of the separating tool 20 giving the shape to the card body 10. A respective cross section of a card body 1 punched out and sealed by the separating tool 20 is shown in Fig. 2.

Claims

1. A method for manufacturing a multilayer card body (1), in particular for a portable data carrier, having the following steps:
 - laminating (300) together at least a first layer (2) and a second layer (4) to form a laminated sheet,
 - separating (400) the multilayer card body (1) from the laminated sheet, the multilayer card body (1) having a top surface (12), a bottom surface (13) and a side surface (10), and
 - sealing (500) the side surface (10) of the multilayer card body (1) during the separating step (400) or as a step following the separating step (400), wherein no test for determining delamination of the layers at the side surface (10) is performed prior to the sealing step,
 - wherein the side surface (10) is sealed by using mechanical or laser engraved edges or micro-structuring.
2. The method according to claim 1, wherein, when sealing (500) the side surface (10) of the card body (1), the card body (1) is sealed from the side surface

(10) side such that delaminated layers at the side surface (10) are bonded together.

3. A multilayer card body (1) manufactured by a method according to any one of the preceding method claims. 5

4. Apparatus for manufacturing a multilayer card body (1), comprising:

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- a lamination device adapted to laminate together at least a first layer (2) and a second layer (4) to form a laminated sheet,
- a separation device adapted to separate a multilayer card body (1) from the laminated sheet, 15
the multilayer card body (1) having a top surface, a bottom surface and a side surface (10), and
- a sealing device adapted to seal the side surface (10) of the multilayer card body (1), wherein 20
the sealing device is either integrated in the separating device so that sealing occurs during separation, or the separating device is arranged subsequent to the sealing device so that sealing occurs subsequent to the separation without 25
performance of a test for determining delamination of the layers at the side surface (10) before the sealing device.

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FIG 1

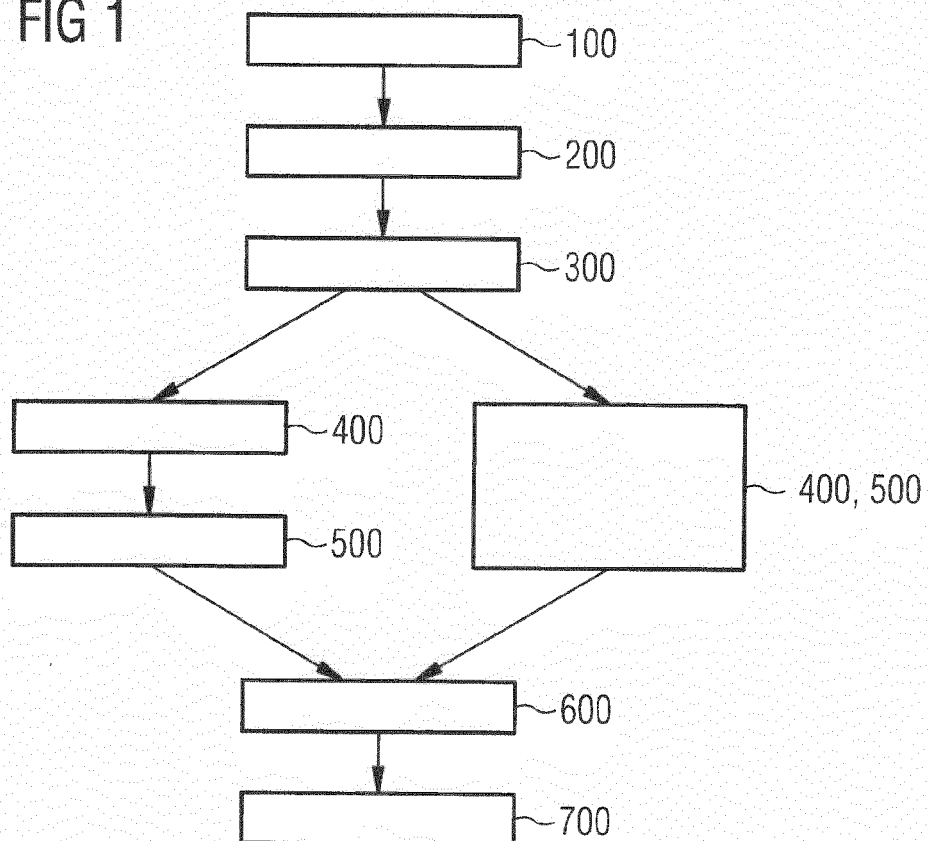


FIG 2

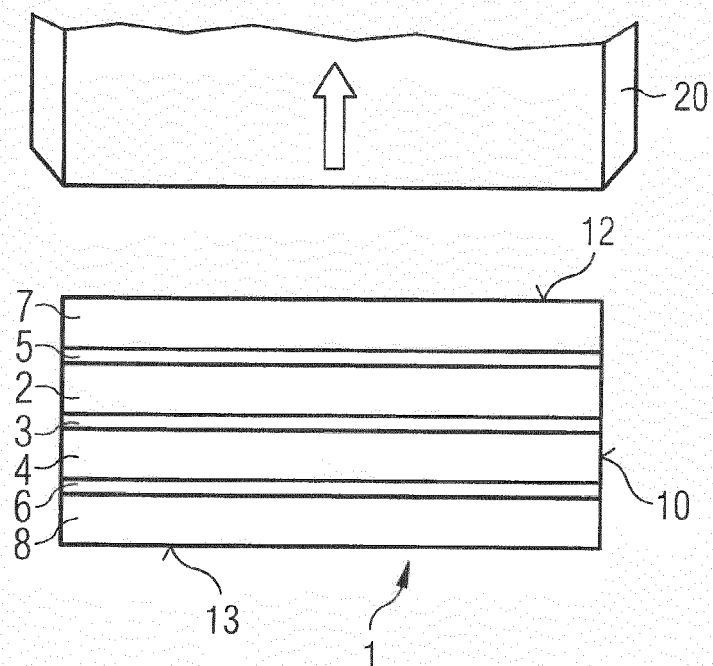


FIG 3

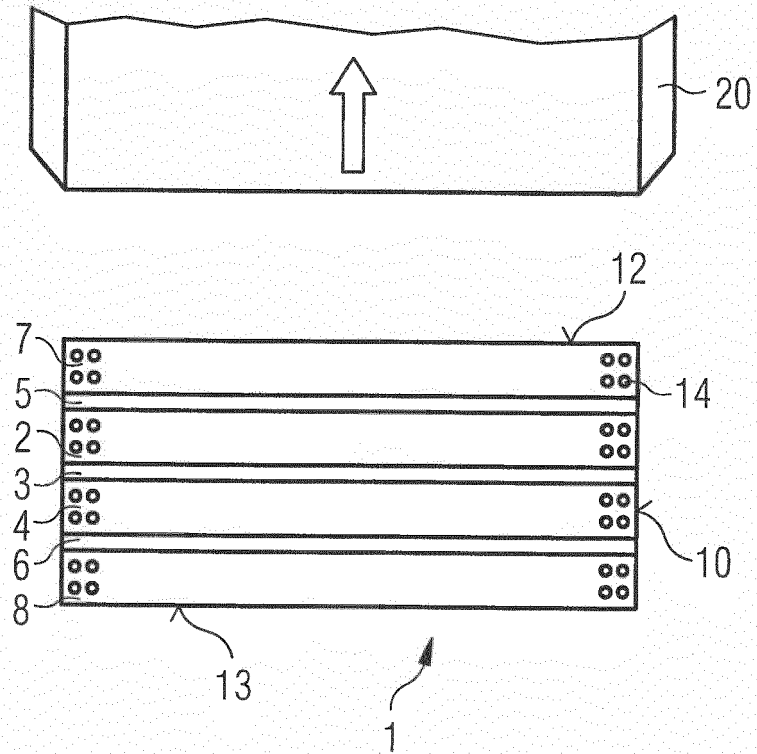


FIG 4

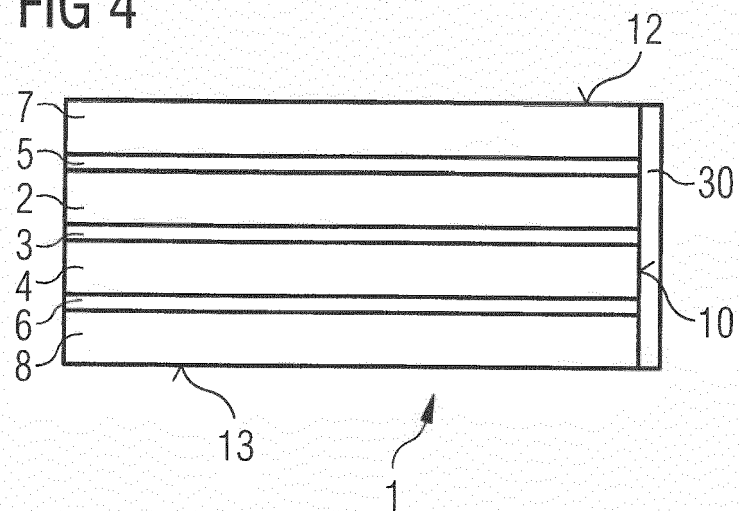


FIG 5

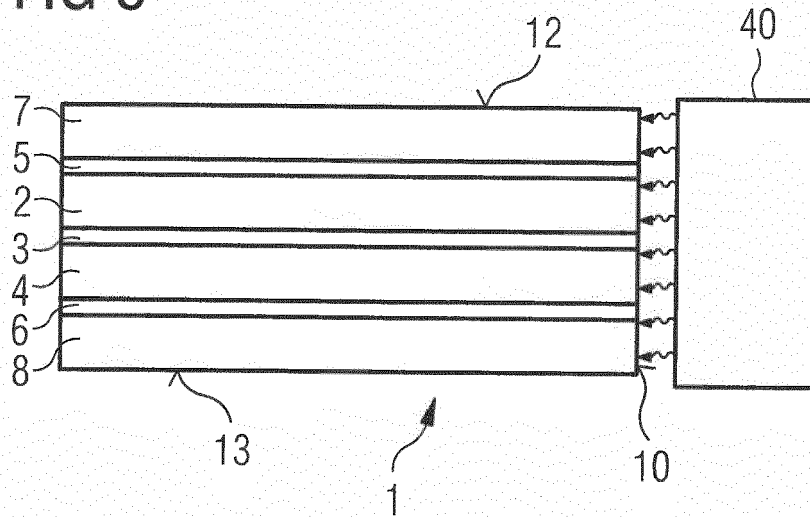


FIG 6

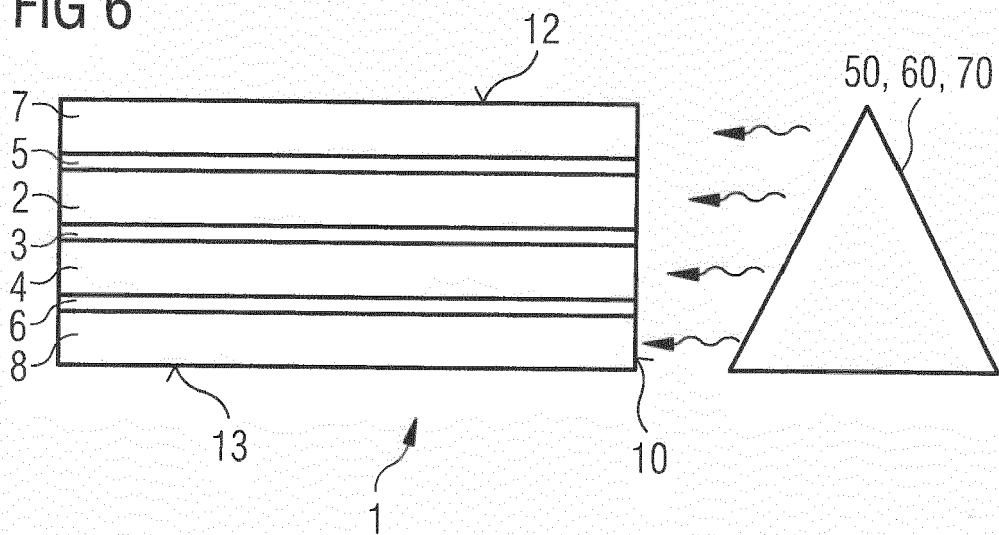


FIG 7

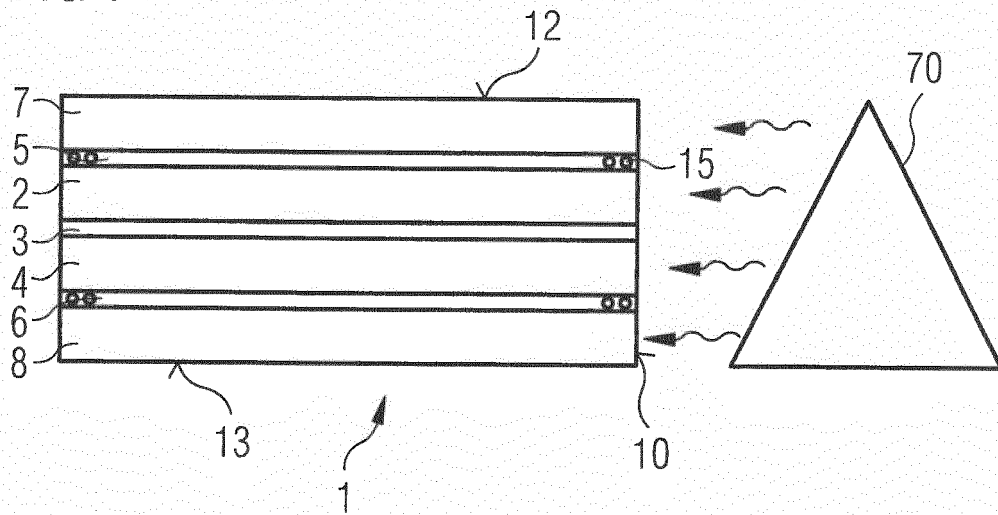
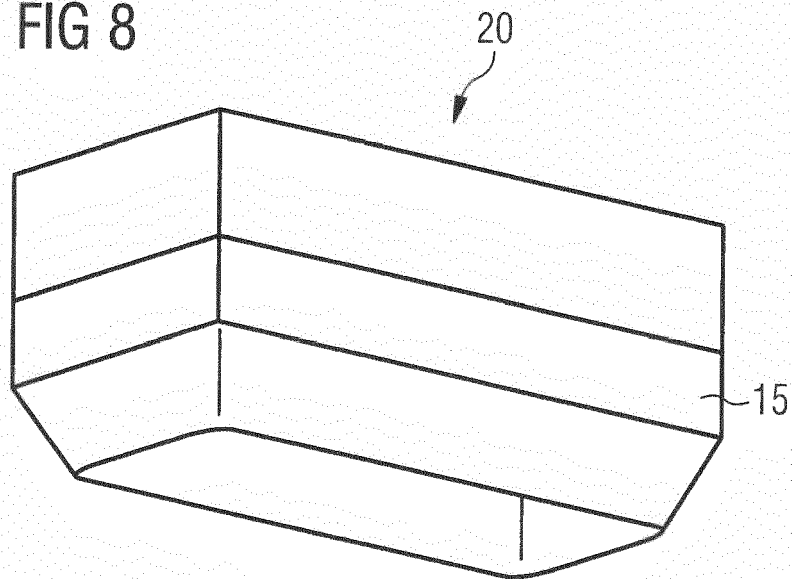


FIG 8





EUROPEAN SEARCH REPORT

Application Number
EP 20 02 0084

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A	* the whole document * -----	1-3	B42D25/47 B42D25/475 B42D25/36
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			TECHNICAL FIELDS SEARCHED (IPC)
			B42D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 July 2020	Examiner Achermann, Didier
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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