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Description

The present invention relates to UV protective films for outdoor use, especially for coating construction elements such as floor coverings, in particular terrace tiles, which are intended for outdoor use.

- 5 An important trend in recent years has been to create valuable-looking construction elements for outdoor use. More and more people are designing terraces, balconies and outdoor seating areas as additional "living space". In addition to appropriate furniture, this also includes homely floor coverings, visual protection elements, fences, plant boxes and much more. Although the look of
10 natural stone and wood is largely preferred, easier-to-clean surfaces are required.

These requirements can be met by plastics. In addition to the use of solid plastics, more recently also so-called WPC materials (wood plastic composite), it has long been known to coat substrates. This has also been very successful for elements such as walls or fences. In the case of floor coverings, however, the durability has
15 so far been insufficient and/or there have been other shortcomings. For example, the laminating films known from furniture and floor panels for indoor use have the problem in outdoor use, among others, that decorative papers fade due to a lack of UV protection by the upper layer(s) and the surface is often too smooth, so that the slip resistance required for outdoor floors is not achieved.

- 20 Thus, the object remains to provide low-maintenance and durable surfaces with a desired appearance for outdoor use.

US 2018/162108 A1 discloses a UV protection film for manufacturing coated construction elements for outdoor use by laminating the protection film onto construction elements, wherein the protection film comprises a base film from
25 polyvinyl chloride, polyacrylate, or polyethylene, a printed design, an abrasion resistant polyurethane based hot melt coating comprising UV absorber and optionally fillers, and a polyurethane lacquer.

Surprisingly, it has now been found that printed base films made of PVC, polyacrylate, or polyolefin, which are provided with an abrasion resistant

polyurethane based hot melt coating and lacquered, exhibit effective UV protection and thus the necessary durability of the printed design is achieved. Slip resistance is ensured by embossing in combination with the abrasion resistant PUR hot melt coating. In a preferred variant, the embossing is particularly easy to obtain by
5 means of an embossed intermediate layer underneath the PUR hot melt coating.

The above problem is thus solved by a UV protective film according to claim 1 which comprises:

- a base film of PVC, polyacrylate or polyolefin,
- a printed design and/or colouring of the base film,
- 10 - an embossed intermediate layer comprising a polyurethane based reactive hot melt mass
- an abrasion resistant polyurethane based hot melt coating, and
- a lacquer and/or a polymer protective layer.

Furthermore, the problem is solved by a method for manufacturing of coated
15 construction elements according to claim 9, in which this UV protective film is laminated to a substrate, by the use of the UV protective film for coating substrates and by a process for the production of UV protective films, in which a base film made of PVC, polyacrylate or polyolefin is printed with a design and/or colored, a polyurethane based hot melt coating and, on top of this, a lacquer and/or a
20 polymer protective layer are applied, wherein one layer underneath the lacquer is embossed.

The UV protective films according to the invention have an at least four-layer structure. Further layers are possible, e.g. a primer on the underside of the base film. The layers of the UV protective film can each consist of several layers
25 independently of each other. For example, thick layers can be obtained by repeated coating with a doctor blade of the material, or a base film can be produced by coextrusion. The layers may have identical or different compositions.

In the context of the present invention, bottom, below, underside, etc. means the surface of a layer facing or closer to the substrate. Top, above and upper side
30 designates a layer facing away from or further away from the substrate, the

uppermost surface of the UV protective film forming the use surface of the construction element.

- The bottom layer is a printable base film. On the one hand, this must provide sufficient adhesion to the substrate during lamination, and on the other hand, it gives the UV protective film the necessary mechanical properties as a carrier during manufacture and processing.

Suitable materials for the base film are PVC (polyvinyl chloride), polyacrylates and polyolefins. Either as such, or at least with additives known per se, these have good UV stability. They are also very resistant to hydrolysis and thermolysis.

- The bond to the substrate is usually achieved by adhesive lamination, e.g. by means of a polyurethane hot melt adhesive. To optimise adhesion, the base film can be provided with a primer on the underside. For example, a primer based on vinyl chloride-vinyl acetate copolymer is well suited for PVC, polyacrylate and PVC-polyacrylate films. For polyolefin films, a 2-component polyurethane primer is suitable, among others. The base film can alternatively or additionally be subjected to a plasma or corona treatment or other surface treatment.

- A PVC base film preferably contains, in addition to the polyvinyl chloride, a stabiliser, processing aids, UV absorbers, an antistatic agent and pigments. Preferably, modifiers, especially polyacrylate, and epoxidised soybean oil are also included. Tin has proved particularly useful as a stabiliser; BaZn and CaZn are also useful. Tin is preferably used in combination with phosphite as a costabiliser. Processing aids are, for example, polymeric flow aids, e.g. based on MMA, BA, styrene. In addition, PVC films with polymer plasticisers and with copolymers - in particular based on vinyl chloride and acrylates - can be used.

- The PVC content is typically 70 wt.% to 85 wt.%. The plasticiser content is typically up to 30 wt.%, but can be fully or partially replaced by suitable raw material supplements or alternative raw materials such as copolymers. One component in the formulation can be recycled material. The amount can be set to

up to 20 wt.-%, preferred are up to 5 wt.-%. The material introduced may be of the same or slightly different formulation.

Polyacrylate base films may preferably be made from methyl methacrylate (MMA), butyl acrylate (BA) and/or ethyl acrylate (EA), in particular copolymers of two,
5 more preferably all three of said monomers, are used. The base film also usually contains one or more UV absorbers, e.g. based on benzotriazole, antioxidants such as phenolic antioxidants, light stabilisers, preferably HALS, and pigments. In addition, polyacrylate based processing aids may be included.

Polyolefin base films may preferably be made from polyethylene, polypropylene or
10 olefin copolymers. The films may contain filler, e.g. chalk, and the usual additives. For example, per 100 parts by weight of polyolefin or polyolefin alloy, preferably propylene homo-polymer or high density polyethylene (HDPE), the polyolefin base film may contain 25 to 120 parts by weight of a finely divided mineral filler or mineral filler mixture, preferably calcium carbonate, alkaline earth oxides,
15 microtalcum, kaolin, silicates, magnesium aluminium oxy- or hydroxy-carbonates and/or silicates and/or silica gel with an average grain diameter below 10 μm , preferably from 0.05 to 5 μm . According to another embodiment, the polyolefin base film contains, per 100 parts by weight of polyolefin or polyolefin alloy, preferably propylene homopolymer or HDPE, from 5 to 40 parts by weight (based
20 on 100 parts by weight of polyolefin), preferably from 10 to 30 parts by weight, of at least one finely divided organic filler or combinations of these amounts by weight of organic fillers with from 0 to 30 parts by weight, preferably from 5 to 25 parts by weight, of at least one finely divided mineral inorganic filler or filler mixture.

25 The thickness of the base film is typically from 80 to 250 μm , preferably from 100 to 200 μm , and most preferred from 120 to 160 μm . The base film is usually produced by calendering, but may also be extruded. Extrusion includes all processes, namely blown film extrusion, casted film extrusion and cast film extrusion. Casted film extrusion is preferred. The melt is distributed through a slot
30 die and cooled by a cooling roll/chill roll. Single-screw and multi-screw extruders and variations thereof are possible as tools. Preferably, the production is carried

out with a single-screw extruder. The base film can be stretched uni- or bi-directionally. This provides a higher dimensional stability against the temperatures during the application of the hot melt coating. In addition, the risk of micro-cracks in the hot melt coating is minimised when substrates are wrapped with the UV protective film according to the invention. By stretching, the stretchability of the base film adapts to that of the hot melt coating, i.e. it becomes similarly low.

The desired design is printed on the base film, unless the base film is dyed for solid colours. The base film can be dyed through or, in the case of multi-layer base films, the top layer can be dyed through. This is preferred for plain designs. A base colour can also be provided for printing by a solid-coloured base film or top layer of the base film. Design printing can be achieved in any known manner. Particularly useful are, for example, gravure printing, especially with solvent inks, and digital printing. Wood decor, natural stone and fantasy patterns are possible as well as plain colours. The printing ink is applied to the base film by a series of printing rollers, for example. In digital printing, both single-pass and multi-pass print heads can be used for design. The printed images are often composed of several printing inks and are characterised by light stability. In addition to solvent based inks, aqueous based inks are also possible.

The pigments used to colour the base film or its uppermost layer and to create solid colours can be organic or inorganic and reflect or transmit the IR component in sunlight.

An embossed intermediate layer and a polyurethane based hot melt coating are applied on top of the print. In the context of the present invention, polyurethane based hot melt coating, also referred to as PUR hot melt coating or hot melt coating for short, means a reactive hot melt mass as described, for example, in WO 2006/056472 A1, WO 2012/084823 A1, WO 2006/106143 A1 or US 8,153,265 B2. The reactive hot melt mass can react and cure e.g. by the humidity of the environment, but also by irradiation with e.g. UV light. It can be a one- or two-component mass. It is important that it is a transparent PUR hot melt coating so that the colour or print remains visible through the hot melt coating.

Preferably, one-component reactive hot melt masses that are cured by atmospheric humidity and contain a polyurethane prepolymer are used. When heated, the prepolymer chains liquefy to form an applicable liquid that cures to form a polyurethane layer when moisture is added.

- 5 To increase the abrasion resistance, the reactive hot melt mass of the abrasion resistant hot melt coating contains particles of appropriate hardness. Preferred are particles like corundum, zirconium, silicon carbide, boron nitride, diamond or glass particles used as abrasive. In particular, corundum and glass particles are preferred due to their cost-effectiveness.
- 10 The abrasion resistant PUR hot melt coating layer normally has a thickness of 10 to 150 μm , preferably of 20 to 120 μm and in particular of 30 to 100 μm . It can be applied in a manner known per se by brushing on, coating on with a doctor blade, roller application, etc.

- An embossed intermediate layer is arranged under the PUR hot melt coating,
- 15 which is also formed from a polyurethane based reactive hot melt mass, but contains no filler or considerably less filler than the PUR hot melt coating. The intermediate layer must also be transparent. The intermediate layer makes it particularly easy to obtain the entire PUR hot melt coating free of bubbles and thus highly transparent. Without a filler-free intermediate layer, gas bubbles can be
 - 20 introduced during the application of the PUR hot melt coating, which impair the transparency.

The thickness of the intermediate layer depends on the desired embossing depth and the thickness of the PUR hot melt coating layer and is usually from 10 to 100 μm , preferably from 20 to 80 μm , particularly preferably 30 to 60 μm .

- 25 The application of the intermediate layer can be carried out in the same way as the application of the PUR hot melt coating, wherein the same or different processes can be used for the coatings of one film. In a preferred embodiment, the intermediate layer is applied by means of a slot die, with or without a roller bar, and the PUR hot melt coating layer is applied by means of roller application. It is

expedient to use the same reactive hot melt mass for the intermediate layer as for the PUR hot melt coating, but without particles. It is also possible to use a different reactive hot melt mass, e.g. a radiation-curable mass for the intermediate layer and a moisture-curing mass for the hot melt coating. The intermediate layer can also be provided as a film, e.g. an embossed film. The intermediate layer significantly improves the UV protection as it contains no or few particles. Without the intermediate layer, particles in the PUR hot melt coating could reach the base film and thus transmit light directly to the printed design.

The embossing of the intermediate layer is carried out in a manner known per se, e.g. with a pair of rollers. As is also known, the embossing pattern can be matched to and correspond with the print design. For example, it is common for an embossing to follow the grain of the printed wood structure or to simulate joints in a tile look.

Typical embossing depths are from 5 to 30 μm , preferably from 10 to 20 μm . This, in combination with the particles in the PUR hot melt coating layer, ensures sufficient slip resistance. Usually, slip resistance values of at least R10 to R12 according to DIN 51130 or ASR A1.5/1.2 are achieved, preferably at least R11.

The upper layer is formed by a transparent lacquer and/or a peelable polymer protective layer. The film is very rough on the surface due to the PUR hot melt coating layer. This is also desired to achieve a high slip resistance when wet. However, a very rough and very hard abrasion resistant surface has the disadvantage that the pressure rollers of wrapping or coating machines wear out in a very short time and the process becomes unstable. Complaints due to faulty coating are the consequence. Therefore, the surface of the protective film according to the invention is formed by the lacquer or the polymer protective layer. The application of a lacquer or a polymer protective layer is also necessary in order to be able to immediately wind up the film with the PUR hot melt coating. Otherwise the film roll will block, as it normally takes some time for the applied hot melt coating(s) to cure block-proof. If the protective polymer layer does not build up too much adhesion to the PUR hot melt mass, the lacquer layer can be omitted, the material can be wound up because of the protective layer. An additional

advantage of the protective layer is that it protects the surface of the construction element against scratching, e.g. by the slip resistant PUR hot melt coating of other construction elements. A lacquer remains part of the protective film according to the invention, the polymer protective layer is peeled off after production of the construction element or directly before or after its laying/installation.

Acrylic lacquers and polyurethane lacquers are preferred as lacquer, especially radiation-curable lacquers. Preferably, the lacquer is cross-linked by UV or LED lamps. This can be done by a single or multiple sources. Herein, the energy output is e.g. 30 W to 200 W, preferably 50 W to 180 W, in particular 90 W to 150 W.

The lacquer is expediently applied by roller or spray application and, if necessary, cured by irradiation. Thicknesses from 1 to 50 μm , preferably from 3 to 15 μm , particularly preferred from 5 to 10 μm , have proven effective. On the one hand, the lacquer improves the UV protection, on the other hand, it provides an anti-blocking effect so that the UV protective film can be wound and, above all, unwound without any problems. The coating normally has a low gloss level of 4 to 20 gloss points, preferably up to 15 gloss points, according to ISO 2813. The measurement is made using a goniophometer. The angle of measurement can be 20°, 35°, 60° (preferred) and 80° or 85°.

A hot melt mass of polyethylene (PE, preferably HDPE) or of PE (preferably LDPE mixed with linear low density polyethylene, LLDPE) and ethylene vinyl acetate (EVA) is preferably used as the polymer protective layer. EVA typically has a vinyl acetate content in the range of 15 to 25 wt.-%. The polymer protective layer may contain additives such as thermal stabilisers, HALS, UV stabilisers and possibly fillers. In a preferred embodiment, no additives are contained or only UV stabilisers in a lower than usual amount.

The material of the polymer protective layer shows a desired adhesion to the PUR hot melt layer or the lacquer by choosing the right weight ratio of PE to EVA. The adhesion should be sufficient that the polymer protective layer does not peel off significantly until the completion of the construction element production. It must be low enough to allow the protective layer to be peeled off. The mixing ratios depend

on the set surface roughness and, if necessary, also on the desired adhesion to the lacquer. The mixing ratio PE:EVA, related to the mass, can be from 1:5 to 5:1, preferably from 1:1 to 3:1, depending on the desired adhesion. The adhesion can also be influenced by mixing different PE, for example, an admixture of LLDPE
5 leads to increased adhesion and at the same time improved tear resistance, which facilitates peeling. Other hot melt masses that build up the desired adhesion with the PUR hot melt coating layer or the lacquer are also possible, e.g. masses that are known as protection for PVC-laminated sheets.

The polymer protective layer can be applied to the rough surface after the PUR hot
10 melt coating or after lacquering using a cast coating process, doctor blade process or rolling process. The casting process into a cooled roller nip is preferred. In this process, the molten mass runs into the valleys and defuses the abrasive effect. The side facing the sheathing pressure rollers is preferably smooth.

The amount applied depends on the structure of the slip-resistant PUR hot melt
15 coating and ranges from 20 g/m² to 200 g/m², preferably from 100 g/m² and 150 g/m².

The total thickness of the UV protective film without polymer protective layer is usually from 10 to 150 µm, preferably from 40 to 100 µm and more preferred from 50 to 80 µm.

20 Preferably, the UV protective film according to the invention has at least one of the following properties:

- Scratch resistance ≥ 3 N, preferably ≥ 4 N, according to DIN 15186, or at least class A3 according to DIN EN 16094:2012-04 and B3 according to DIN CEN/TS 16611:2014, and/or
- 25 - Abrasion and wear resistance $\geq 3,000$ revolutions, preferably $\geq 4,000$ revolutions according to DIN EN 13329, or $\geq 8,000$ revolutions, preferably 10,000 revolutions according to EN 14354:2017-11, and/or
- Weather resistance with at least 10,000, preferably at least 15,000, test hours according to EN 513 (method 1 (M)) and thereby a minimum colour stability of
30 grey scale 3, assessed according to EN 20105-A02 and/or

- slip resistance reaches at least class R10, which according to DIN 51130:2014 corresponds to a minimum slope of 10°, preferably R11.

Suitable substrates are wood, metal, plastic and composite materials. The substrate provides the necessary mechanical properties for the construction element. The coating with the UV protective film provides the desired optical design on the one hand and protects the substrate from the weather on the other. Plastics do not age due to UV light, metals do not corrode, wood remains dry and is also protected from UV light. The surface is easy to clean and thus remains visually appealing for much longer and with much less effort.

Typical construction elements are floor boards and slabs for terraces, balconies, paths, etc., panels, fence posts and fence elements, visual protection elements, and plant boxes. According to the invention, floor coverings are of particular interest, as they have high slip resistance requirements, get dirty particularly quickly and are subject to high UV and mechanical stress. Previous products often failed to achieve slip resistance, deteriorated too quickly in appearance due to UV light and/or were not able to withstand the mechanical stresses. Delamination, especially at corners and edges, occurred frequently.

In contrast, the construction elements made according to the invention have improved UV protection, especially when the intermediate layer is present, and do not have to make any compromises in terms of slip resistance. The mechanical load-bearing capacity is also improved, since the adhesion of the base film to the substrate and of the film layers to each other is optimal due to the measures described.

Well-known films for outdoor use are, for example, the Elesgo paper based film. In this film, a printed paper film impregnated with acrylate is coated with a thick acrylic lacquer containing corundum. The top structure is created by a texturing film, whereby only slip resistance in the range of R10 can be achieved. This is a low value for safe walking on in wet conditions. Variants of this plastic based film with improved internal strength have the same negative slip behaviour due to the

identical manufacturing technology of the coating. The process is shown at <https://laminat.de/index.php/de/technologie2/prozess>.

Furthermore, HPL compact plates are known, which are produced on the basis of melamine or phenolic resin impregnated papers. Many of these products have a
5 low light resistance due to the printing. The slip resistance of these products is created via press plates, which reduces the effectiveness of interspersed corundum in the top paper layer. Although this achieves good abrasion resistance, the slip resistance is rather low because the press plates would otherwise be quickly worn out due to the process.

10 The current state of the art does not know any high-quality decors in the horizontal outdoor area, as they can be implemented with the present invention. Existing systems fail after only a few years due to the high demands. Known failures are separation of the layers, breakage of the layers, fading and change of colour due to the use of unsuitable UV-protective layers, difficult process control due to too
15 high stiffness, favouring of water absorption and resulting swelling capacity, lack of adhesion to the substrate.

Furthermore, the UV protective films according to the invention are very well suited for the decorative design of swimming pool covers (so-called roller shutter system). Previously known plastic films have often failed due to their lack of
20 weathering stability. In the case of plastic films with a transparent polyacrylate layer as weather protection, clouding thereof due to water absorption is a problem. The UV protective films according to the invention, on the other hand, offer good stability in chlorinated (and also saline) swimming pool water as well as the necessary weathering stability. The known shutter-like covers are suitable as
25 substrates with the condition that the cover must be buoyant. Thus, segments made of wood, plastic and composite materials are preferred, and in the case of the particularly preferred hollow segments, those made of plastic, composite materials and metal.

Embodiments of the method for manufacturing the UV protective film according to
30 the invention are illustrated in figures 1, 2, 4 and 6. The methods illustrated in

figures 3, 5, and 7 are outside the claimed scope of the present invention. For identical process sequences, the same reference signs are used for the devices shown in the figures. In all illustrated processes, a base film 1 is produced in a manner known per se (not shown), e.g. by calendering. This base film 1 is printed
5 in an equally known manner (unless it is a coloured film for monochrome construction elements) and, if necessary, provided with a primer 5 and/or irradiated on the underside (bottom meaning facing the substrate). Usually, the base film 1 is wound up and stored. In the next step, the printed (or dyed) base film 1 is unwound and a reactive hot melt mass is applied to the base film 1 or the
10 print D.

In the embodiments shown in figures 1, 2, 4 and 6, an intermediate layer 2 without particles is first applied by means of a slot die a. The intermediate layer 2 on the base film 1 is embossed with a pair of rollers b, b'.

In all figures, an abrasion resistant polyurethane based hot melt coating with
15 particles is applied as a second or third layer 3 by means of rollers c, c'. After application, the heated PUR hot melt coating 3 cures by contact with atmospheric moisture. Alternatively, radiation curing can be provided for radiation-curing reactive hot melt masses.

Then, in figures 1, 2, 4 and 6, the lacquer 4, here a UV-curing acrylic lacquer, is
20 applied by roller application through the rollers d, d'. The lacquer 4 is cured by UV radiation from the radiation source. The lacquer is cured e.g. by UV lamps, LED lamps; an excimer laser or excimer UV lamp may also be used to achieve a matt finish and improved scratch resistance of the surface.

According to figure 2, a polymer protective layer 6 is cast onto the lacquer, coated
25 on with a doctor blade according to figure 4, and rolled on according to figure 6. In figure 3 (not according to the invention), the polymer protective layer 6 is cast directly onto the PUR hot melt coating 3, in figure 5 (not according to the invention) it is coated on with a doctor blade and in figure 7 (not according to the invention) it is rolled on.

The finished UV protective film is wound up and is ready for coating substrates after the hot melt coating(s) has/have cured. It comprises an intermediate layer and a lacquer in figures 1, 2, 4 and 6, and a polymer protective layer in Figures 2 to 7. In figures 3, 5 and 7 the lacquer and the intermediate layer are missing (not according to the invention), in figure 1 a polymer protective layer.

Figures 8a and 8b schematically show the layers of a first preferred UV protective film separated and brought together. It can be seen here how the embossing of the intermediate layer 2 determines the surface structure of the UV protective film. PUR hot melt coating 3 and lacquer 4 follow the structure of the intermediate layer 2.

Figures 9a and 9b schematically show the layers of a second preferred UV protective film separated and brought together. It can be seen here how the embossing of the intermediate layer 2 determines the surface structure of the UV protective film. PUR hot melt coating 3, lacquer 4 and polymer protective layer 6 follow the structure of the intermediate layer 2.

Figures 10a and 10b schematically show the layers of a third preferred UV protective film separated and brought together. It can be seen here how the embossing of the intermediate layer 2 determines the surface structure of the UV protective film. PUR hot melt coating 3 and polymer protective layer 6 follow the structure of the intermediate layer 2.

The invention also relates to all combinations of preferred embodiments, as far as these are not mutually exclusive. The indications "approximately" or "about" in connection with a numerical indication mean that at least values higher or lower by 10 % or values higher or lower by 5 % and in any case values higher or lower by 1 % are included. Unless otherwise stated or the context necessarily indicates otherwise, percentages refer to the weight, in case of doubt to the total weight of the mixture.

List of reference signs

- 1 Base film
- 2 Intermediate layer
- 3 PUR hot melt coating based on polyurethane
- 5 4 Lacquer
- 5 Primer
- 6 Polymer protective layer

- D Pressure
- 10 a Slot die with or without roller bar
- b, b' Pair of embossing rollers
- c, c' Roller application PUR hot melt coating
- d, d' Roller application of lacquer
- e Radiation source
- 15 f Casting polymer protective layer (direct extrusion)
- g Doctor blade application of polymer protective layer
- h Roller application of polymer protective layer

Patentkrav

- 1.** UV-beskyttelsesfolie omfattende:
 - en basisfolie af polyvinylchlorid, polyacrylat eller polyolefin,
 - 5 - et trykt design og/eller en farvning af basisfolien,
 - en slidstærk, transparent smeltebelægning på polyurethanbasis, der indeholder partikler af passende hårdhed, og
 - en lak og/eller et polymerbeskyttelseslag, **kendetegnet ved, at** der under den slidstærke smeltebelægning på polyurethanbasis er anbragt et præget,
 - 10 transparent mellemlag, der omfatter en reaktivsmeltetmasse, som indeholder ingen eller færre partikler end den slidstærke smeltebelægning på polyurethanbasis.

- 2.** UV-beskyttelsesfolie ifølge krav 1, **kendetegnet ved, at** mellemlagets tykkelse
15 udgør fra 10 til 100 μm , fortrinsvis fra 20 til 80 μm , særlig foretrukket 30 til 60 μm .

- 3.** UV-beskyttelsesfolie ifølge krav 1 eller 2, **kendetegnet ved, at** basisfolien på
undersiden har en primer og/eller er blevet underkastet en plasmastråling eller
20 koronabehandling.

- 4.** UV-beskyttelsesfolie ifølge et af kravene 1 til 3, **kendetegnet ved, at**
basisfolien har en tykkelse fra 40 til 250 μm , fortrinsvis fra 100 til 200 μm og
særlig foretrukket fra 120 til 160 μm .
25
- 5.** UV-beskyttelsesfolie ifølge et af kravene 1 til 4, **kendetegnet ved, at**
partiklerne blandt andet er valgt blandt glaspartikler, som slibemidler anvendte
partikler og blandinger deraf, fortrinsvis korund.

- 30 **6.** UV-beskyttelsesfolie ifølge et af kravene 1 til 5, **kendetegnet ved, at** den
slidstærke smeltebelægning har en tykkelse fra 10 til 150 μm , fortrinsvis fra 20 til
120 μm og især fra 30 til 100 μm .

- 7.** UV-beskyttelsesfolie ifølge et af kravene 1 til 6, **kendetegnet ved, at** lakken
35 er en acrylatlak eller en polyurethanlak, fortrinsvis en strålehærdbar acrylat- eller

polyurethanlak.

8. UV-beskyttelsesfolie ifølge et af kravene 1 til 7, **kendetegnet ved, at** lakken har en tykkelse fra 1 til 50 μm , fortrinsvis fra 3 til 15 μm , særlig foretrukket fra 5 til 10 μm .

9. Fremgangsmåde til fremstilling af belagte konstruktionsdele, **kendetegnet ved, at** en UV-beskyttelsesfolie ifølge et af kravene 1 til 8 lamineres med et substrat.

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10. Fremgangsmåde ifølge krav 9, **kendetegnet ved, at** UV-beskyttelsesfolien lamineres med substratet ved en varmelaminering eller en klæbelaminering, f.eks. ved hjælp af polyurethanvarmeklæber.

15 **11.** Fremgangsmåde ifølge krav 9 eller 10, **kendetegnet ved, at** substratet består af træ, metal, kunststof eller kompositmateriale.

12. Fremgangsmåde ifølge krav 11, **kendetegnet ved, at** konstruktionsdelen er valgt blandt gulvbrædder og -plader, fyldinger, hegnspæle og -elementer, indblikbeskyttelseselementer, svømmebassintildækninger og plantekasser.

13. Fremgangsmåde til fremstilling af UV-beskyttelsesfolier ifølge et af kravene 1 til 8 omfattende

- fremstilling af en basisfolie af PVC, polyacrylat eller polyolefin og påtrykning af basisfolien med et design eller fremstilling af en indfarvet basisfolie af PVC, polyacrylat eller polyolefin,
 - påføring af en smeltebelægning på polyurethanbasis på basisfolien eller trykket,
 - påføring af en lak og/eller et polymerbeskyttelseslag, idet basisfolien og/eller et mellemlag under smeltebelægningen og/eller smeltebelægningen præges,
- 30 **kendetegnet ved, at** et præget mellemlag på polyurethanbasis, der indeholder intet eller væsentlig mindre fyldstof end smeltebelægningen, er indført under smeltebelægningen.

14. Fremgangsmåde ifølge krav 13, **kendetegnet ved, at** basisfolien påtrykkes ved dybtryk, især med farver i opløsningsmiddel, eller ved digitaltryk.

15. Fremgangsmåde ifølge krav 13 eller 14, **kendetegnet ved, at** den slidstærke smeltebelægning påføres ved påstrygning, påføring med rakel eller valsepåføring.

16. Fremgangsmåde ifølge et af kravene 13 til 15, **kendetegnet ved, at** det prægede mellemlag på polyurethanbasis er indført med en spaltetdysse med eller uden rullestok.

10

17. Fremgangsmåde ifølge et af kravene 13 til 16, **kendetegnet ved, at** prægedybderne udgør fra 5 til 30 μm , fortrinsvis fra 10 til 20 μm .

18. Fremgangsmåde ifølge et af kravene 13 til 17, **kendetegnet ved, at** lakken hærdes ved stråling, og/eller polymerbeskyttelseslaget påføres ved påhældning, påføring med rakel eller valsepåføring.

15

Fig. 1

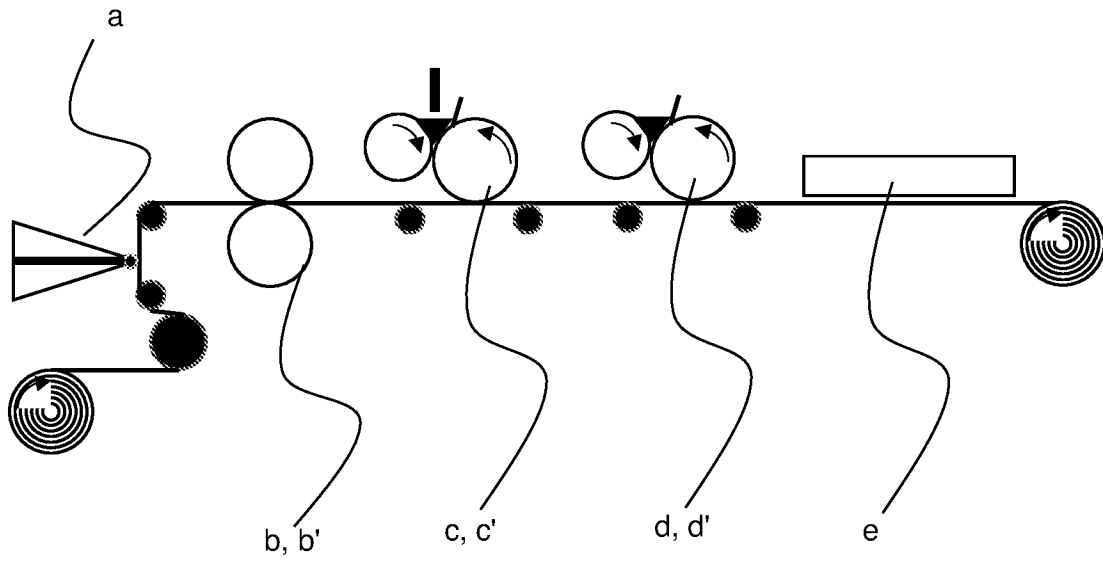


Fig. 2

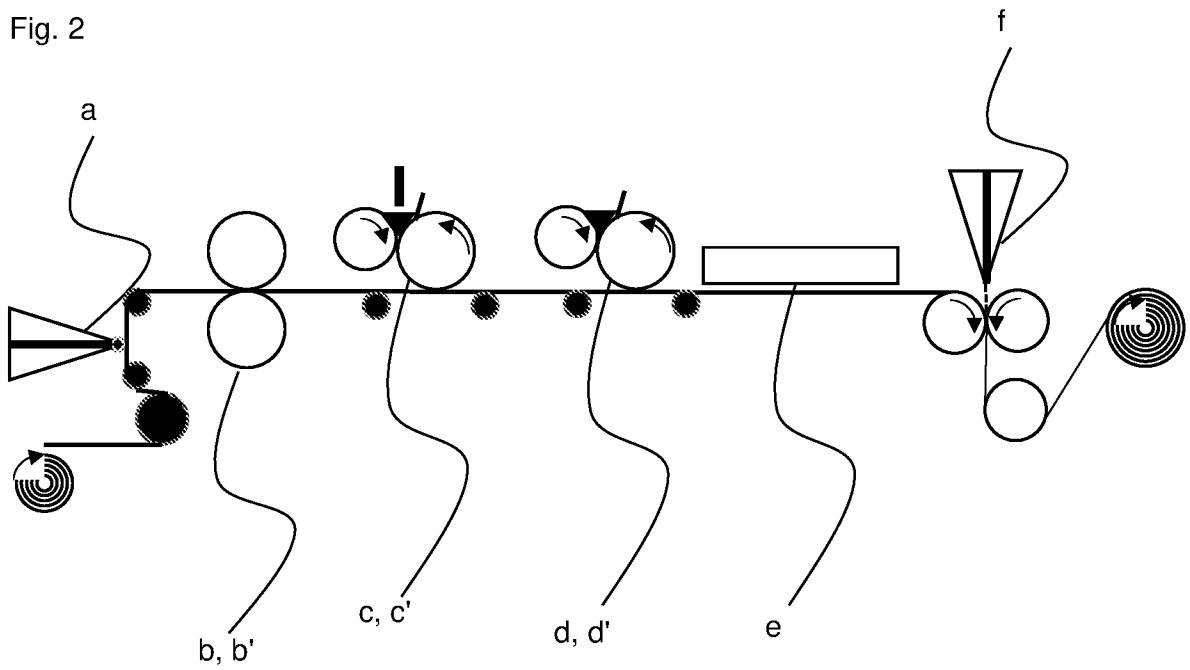


Fig. 3

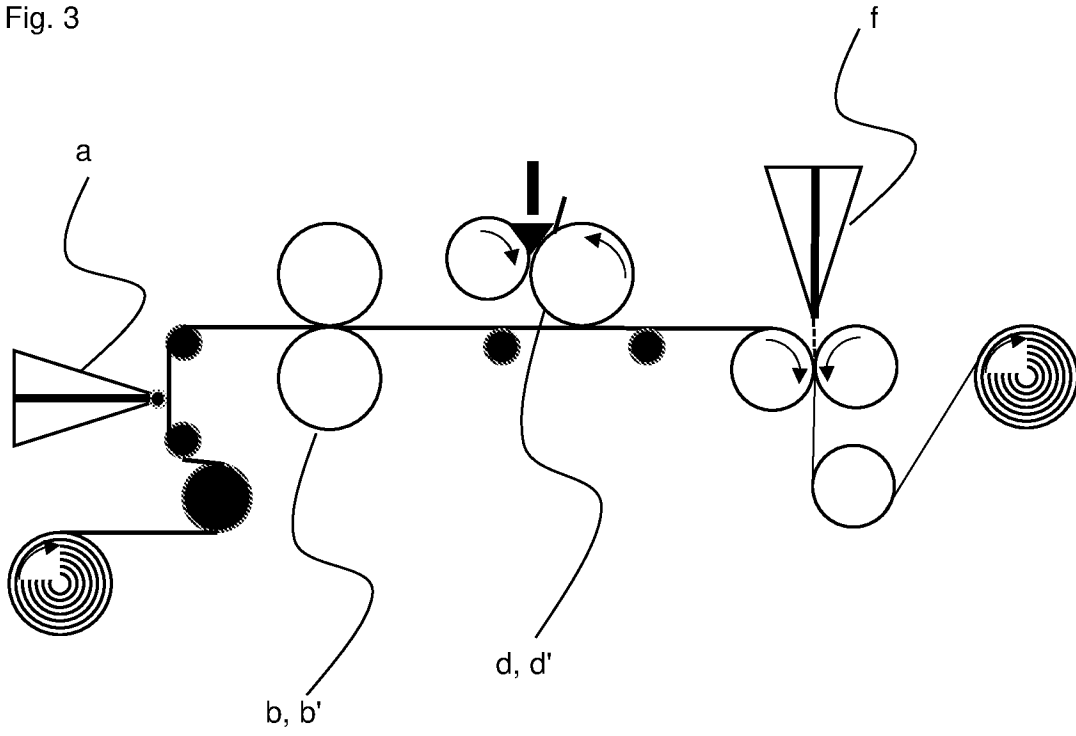


Fig. 4

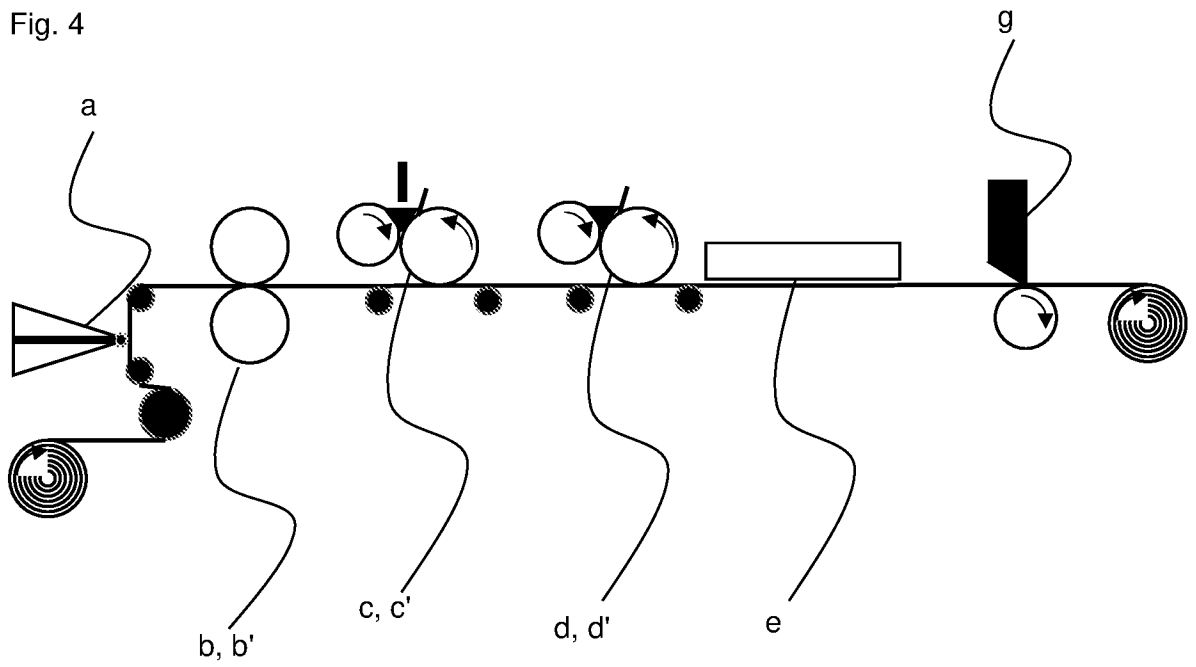


Fig. 5

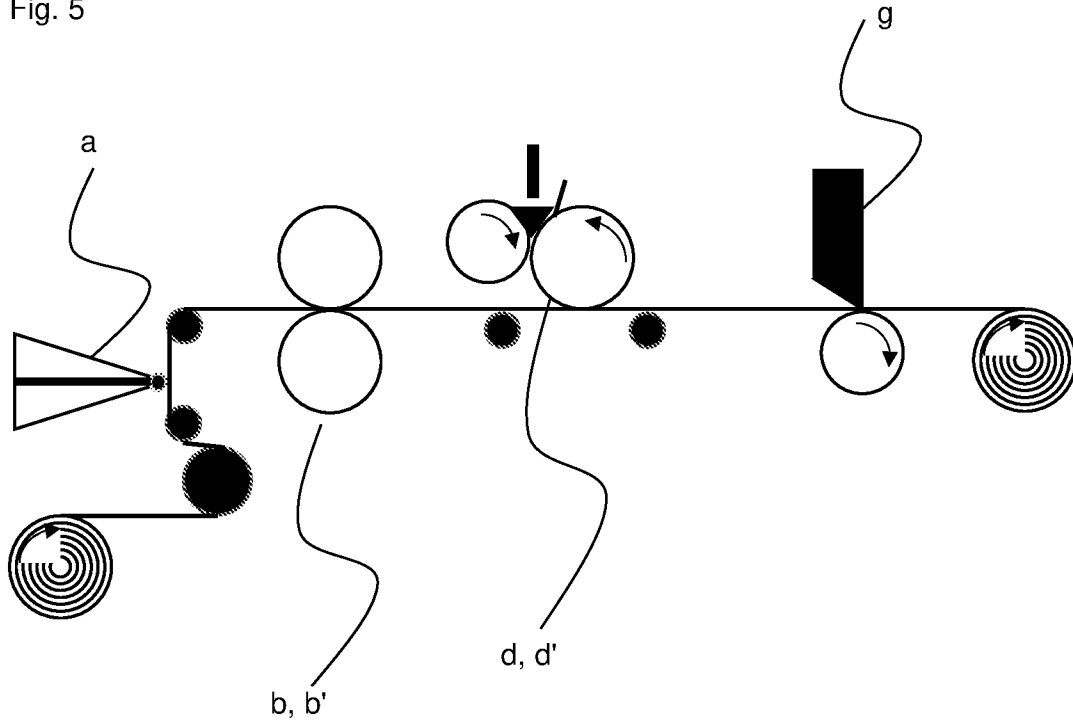


Fig. 6

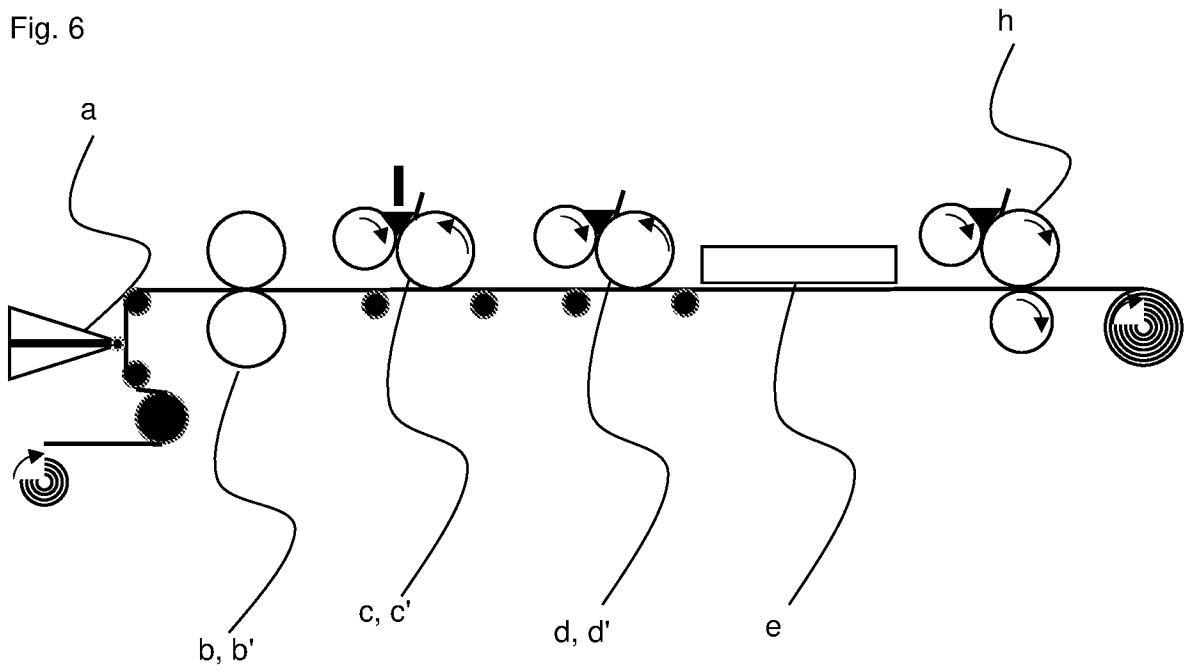


Fig. 7

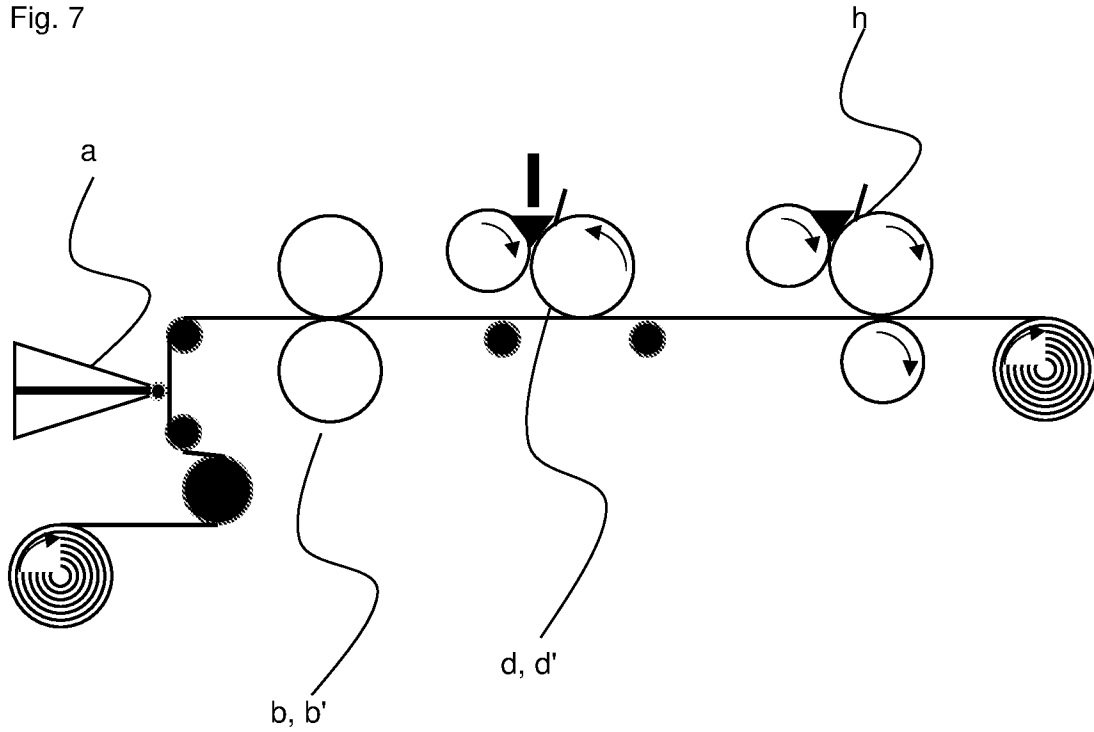


Fig. 8a

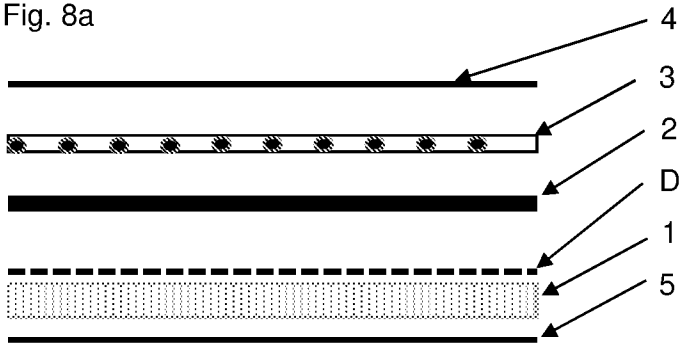


Fig. 8b

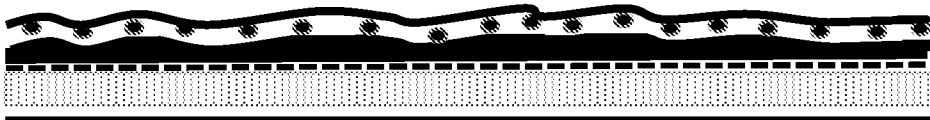


Fig. 9a

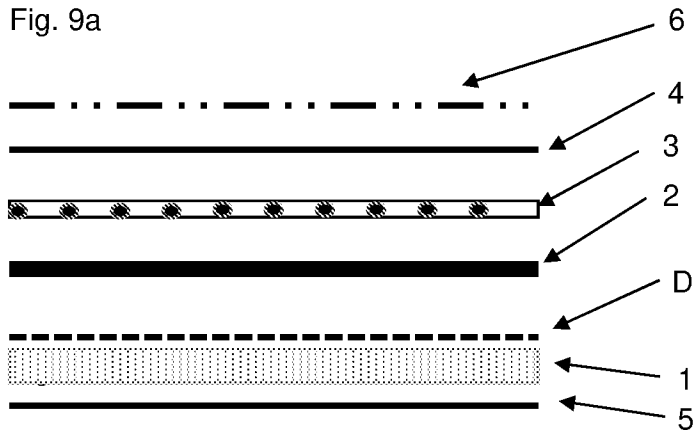


Fig. 9b

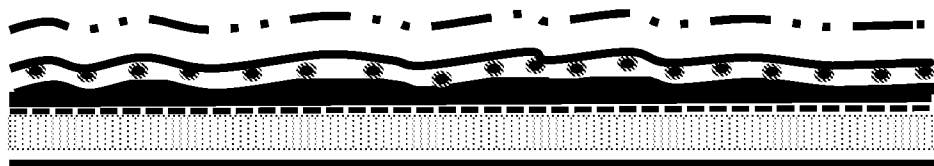


Fig. 10a

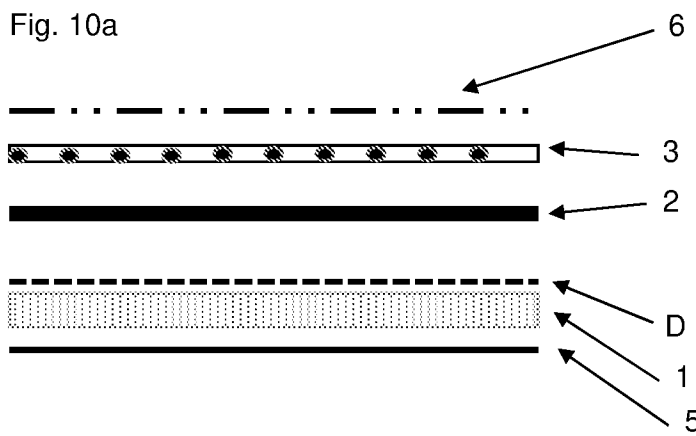


Fig. 10b

