(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 364 863 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.09.2011 Bulletin 2011/37

(21) Application number: **11154474.8**

(22) Date of filing: **15.02.2011**

(51) Int Cl.:
B44C 1/10 *(2006.01)* ***B44C 1/17*** *(2006.01)*
B41M 7/00 *(2006.01)* ***B60R 13/02*** *(2006.01)*
G09F 7/02 *(2006.01)* ***G09F 7/12*** *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **08.03.2010 NL 2004360**

(71) Applicant: **Grafityp Selfadhesive Products N.V.**
3530 Houthalen (BE)

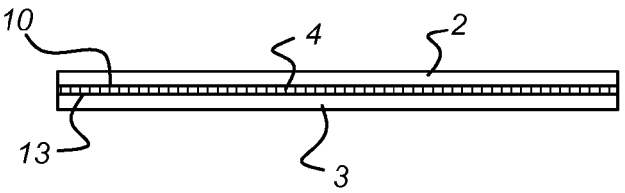
(72) Inventor: **Bosman, Herman Rudolph**
3500 Hasselt (BE)

(74) Representative: **van Westenbrugge, Andries**
Nederlandsch Octrooibureau
J.W. Frisolaan 13
2517 JS Den Haag (NL)

(54) Assembly for improving visibility in the dark and method of producing the assembly

(57) The present invention relates to an assembly of a substantially transparent film (2,6) of plastic material and an adhesive layer (4,8) provided on a side of the transparent film in order to render the film self-adhesive. Furthermore, the film contains phosphorescent material which ensures that the film will continue to glow for a certain period of time after having been illuminated. In particular, the assembly here is configured to increase visibility in the dark of one or more images (9) on a surface onto which the self-adhesive film can be applied or has been applied. The invention also relates to a method for producing an assembly. The method comprises combining plastic material and phosphorescent material, producing a substantially transparent phosphorescent film (2,6) from the combined material and applying an adhesive layer (4,8) to one side of the film.

Fig 2



EP 2 364 863 A1

Description

[0001] The present invention relates to an assembly, in particular an assembly which is adapted to improve the visibility of an image. The invention also relates to a method for producing an assembly of this type and to the use thereof.

[0002] It is known to use indicating signs, such as images which are used in the context of aiding safety in the case of emergency situations, for example a fire in a building, which still remain visible for some time even when it suddenly becomes dark, so that they can still fulfil their indicating function. If, for example as a result of the emergency situation, the light goes out, the indication may be adapted in such a manner that it glows for some time as a result of the use of luminescent material.

[0003] A known product comprising such an indication is formed by sheet material, for example a relatively stiff layer of vinyl, with one side of the sheet material being imprinted with paint or ink which contains an amount of phosphorizing material. Phosphorizing material is a material which, when it has been illuminated, for example using natural light or artificial light, will still glow in the dark for a certain period of time. The glowing of the material is caused by the fact that the electrons in the material which have been excited slowly dropping back. In order to provide the sheet material with indications, signs are produced on said paint or ink which contains phosphorizing material using dark, usually green (at least non-phosphorizing) ink. The parts which have not been treated with dark ink, are still visible in the dark for a short period, while the parts which have been treated with the dark ink are hardly visible, if at all. By means of suitable arrangement of the glowing and non-glowing parts, the desired indicating signs can be made visible in the dark. In order to increase the visibility of the indicating signs, the sheet material, in some embodiments, is provided with a light, usually white, base. The white base produces an area which is more readily visible than a dark (for example grey, black or green) area. Finally, a protective layer (laminate) is provided on top of the phosphorizing layer and the image. This layer protects the combination against outside influences, such as detergents, mechanical influences and/or influences resulting from the incidence of sunlight.

[0004] However, the known product has a number of drawbacks. Firstly, the sheet material is relatively inflexible, so that the material cannot readily be applied to an irregular surface. The assembly of sheet material and protective layer can only be less flexible than the sheet material as such. In practice, the sheet material can only be readily applied to a flat surface, which greatly limits the possible uses of the product.

[0005] Since both the ink or paint which contains the abovementioned phosphorizing material, and the image itself are applied on top of one of the surfaces of the sheet material, the assembly is relatively susceptible to outside influences. The phosphorizing ink and the image can easily become damaged. This means that both the paint or ink and the image have to be well protected against these influences. However, protection of the assembly requires additional material and effort, such as for example applying one or more protective laminate layers to the assembly.

[0006] A further drawback is the fact that the production of the product requires a relatively large number of production steps, i.e. applying the paint or ink containing phosphorizing material, applying an image (indicating sign) thereon and finally providing the combination with a protective laminate.

[0007] Another drawback of the known product is the fact that it has to be made especially for this purpose and that it is not possible to impart the desired glowing properties to an already existing image on any substrate. If, for example, indicating signs on a wall or an image, such as a photograph, drawing and/or text, have been mounted on a poster, it is no longer possible to make them glow in the dark. The indication on the wall or the poster has to be removed first and has to be replaced by a product which has been specially prepared for this purpose. There is a need for an assembly which makes it possible for an existing image on a substrate to glow in the dark.

[0008] It is an object of the present invention to provide an improved assembly and/or an improved method which overcomes at least some of the abovementioned drawbacks. It is also an object of the invention to provide an assembly and/or a method by means of which an existing substrate (with or without one or more images) can be imparted the desired optical properties in a simple manner.

[0009] According to a first aspect of the present invention, an assembly is provided, comprising:

- a substantially transparent film of plastic material, wherein the film contains phosphorescent material;
- an adhesive layer provided on one side of the transparent film in order to render the film self-adhesive.

[0010] By means of the adhesive layer provided, the film can be attached to any surface. The surface may in this case already be provided with an image and it is therefore possible to transform any ordinary image into a phosphorizing image. However, it is also possible to first provide the film with an image and only then to apply the phosphorescent film to the substrate. In the latter case, the image may be provided on the side opposite said side to which the adhesive layer is applied, but it is also possible to apply an image first and only then to provide an adhesive layer on top of the image.

[0011] An assembly of this type may be used in order to improve visibility in the dark of an image on a surface to which the self-adhesive film can be attached. By providing the phosphorizing layer on top of the substrate and the image provided thereon (text, figures, photographs, symbols or the like), the image or, on the contrary, the area around the image can light up in the dark, so that

the image remains partly or entirely visible.

[0012] In order to improve storage and transportation of the assembly, the assembly, in a further embodiment, comprises a removable support, for example a removable covering layer or film. By means of the abovementioned adhesive layer, the removable support is temporarily attached to the film. In this state, the assembly can be readily stored and/or transported. In many cases, the assembly will have been rolled up on a roll, but this is not compulsory. When the film is to be used after the storage and transportation stage (i.e. in the operational stage), the removable support is removed. The film, removable support and adhesive layer are in this case configured in such a manner that when they are separated, the adhesive layer is transferred from the removable support onto the transparent film. This means that the film becomes self-adhesive.

[0013] In certain embodiments, the transparent film is a calendered monomer film. In these embodiments, a thermoplastic is heated to form an extruded sausage-like mass and kneaded and subsequently processed between two or more rollers to form a cooled film of a certain thickness. The resulting film may be the end product, but may also be a semi-finished product. After calendering, the film may be treated further, for example by imprinting it. The thickness of the films is typically between 100 and 500 μm.

[0014] In embodiments of the invention, the side of the film opposite the side of the adhesive material is adapted to be printed on directly.

[0015] In case the image is to be printed on the transparent film itself, for example if the film has the abovementioned property that it can be printed on directly, it may be advantageous to produce the adhesive layer in the form of a substantially light, more particularly white, glue layer. Those parts of the film which are not covered, for example by the image, then have a light (white) background. This ensures that the respective parts glow well and are thus readily visible in the dark.

[0016] If the image is printed directly onto the film or if the image is applied in any other way, it is often advisable to protect the image against outside influences. In a further embodiment, the side which is situated opposite the side of the adhesive layer and which is optionally provided with an image is provided with a transparent protective layer. The protective layer is applied after one or more images have been applied on the printable side, for example images which have been printed thereon by means of an ink-jet printer.

[0017] In other embodiments of the invention, the transparent film is a polymer cast film. During a preparation process or a casting process, phosphorescent material, for example phosphorizing pigment, is mixed with the polymer material in order to impart the desired phosphorizing properties to the film. By means of such a casting process, very thin films can be produced, typically having a thickness of between 50 and 90 μm. Due to their low thickness and/or their other material properties, these films are highly flexible and/or extensible. This means that the film can be applied to any surface and therefore also to a relatively irregular surface. It is, for example, possible to apply the film, which is optionally provided with images, onto the paint coat of a vehicle, such as a passenger car or lorry. Due to its flexibility, the film can follow the shape of the vehicle entirely. Therefore, when there is sufficient light, it is (virtually) impossible to see that a film has been applied to the vehicle. However, if it suddenly goes dark, for example when the vehicle is driven through a tunnel, the film glows, which produces a special effect.

[0018] The amount and the composition of the phosphorizing material in the transparent film is chosen such that the transparent film is visible for a period of time in excess of 20 minutes after it has been illuminated with the usual light intensity.

[0019] The invention also comprises the use of the assembly described herein.

[0020] According to another aspect of the present invention, a method for producing an assembly is provided to this end, the method comprising:

- combining plastic material and phosphorescent material;
- producing a substantially transparent phosphorescent film (laminate) from the combined material;
- applying an adhesive layer to one side of the film.

[0021] Applying an adhesive layer may in this case comprise the following:

- applying the adhesive layer on a removable support;
- attaching the support to said side of the film using the adhesive layer;

  wherein the film, removable support and adhesive layer are configured in such a manner that when they are separated, the adhesive layer is transferred from the removable support onto the transparent film in order to provide a self-adhesive side on the film.

[0022] According to a particular embodiment, the method comprises:

- producing an intermediate product consisting of a mixture of at least a monomer material and a phosphorescent material;
- calendering the intermediate product in order to produce a transparent film.

[0023] The film material may be configured in such a way that image(s) can be applied thereto directly. One or more images can then be applied to the side of the film opposite the side of the adhesive material. In a particularly advantageous embodiment, the film side can be printed on directly and the method comprises printing images onto the film, for example by means of an ink-jet printer which is known per se. After the images have been

applied, a transparent protective layer is applied in order to protect the image against outside influences, such as scratches, dust, dirt, UV radiation and the like. The protective layer not only ensures that the image is physically protected, but is usually also provided with UV absorbers or stabilizers in order to prevent the colours of the image from fading.

[0024] In other embodiments, the method comprises mixing phosphorescent material and liquid polymer material and casting the liquid mixture in order to produce a cast film. Such a film may be very thin. The film is highly flexible so that it can also be applied to a surface which has an irregular shape. Preferably, materials are added to the mixture of polymer material and phosphorizing material which ensure that the film can fulfil the function of the abovementioned protective layer. The film then has properties which are such that the image on the substrate is not only protected against mechanical outside influences (such as scratches), but also against the effects of UV radiation and the like, due to the UV absorbers or stabilizers.

[0025] Further advantages, features and details of the present invention will be explained below by means of the following description of some preferred embodiments thereof. In the description, reference is made to the attached figures, in which:

Fig. 1a shows a top view of a substrate provided with an image in the form of an indicating arrow;
Fig. 1b shows a side view of the substrate with the indicating arrow;
Fig. 2 shows a longitudinal section through an embodiment of an assembly 1 according to the invention;
Fig. 3 shows a longitudinal section through the embodiment of Fig. 2, in which the covering layer 3 has been removed;
Fig. 4a shows a top view of the substrate with the indicating arrow from Fig. 1a, provided with an embodiment of a film according to the invention;
Fig. 4b shows a longitudinal section through the substrate, indicating arrow and the embodiment of the invention, in the attached state;
Fig. 5 shows a longitudinal view of a second preferred embodiment of the assembly according to the invention, in the original state; and
Fig. 6 shows a longitudinal section through the second embodiment of the invention, in the position of use.

[0026] Figs. 1a and 1b show a surface (O), for example a wall or floor of a building, onto which an image (A) in the form of an indicating arrow is applied by means of paint, ink or any other means, such as with the aid of a self-adhesive label. In the illustrated embodiment, the colour of the image is dark, while the area (G) around the image is light. Preferably, this area is white and the image is green, but different colours or shades of grey are likewise possible, provided the material used (paint, ink, and the like) has sufficient coating power.

[0027] When the surface is lit with sufficient (natural and/or artificial) light, the indicating arrow is readily visible. However, when the light fails or night falls outside, visibility will deteriorate. In order to ensure that the indicating arrow remains visible for some time even when there is little incident light or none at all, an embodiment of the assembly according to the invention is applied to the surface and the indicating arrow.

[0028] Fig. 2 illustrates a first embodiment of the assembly. It shows a thin transparent film 2, on a side 10 of which a layer of glue 4 is provided. On the opposite side 13 of the layer of glue 4, a removable covering layer 3 is provided. The covering layer 3, also referred to as the support or support layer in this description, serves as protection for the assembly during storage and transportation thereof and is preferably formed by paper which is siliconed on at least one side. More generally, the support is configured such that, on the one hand, it can support the adhesive of the adhesive layer or layer of glue 4, but, on the other hand, bonds with the adhesive in such a (weak) manner that the adhesive can be transferred from the covering layer to the film 2 when the covering layer 3 is removed. Any suitable adhesive or any suitable glue can be used for the adhesive layer, provided that it is compatible with the properties of the film 2 and makes the abovementioned transfer possible. In the illustrated embodiment, the adhesive layer 4 is transparent.

[0029] As has been described above, the film 2 itself is also transparent or even completely clear. In a preferred embodiment, the film is made of a polymer material, for example a cast film, so that the pigment can be mixed in in a more homogeneous manner. During the production of the film the polymer material is firstly made into a liquid in a preparation process. Subsequently, phosphorizing pigments are added to the liquid polymer material. The mixture is then cast onto a casting support and is plastified and dried in the known drying ovens. This is what is referred to as the "cast film" process. The processing of the mixture results in a film having the desired mechanical and optical properties. The film can be made relatively thin, typically in the range from 50 to 90 μm. The film is highly flexible and can thus be applied to any surface, even when the surface is irregular, for example when the surface is formed by the paint coat on the outside of the body of a motor vehicle.

[0030] In certain embodiments of the invention, the assembly of film, layer of glue and covering layer is stored and transported on a roll. After a sufficiently large piece of the assembly has been cut off, that is to say, a piece which is sufficiently large to cover at least the indicating arrow (A) and the surrounding area (G), the covering layer 3 is pulled off the remainder of the assembly by hand. Due to the properties of the covering layer (for example because the covering layer 3 is provided with a siliconed side 13), the adhesive layer 4 will come off the covering layer 3 and only remain attached to the film 2. This situ-

ation is illustrated in Fig. 3. The film 2 has thus become a self-adhesive film which can be applied to a surface.

[0031] Figs. 4a and 4b show the situation where the film 2 is attached to the surface and the indicating arrow (A) provided thereon by means of the layer of glue 4. Due to the fact that the adhesive layer 4 and the film 2 are transparent, the indicating arrow (A) and the surrounding area (G) are still visible. When the film and the layer of glue are sufficiently transparent, no difference or hardly any difference is noticeable between the surface with and without film when there is sufficient light. However, when the light intensity decreases, for example because the artificial light has been switched off for whatever reason, the film 2 will continue to glow for a certain period of time due to the presence of the phosphorizing material therein.

[0032] In the illustrated embodiment, in which the indicating arrow (A) is dark and the surrounding area (G) is light, the surrounding area will now light up clearly in the dark and the area of the indicating arrow remains relatively dark. In this way, the indicating arrow is sufficiently visible for a certain period of time, even in the dark. This means that if the lighting in a building fails, for example as a result of an emergency situation, the occupants of the building can still be guided to, for example, an exit of the building by means of the arrow.

[0033] In the above-described embodiment, the film 2 is made from a cast film made from, inter alia, polymer material. This film is so flexible and thin, that the film can be applied on top of an existing surface, without this surface having to be smooth and even. However, other embodiments are also possible. For example, it is possible to produce the film as a monomer film. Such monomer films are generally thicker than the polymer cast films. They are produced by adding an amount of phosphorizing material to the monomer material, mixing these materials and then extruding and subsequently calendering the mixture until a film having the desired properties is achieved.

[0034] Thereafter, the abovementioned glue or adhesive layer 8 is applied (usually by means of a laminator). The choice of suitable adhesives and types of glue will be clear to those skilled in the art. The adhesives or types of glue may preferably be white or opaque and optionally have a composition which is such that they can be transferred from a particular support material, for example silicone paper, to another support material, such as crystal-clear or transparent film. It is also possible to use known crystal-clear or transparent types of glue or adhesives, to which suitable quantities of white pigments or fillers have been added.

[0035] Thereupon, the monomer film can be used in the same manner as described with reference to Figs. 1a-4b, i.e. as a self-adhesive film which can be applied on top of an existing surface. However, since a monomer film is thicker and less flexible, it is less suitable to be applied to a surface which is irregular. In addition, this film has the drawback that it cannot be stuck on top of existing images, since no image would then be visible. However, the monomer film can also be used in another manner, as is illustrated, for example, in Figs. 5 and 6.

[0036] Fig. 5 shows the monomer film 6 which has been provided with a layer of glue 8 and a covering layer or support 17 in the abovementioned manner. However, in the illustrated embodiment, the layer of glue 8 is a white or virtually white layer of glue, so that the transparent film 6 is provided with a uniform white background on one side (side 16). On the other side (side 15), the film 6 is provided with an image 9, for example (but obviously not limited thereto), the abovementioned indicating arrow. This image can be applied in a variety of ways.

[0037] The image 9 can be produced by passing the combination of support 17, film 6 and layer of glue 8 through an ink-jet printer. Although the invention is not limited to specific types of ink or the number of colours thereof, and it is also possible to use only black ink or ink of one single colour, the invention is in particular suitable for producing colour images, such as the printing of photographs and the like. In this case, the base colours yellow, magenta and cyan are usually used, if desired in combination with black ink. Obviously, it is also possible to use a larger number of colours.

[0038] Once the image has been applied to the suitable side of the film, the ink is allowed to dry first. When the ink has dried to a sufficient extent, a film is applied to the side on which the image 9 has been provided, which film is provided with a layer of glue or adhesive.

[0039] A protective or covering layer 14 is provided on top of the side 15 and the image 9 in order to protect the film and, in particular, the image 9. The covering layer 14 ensures that the image is not exposed to outside influences, such as mechanical influences or the effects of incident sunlight, or at least to a lesser extent.

[0040] Fig. 5 shows the situation in which the assembly can be placed on a roll for the purposes of storage and/or transportation. Usually, the assembly is made available again on a roll, but in other cases, the assembly is stored and/or transported in a different form. The support 17 can be removed again in order to attach the combination to a surface, so that the assembly, that is to say the film 6, image 9 and, if desired, the covering layer 14, becomes self-adhesive. After all, the transparent or, preferably, white layer of glue is configured in such a manner that it remains behind on the surface 16 of the film 6 and comes off the support 17. The assembly is now in the position of use illustrated in Fig. 6 and can be attached to a surface (O) in a known manner.

[0041] Due to the fact that the covering layer 14 is transparent, image 9 remains visible when it is light. When it gets dark, the film 6 will continue to glow due to the presence of phosphorizing material in the film 6 itself. In the illustrated embodiment, the entire area of the film will light up more brightly (at least those areas where the white layer of glue is situated) due to the presence of the white layer of glue 8 behind the transparent film 6. The light of the film 6 can then leave the assembly via the

covering layer 14. However, due to the presence of the image 9, no light will be emitted from certain locations, which means that the image 9 can be identified as a relatively dark area. In this case, the image 9 can form, for example, the indicating sign, and as a result the area around the indicating sign lights up in the dark and the area of the indicating sign remains dark. Of course, it is also possible to provide the image 9 in reverse form so that the indicating sign is formed by the area in which the image is not situated. When it gets dark, it will be the indicating sign that lights up and the surrounding area (where the image is not situated) will remain dark.

[0042] The method of the invention and the resulting self-adhesive film can, for example, be used for all known uses of ink-jet techniques, such as making self-adhesive transparencies of photographs, drawings, graphic designs and the like, for example for use as decoration, logo, lettering and/or for advertising purposes. The surfaces to which the films can be attached can vary and may include vehicles, such as commercial vehicles, racing cars, boats, walls, floors, windows, banners, panels and the like.

[0043] The present invention is not limited to the preferred embodiments thereof described here. Rather, the rights sought are defined by the following claims, which allow for numerous modifications.

Claims

1. Assembly comprising:

- a substantially transparent film of plastic material, wherein the film contains phosphorescent material;
- an adhesive layer provided on one side of the transparent film in order to render the film self-adhesive.

2. Assembly according to Claim 1, furthermore comprising a removable support provided with the adhesive layer, wherein the film, removable support and adhesive layer are configured in such a manner that when they are separated, the adhesive layer is transferred from the removable support onto the transparent film so that the film becomes self-adhesive.

3. Assembly according to one of the preceding claims, wherein the transparent film comprises a calendered monomer film.

4. Assembly according to one of the preceding claims, wherein the adhesive layer comprises a substantially white layer of glue.

5. Assembly according to one of the preceding claims, wherein the side of the film opposite the side of the adhesive material is adapted to be printed on directly.

6. Assembly according to one of the preceding claims, wherein the transparent film, on the optionally printed side which is situated opposite the side of the adhesive layer is provided with a transparent protective layer.

7. Assembly according to one of Claims 1-2, wherein the transparent film comprises a polymer cast film in which phosphorescent material is added to the polymer material during a preparation process or a casting process.

8. Assembly according to one of the preceding claims, wherein the phosphorescent material comprises pigment which is mixed in with the polymer material.

9. Use of the assembly according to one of the preceding claims, wherein the self-adhesive film is bonded to a surface.

10. Object, in particular a vehicle, provided with a paint coat, wherein the surface is formed by the paint coat and a self-adhesive phosphorescent film according to one of the preceding claims is bonded to the paint coat.

11. Method for producing an assembly according to one of Claims 1-8, the method comprising:

- combining plastic material and phosphorescent material;
- producing a substantially transparent phosphorescent film from the combined material;
- applying an adhesive layer to one side of the film.

12. Method according to Claim 11, wherein applying an adhesive layer comprises:

- applying the adhesive layer on a removable support;
- attaching the support to said side of the film using the adhesive layer;

wherein the film, removable support and adhesive layer are configured in such a manner that when they are separated, the adhesive layer is transferred from the removable support onto the transparent film in order to provide a self-adhesive side on the film.

13. Method according to Claim 11 or 12, comprising:

- producing an intermediate product consisting of a mixture of at least a monomer material and a phosphorescent material;
- calendering the intermediate product in order

to produce a transparent film.

14. Method according to Claim 13, comprising applying one or more images to the side of the film opposite the side of the adhesive material, preferably printing the images onto said side of the film.

15. Method according to one of Claims 13 or 14, comprising applying a transparent protective layer to the side which is optionally provided with images.

Fig 1a

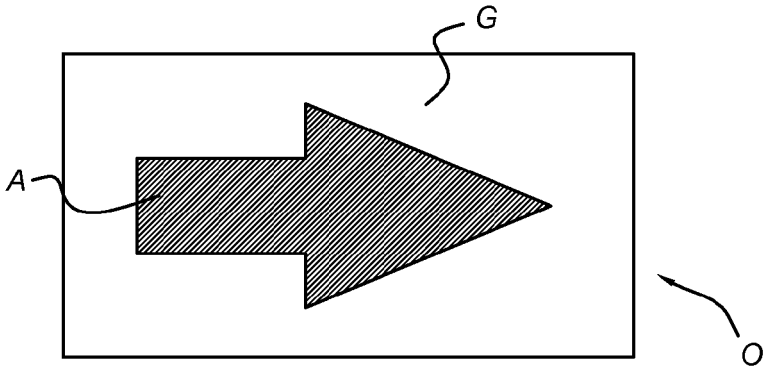


Fig 1b

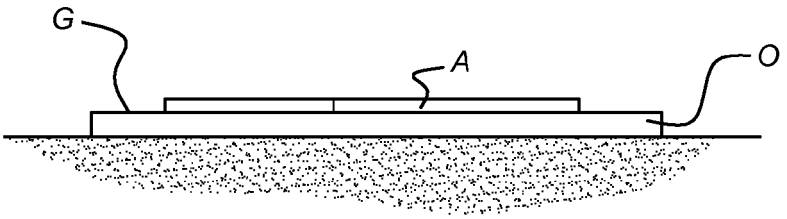


Fig 2

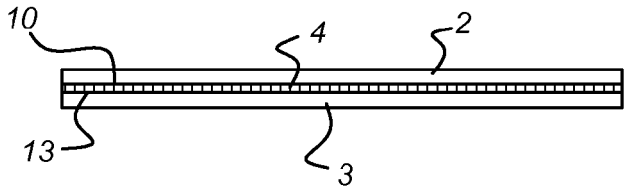


Fig 3

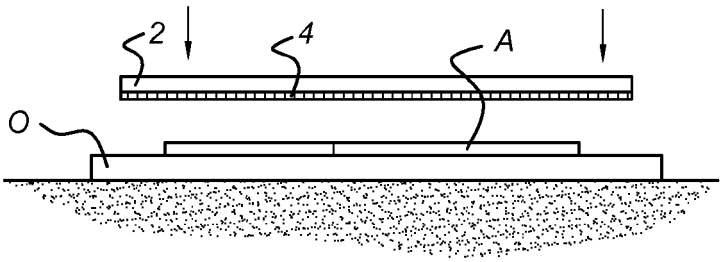


Fig 4a

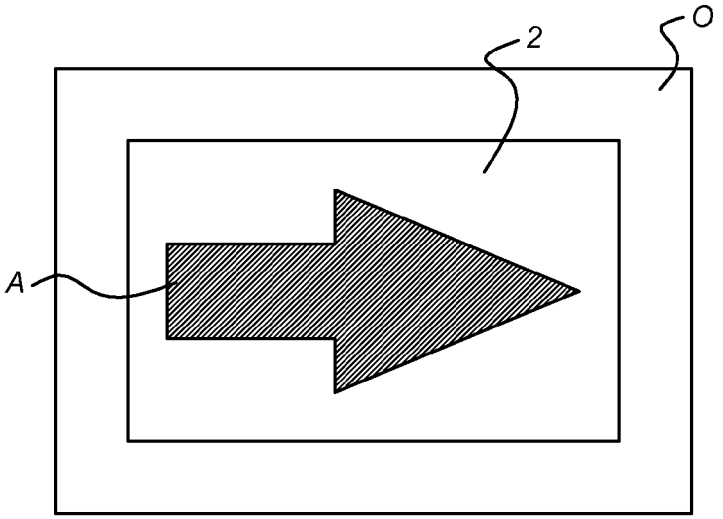


Fig 4b

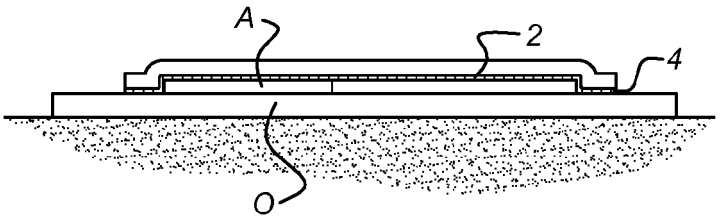


Fig 5

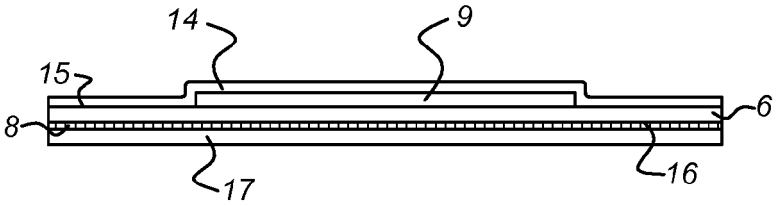
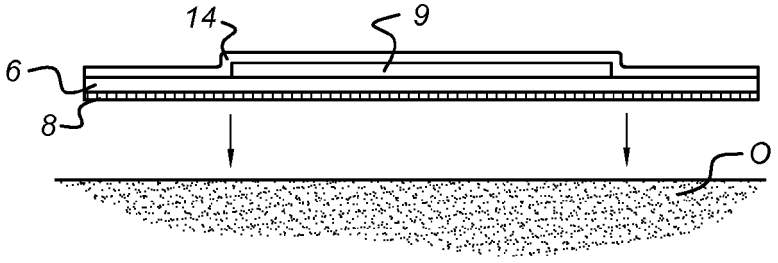


Fig 6



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 15 4474

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2006/127155 A1 (CHERYL J. BRICKEY ET AL.) 15 June 2006 (2006-06-15) * see abstract; paragraph [0018] - paragraph [0042]; figure 1 *	1-15	INV. B44C1/10 B44C1/17 B41M7/00 B60R13/02 G09F7/02
X	FR 1 191 576 A (CIDITI ET AL.) 20 October 1959 (1959-10-20) * the whole document *	1,9,11	G09F7/12
A	WO 87/04555 A1 (WALKER, JOSEPH, L.) 30 July 1987 (1987-07-30) * the whole document *	1-15	
A	WO 03/054099 A2 (3M INNOVATIVE PROPERTIES) 3 July 2003 (2003-07-03) * the whole document *	1-15	
A	DE 200 12 900 U1 (SEIDENBUSCH, RICHARD) 4 January 2001 (2001-01-04) * the whole document *	1-15	
A	US 2004/200564 A1 (VON ADONIRAM KINSEY ET AL.) 14 October 2004 (2004-10-14) * the whole document *	1-15	TECHNICAL FIELDS SEARCHED (IPC) B44C B41M B60R G09F
A	US 2 652 651 A (M. LA BARBERA) 22 September 1953 (1953-09-22) * the whole document *	1-15	
A	WO 02/062591 A2 (STEINBERG, RICHARD, F.) 15 August 2002 (2002-08-15) * the whole document *	1-15	
A	GB 2 312 645 A (BORIS SIEGMUND DAVIS ET AL.) 5 November 1997 (1997-11-05) * the whole document *	1-15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 July 2011	Greiner, Ernst

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 15 4474

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-07-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006127155 A1	15-06-2006	NONE	
FR 1191576 A	20-10-1959	NONE	
WO 8704555 A1	30-07-1987	AU 6930887 A	14-08-1987
		CA 1282588 C	09-04-1991
		EP 0256089 A1	24-02-1988
		US 4831760 A	23-05-1989
WO 03054099 A2	03-07-2003	AU 2002360754 A1	09-07-2003
		BR 0106170 A	23-09-2003
DE 20012900 U1	04-01-2001	NONE	
US 2004200564 A1	14-10-2004	US 2008069996 A1	20-03-2008
US 2652651 A	22-09-1953	NONE	
WO 02062591 A2	15-08-2002	AU 2002253922 A1	19-08-2002
		US 2002142155 A1	03-10-2002
GB 2312645 A	05-11-1997	WO 9738868 A2	23-10-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82