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(71) Applicant *(for all designated States except US)*: **BRAUN GMBH** [DE/DE]; Frankfurter Strasse 145, 61476 Kronberg/Taunus (DE).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **JUNGNICKEL, Uwe** [DE/DE]; Rossertstrasse 4, 61464 Koenigstein (DE). **STEGMANN, Wolfgang** [DE/DE]; Gabelsbergerstrasse 12, 60389 Frankfurt/Main (DE).

(74) Common Representative: **BRAUN GMBH**; c/o Eileen L. Hughett, The Procter & Gamble Company, Global Patent Services, 299 East Sixth Street Sycamore Building, 4th Floor, Cincinnati, Ohio 45202 (US).

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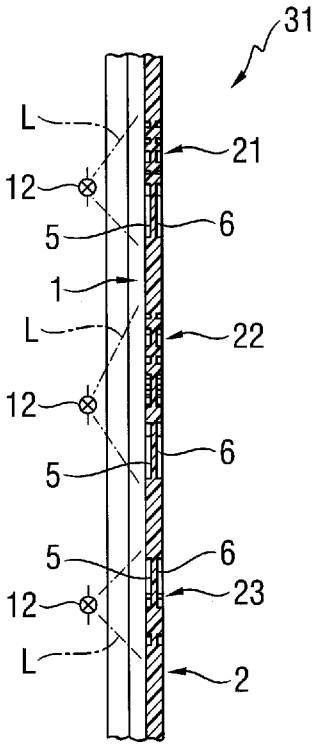
(54) Title: DISPLAY PANEL AND MANUFACTURING A TRANSLUCENT CARRIER ELEMENT OF THE DISPLAY ELEMENT

Fig. 1c



(57) Abstract: A display panel (31) is proposed that comprises a translucent carrier element (10) that has an inner side (1), an outer side (2), and a display area (3). At least one display element (21-28) is arranged within the display area (3), the display element (21-28) being formed by geometric structures (5, 6; 60) realized as protrusions (60) and/or depressions (5, 6) on both of the inner side (1) and the outer side (2) of the translucent carrier element (10). The display panel can be used in an information display that in particular comprises at least a light emitting element for backlighting the display element. The information display can be used in an appliance such as an electric toothbrush, wherein the protrusions (60) and/or depressions (5, 6) integrally formed with the translucent carrier element (10).

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DISPLAY PANEL AND MANUFACTURING A TRANSLUCENT CARRIER ELEMENT OF THE DISPLAY ELEMENT

FIELD OF THE INVENTION

The present invention is concerned with a display panel, an information display comprising the display panel, an appliance that comprises the information display, and a method of manufacturing a translucent carrier element of the display panel.

BACKGROUND OF THE INVENTION

In electronic and electromechanical handheld appliances, which can be manually handled, light emitting elements are provided in the interior thereof, in particular in the form of LEDs, through which specific switching and operating states of the appliance are visualized to a user. These light emitting elements are typically arranged in the interior of the housing so that corresponding lighted dots can be generated that are usually associated to an explanatory print on the outside of the housing (e.g. "Charge Status" could be printed onto the housing and the lighted dot could change between a green color and a red color).

A backlit display panel is known from DE 20 2008 008 101, which comprises a light-transparent main body, an outer light-transparent cover layer and an inner light-opaque cover layer being provided on this main body. The inner light-opaque cover layer is locally provided with a pictogram mask. With corresponding backlighting of the main body, the lighted image generated by the pictogram mask is visible through the main body and the outer cover layer.

SUMMARY OF THE INVENTION

Thus it is a desire to provide a display panel, an information display comprising the display panel and an appliance that comprises the information display that provide attractive display elements.

This object is achieved by a display panel according to claim 1, an information display according to claim 12, an appliance according to claim 14 and a method according to claim 15.

The display panel as proposed has a translucent carrier element, which is manufactured from an essentially translucent (plastic) material. The display panel has an inner side, an outer side, and a display area. At least one display element is arranged within the display area. The display element is formed by geometric structures that are realized as protrusions and/or depressions on both of the inner side and the outer side of the translucent carrier element, wherein the protrusions (60) and/or depressions (5, 6) integrally formed with the translucent carrier element (10), i.e. at least one geometric structure is formed on the outer side and at least another geometric structure is formed on the inner side that together form the display element. In an embodiment, the geometrical structures formed on the inner side of the translucent carrier element are only realized as depressions. The display element can in particular be a pictogram or symbol.

In contrast to a display panel where only a light-opaque masking is applied on the inner side of a translucent carrier element and a blurry image of the masked structure would result on the outer side of the display panel, the proposed display panel having geometric structures on the outer side and the inner side of the translucent carrier element can provide display elements with e.g. a high edge sharpness and other appealing optical effects such as a halo effect.

In an embodiment, the geometric structure(s) that is (are) formed on the inner side and the geometrical structure(s) that is (are) formed on the outer side of the translucent carrier element and that together form the display element have essentially identical contour and/or have essentially coinciding positions (i.e. they are congruent) so that the geometrical structures are at least approximate identically or mirror-symmetrically formed on both sides as protrusions and/or depressions. In particular, the spatial deviation between the geometric structures formed on the inner side and the outer side, respectively, deviates by not more than about 20 micrometer (μm), in particular by not more than 10 micrometer, where the spatial deviation is measured with respect to the normal vector of the translucent carrier element, which means that for an identical contour and position of the geometric structure realized on the inner side and the geometric structure realized on the outer side, the normal vector that contacts the contour of one of the geometric structures does so also for the contour of the other geometric structure. A high edge

sharpness of the display element contours in a backlit state is achieved when both geometric structures are realized as depressions.

In another embodiment, the geometric structure formed on the inner side is realized as a depression and the geometric structure formed on the outer side is realized as a protrusion, where in particular the contour of the depression envelopes the contour of the protrusion, i.e. the protrusion may be realized within the area of the depression or in other words, the depression has larger spatial extensions than the protrusion.

In yet another embodiment, an essentially light-opaque masking is arranged on the inner side of the translucent carrier element, which light-opaque masking is not covering the geometric structure(s) formed on the inner side. The light-opaque masking may in particular be a layer of black ink, e.g. applied via a printing process.

It is to be noted that the geometric structures and the various embodiments described lead to different display elements that in an active state, when the display panel is backlit by light emitting elements, have, e.g., high edge sharpness (e.g. in case contour-identical depressions are realized on the inner side and the outer side with coinciding positions) or a structure is highlighted by a surrounding diffuse bright area when a large depression is realized on the inner side and a smaller protrusion is realized on the outer side (halo effect). The effects are increased by using an essentially light-opaque masking on the inner side.

In an embodiment, the thickness of the translucent carrier element is about 0.5 mm – 3.5 mm and the height extension of the geometric structures in thickness direction (i.e. in the direction of the normal vector) lies in the range of 10% to 50% of the thickness of the translucent carrier element. The thickness value of the translucent carrier element neglects the presence of depressions and protrusions and is measured along the surface normal.

In a further embodiment, the translucent carrier element has a curved shape, i.e. the translucent carrier element is non-planar, in particular non-planar in the display area and it is in particular having a three-dimensionally curved shape.

Multiple display areas may also be implemented on the display panel, which either have depressions on both sides or a depression on one side and a corresponding protrusion on the other side. Different characteristics of the individual display elements may be achieved by a corresponding selection.

In an even further embodiment, the display panel comprises an essentially transparent layer that covers at least a part of the outer side of the translucent carrier element. In particular, the transparent layer may be smooth on its outer side for improved handling properties as any unevenness due to depressions and/or protrusions is avoided. The essentially transparent cover may be slightly colored, e.g. to generate the effect of tinted or smoked glass. The pigments used for coloring the transparent cover essentially only absorb light but do not scatter the light so that the back-lit display elements may only loose some contrast but will not be blurred. The transparent layer can be manufactured from a plastic material. Surface effects, in particular contours may optionally be implemented on the surface of the transparent layer by gloss/matte boundaries.

According to a further aspect of the present invention, it is possible to provide the display panel in the area of its outer side with an imprint. E.g. the outer side of the translucent carrier element can be printed or the outer side of the transparent layer can be printed. Furthermore, a laser inscription can also be implemented in the area of the display area.

An information display according to the invention comprises a display panel as described and at least one light emitting element such as a LED that is arranged for illuminating the inner side of the translucent carrier element in the area of the display element such that an attractive pictogram or symbol becomes visible on the outer side of the display panel in the backlit state, where the illuminated display element can e.g. have a high edge sharpness or can be a pronounced darker symbol within a diffuse brighter area (halo effect). In an embodiment, several light emitting elements are arranged for selective illumination of several display elements such that e.g. different information can be selectively presented (e.g. different operation modes of an appliance such as an electric toothbrush). In particular, the light emitting elements can be separated by light-opaque separation walls for avoiding that neighboring display elements are illuminated.An appliance according to the invention comprises an information display as proposed. An appliance is in particular a hand-held electronic appliance such as a mobile phone, a laptop, a PDA, a

remote control, a camera, an electronic tool (e.g. drilling machine), a toothbrush, a shaver, a kitchen device etc.

The invention is also concerned with a method of manufacturing a display panel as proposed. The manufacturing method comprises the step of injecting a translucent material, in particular a plastic material having translucent properties, into an injection mold, which injection mold provides a negative image of the geometric structures such that the translucent carrier element is formed.

In an embodiment, a transparent layer is injection molded at least over a part of the translucent carrier element in a second injection molding process step.

In another embodiment, an essentially light-opaque masking is applied onto the inner side of the translucent carrier element.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be further elucidated by a detailed description of exemplary embodiments and by reference to figures. In the figures:

Figures 1a, 1b, 1c visualize the fundamental construction of a display panel according to the invention;

Figure 2 shows an illustration to visualize a variant according to the invention according to Figures 1a, 1b, 1c having additional masking;

Figure 2a shows a perspective view of an electrical toothbrush comprising the display panel shown in Figures 1a-1a;

Figures 3a, 3b, 3c visualize the basic construction of a display panel according to the invention, designed as a housing shell, in a variant having depressions on the inner side and protrusions on the outer side;

Figure 4 shows a visualization of another exemplary embodiment of a proposed display panel similar to the variant according to Figures 3a to 3c having additional masking;

Figure 5 shows a perspective illustration to visualize a display panel according to the invention having double-sided congruent depressions, with identical contours,

Figure 6 shows a further embodiment of the carrier element.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1a, 1b, and 1c show an exemplary embodiment of a display panel 31 according to the invention. The display panel 31 comprises a translucent carrier element 10, which can be backlit. The translucent carrier element 10 has an inner side 1 and an outer side 2. The display panel 31 comprises at least one zone functioning as a display area 3. Geometric structures in the form of depressions 5, 6 are formed within the display area 3 both on the inner side 1 and also on the outer side 2 of the translucent carrier element 10 such that display elements 21, 22, 23, 24, 25 are realized. When being backlit (i.e. in a state when the inner side of the translucent carrier element 10 of the display panel 31 is illuminated by light emitting elements 12) a light/dark contrast is achieved by interaction of the geometric structures implemented on both sides of the translucent carrier element 10. The translucent carrier element may in particular also have absorption properties such that the light emitted 12 by a light emitting element is only decently recognizable on the outer side 2 if the material thickness of the translucent carrier element is below a certain value such that only the depressions on the outer side become visible but the translucent carrier element 10 does not emit light at a recognizable strength. The contrast of the backlit display elements 21, 22, 23, 24, 25 with respect to the translucent carrier element 10 can also be enhanced by a masking layer 4 on the inner side, as will be discussed with reference to Fig. 2.

In the shown embodiment, the display panel 31 is realized as a housing part of an electromechanical tooth cleaning device (electrical toothbrush 41 – Figure 2a) - where this specific realization should not be intended to limit the scope of the present invention to this particular embodiment. The display elements 21-25 (display symbols) are used for visualizing various operating states of the tooth cleaning device. The display elements 21-25 particularly visualize a main cleaning mode 21, a gentle cleaning mode 22, a gum cleaning mode 23, and charge state displays 24, 25. The display symbols 21-25 are implemented by geometric structures like pictograms or icons which are formed on both the inner side 1 and also the outer side 2 on the translucent carrier element 10 - for example, by depressions 5, 6 having congruent contours on both sides.

The design of the display panel 31 is further visualized by cross-sectional views shown in Figures 1b and 1c. Figure 1c shows a magnification of the cross-sectional view of the display area 3 of the display panel 31 lying within the elliptical shape shown in Fig. 1b. The geometric structures comprise depressions 5, 6 which are molded into the translucent carrier element 10 on both sides and correspond in their contour to the display elements 21-25. In the embodiment shown here, the depressions 5, 6 have identical contours and are congruent with each other. The display effect is thus achieved by depressed display elements 21-25 implemented on both the inner side 1 and the outer side 2. It is also possible to intentionally provide slight contour offsets. In case the translucent carrier element 10 is manufactured by an injection molding process, the mold can be manufactured with a high precision such that any spatial offsets between the depressions 5, 6 on the inner side 1 and the outer side 2 are less than 20 micrometer, in particular less than 10 micrometer.

As is obvious from Figure 2, it is possible to mold an essentially transparent layer 7 over at least a part of the outer side 2 of the translucent carrier element 10. The transparent layer 7 fills up the depressions 6 on the outer side 2 so that a smooth outer surface 7a results that improves the handling properties. The smooth face 7a is insensitive to dirtying and can be cleaned easily. Geometric structures realized as depressions 5 are formed on the inner side 1 of the translucent carrier element 10.

In the embodiment visualized in Figure 2, a light-opaque masking layer 4 is additionally provided on the inner side 1. As the geometric structures are realized as depressions 5 on inner side 1 of the translucent carrier element 10, the masking layer 4 can be applied by a simple printing process even if the translucent carrier element 10 has a curved shape in the display area 3. The inner side 1 can be printed over its entire area using a Tampoprint® process, for example, without special additional measures, no ink is thereby introduced into the depressions 5 forming the display elements 21-25. The Tampoprint® process is specifically suited for curved surfaces. Without depressions 5 formed on the inner side 1 of the translucent carrier element 10, it would have to be ensured (with great technical effort), that a corresponding opening remains in the masking layer in the area of the display elements 21-25, which is correspondingly identical in contour and congruent with the structure on the part outer side. This is specifically complicated if the translucent carrier element 10 has a curved shape in the display area 3. Further, the congruency of the masking layer cannot be easily achieved with a high precision.

Areas of low material thickness 15 result from the congruent depressions 5, 6 on both sides of the translucent carrier element 10, whereby a higher light output occurs in these areas. In addition, a significantly brighter light output occurs in the area of an outer edge 61 and an inner edge 65 through optical properties, whereby contours of the display elements 21-25 which appear bright are visible.

The essentially transparent layer 7 is provided on the outer side 2 of the translucent carrier element 10. This transparent layer 7 fills up the depressions 6 formed on the outer side 2 of the translucent carrier element 10 and a smooth face 7a of the transparent layer 7 can be achieved. Although it is not shown here, it is also possible to implement further display elements such as icon or image contours in the area of the outer side 2, in particular inside the depressions 6, in that bars are realized in the depressions 6, which in turn project forward out of the depressions and may also be printed by a printing method. The bars printed in this way may be dimensioned so that they are then embedded in the transparent cover layer 7 and do not protrude beyond the cover layer outer side 7a.

The display area 3 of the display panel 31 is designed in a curved shape D in this example according to Figures 1a through 1c. Alternately, however, a flat shape C according to Figures 3a through 5 can also be provided, or flat and curved parts could be present in combination.

Fundamentally, any arbitrary three-dimensional profile of the display panel 31 can be provided depending on the technical capabilities of a corresponding injection mold.

Fig. 2a shows the display panel 31 as a part of an electric toothbrush 41. The electrical toothbrush 41 has a handle part having a brush attachment 43. An operating mode switch 45 is situated adjacent to an operating switch 44. The various types of operation (usage modes) are displayed by the corresponding display elements 21, 22, 23. Still further display elements 24, 25 for indicating a charging state of a battery are arranged adjacent thereto. Depending on the usage mode, at least one display element 21-25 is backlit at a time by selective activation of a light source (LED) 12 (e.g. via a respective control unit).

Another embodiment of a display panel 31 is shown in Figures 3a, 3b, and 3c, in which the translucent carrier element 10 has protrusions 60 formed on the outer side 2 of the translucent carrier element 10 in addition to depressions 5 (Figure 3c) formed on the inner side 1. In the event of a combination of a depression 5 on the inner side 1 of the translucent carrier element 10 with a protrusion 60 on the outer side 2, interesting optical effects result, which increase the attraction and value of a corresponding appliance that comprises the display panel 31. As can be seen, the upper depression 5 (relating to the smiley-like icon 26) is larger than the upper protrusion 6 (relating to the smiley-like icon 26) – see offset A in Fig. 4c. This leads in an active state, when the upper display element 26 is back-lit, to the effect of a somewhat darker protrusion 6 being surrounded by a relatively wide area that appears brighter than the protrusion 6 as the protrusion 6 partially absorbs the light. For the lower icon 27, the protrusion 6 and the depression 5 are congruent (see line B in Fig. 4c) such that the effect of a bright area surrounding the somewhat darker protrusion 6 is less pronounced.

As is obvious from Figures 4a, 4b, and 4c, a simple masking layer 4 on the inner side 1 is again possible due to the fact that only depressions 5 are formed on the inner side 1.

Depending on the dimensioning of the offset A between the inner depression 5 and the outer protrusion 60, a contour of the display element 26 which is lighted more or less brightly results, which is caused by the corresponding width of the offset A of the areas of low material thickness 15. In contrast, in the display element 27, there is no offset A, but rather congruence of the inner depression 5 and the outer protrusion 60 – symbolized by dashed lines B – whereby a more

narrowly delimited brightly lit contour results, because the brighter light output only occurs essentially in the area of the outer edge 61 and the inner edge 65. Also scattering effects in the translucent carrier element 10 lead to a small halo effect in case of a congruent depression-protrusion display element 27.

In general, differing light effects may be achieved by the concept according to the invention through a combination of geometric structures realized as depressions and protrusions that form the display elements 21-28. Through a depression 5 on the inner side 1 in combination with a masking layer 4, the lighted area of the display elements 21-28 may be intentionally defined. Via sharp edges 61 and small local depressions 62 in the protrusions filigree shapes of the display elements can be realized.

A further exemplary embodiment of a translucent carrier element 10 is shown in Figure 5. Geometric structures in the form of depressions 5, 6 are implemented on both the inner side 1 and also on the outer side 2 in a display area 3. The geometric structures are realized as congruent depressions having essentially identical contours. As explained with Figures 4a through 4c, it is possible to apply an additional layer 7, in particular made of an essentially transparent plastic material, in the area of the outer side 2 of the translucent carrier element 10. This additional cover layer 7 fills up the depressions 6 and forms an essentially smooth outer side 7a.

A further exemplary embodiment of a translucent carrier element 10 is shown in Figure 6 with an exemplary display element 28 in the form of a circle. The carrier element 10 is provided on the inner side 1 with a depression 5 in the form of a full circle. The other outer side 6 is provided with a display element 28 having a depression 6 in the form of an annulus. If light L is back-lit the display element 28 region D of the circle is brighter than the full circle region C, and the full circle region C is brighter than the region outside the display element 28 because the bigger thickness of the translucent carrier element 10. A masking layer 4 is provided at the inner side 5 additionally increases the visible transmissibility contrast at the geometrical structure from the outer side 2.

In a method for manufacturing a display panel, the translucent carrier element 10 having geometric structures forming the display elements 21-28 is produced in an injection-molding method by injecting a (plastic) material having translucent properties into an injection mold. Due

to the precise techniques in the manufacturing of the injection mold, a high precision of the molded product can be achieved such that a relative positioning accuracy of the geometric structures on the inner side 1 and the outer side 2 of the translucent carrier element 10 of less than 20 micrometer, in particular about 10 micrometer can result. This high relative positioning precision leads in the case of congruent and identical depressions on the inner side 1 and the outer side 2 to very sharp edges of the display elements 21-28 when being illuminated. Other techniques may not achieve this high precision (e.g. a relative positioning deviation of up to 200 µm could result) and a much more blurred impression of the display elements 21-28 would result.

In a further method step of the injection molding method, the essentially transparent layer 7 is injected onto the translucent carrier element 10 using a further injection mold and injecting a material having essentially transparent properties, for example, polycarbonate (PC) or polymethyl methacrylate (PMMA).

The invention described here has the following advantages:

- An appliance comprising an information display as proposed has an attractive front having a relief-like character, which is nonetheless easy to clean.
- The display elements (pictograms) can also decently be seen in an unlit state because of the geometric structures on the outer side of the translucent carrier element.
- A sharply delimited lighted area is achieved by geometric structures realized as identical and congruent depressions.
- The relief is lighted directly.
- Very different visual appearances may be implemented easily by the combination of protrusions and depressions.
- In addition to the injection-molding process, only a simple and cost-effective printing process is still optionally necessary.
- The light intensity can be varied by differently dimensioned depressions (e.g. different depths), so that lighter and darker areas or contrast intensity curves may be implemented.
- Any arbitrary shape of the display elements can be realized.
- Display elements can be generated on arbitrarily shaped translucent carrier elements (flat and/or curved).

The technique according to the invention is suitable for display panels 31 that are used in any type of appliance, in particular in electrical appliances which have display elements, in order to give the user feedback about the operating state or other information.

The backlighting of the display area 3 is performed by active light emitting elements, in particular by LEDs 12. The LEDs can be arranged on a circuit board (not shown), for example, and associated accordingly with the display elements 21-28.

The information display may be comprised by an electrical appliance, in particular an electric toothbrush, a television, a (mains-operated and/or battery-operated) monitor, a handheld electrical appliance, such as a drill, a mobile telephone, a PDA, a remote control, a digital camera, or the like.

The display panel or the information display may also form a component of an instruction and/or information sign or an electric switch.

List of reference numerals

1	inner side
2	outer side
3	display area
4	masking
5	depression (inner side)
6	depression (outer side)
7	essentially transparent layer
7a	(smooth) outer face
8	plane / area
10	translucent carrier element
10a	outer face
12	LED
15	area of low material thickness
21-28	display element
31	display panel
41	electrical toothbrush

42	handle part
43	brush attachment
44	operating switch
45	operating mode switch
60	(plateau-like) protrusion
61	(outer) edge
62	(small) depression
65	(inner) edge
A	offset
B	congruency
C	area
D	brighter area
L	light impingement direction

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "10 µm" is intended to mean "about 10 µm."

Every document cited herein, including any cross referenced or related patent or application, is hereby incorporated herein by reference in its entirety unless expressly excluded or otherwise limited. The citation of any document is not an admission that it is prior art with respect to any invention disclosed or claimed herein or that it alone, or in any combination with any other reference or references, teaches, suggests or discloses any such invention. Further, to the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

1. A display panel (31) comprising a translucent carrier element (10) that has an inner side (1), an outer side (2), and a display area (3) and at least one display element (21-28) being arranged within the display area (3), the display element (21-28) being formed by geometric structures (5, 6; 60) realized as protrusions (60) and/or depressions (5, 6) on both of the inner side (1) and the outer side (2) of the translucent carrier element (10), wherein the protrusions (60) and/or depressions (5, 6) integrally formed with the translucent carrier element (10).

2. The display panel according to Claim 1, characterized in that the geometric structures forming the display element (21) and that are arranged on the inner side (1) and the outer side (2) have essentially identical contours

3. The display panel according to Claim 2, characterized in that the positions of the geometrical structures coincide on the inner side (1) and the outer side (2) in particular with a maximum spatial deviation of 10 µm, so that the geometrical structures are at least approximate identically or mirror-symmetrically formed on both sides (1, 2) as protrusions (60) and/or depressions (5, 6).

4. The display panel according to any one of Claims 1 to 3, characterized in that the geometric structures that are arranged on the inner side (1) and the outer side (2) are all realized as depressions (5, 6).

5. The display panel according to any one of Claims 1 to 4, characterized in that the depression (5) on the inner side (1) of the translucent carrier element (10) is provided with a plane (8) having the same area as the whole display element (28) of the outer side (2) of the translucent carrier element (10).

6. The display panel according to any one of Claims 1 to 3, characterized in that the geometric structure arranged on the inner side (1) is realized as a depression (5) and the

geometric structure arranged on the outer side (2) is realized as a protrusion (60) that in particular has a smaller spatial extension than the depression (5).

7. The display panel according to any one of Claims 1 to 6, characterized in that the translucent carrier element (10) is at least partially covered with an essentially transparent layer (7) on the outer side (2).

8. The display panel according to Claim 7, characterized in that the outer side (2) of the covered transparent layer (7) is flat (planar) or/and curved.

9. The display panel according to any one of claims 1 to 8, characterized in that the translucent carrier element (10) has a curved shape at least in the display area (3).

10. The display panel according to at least one of Claims 1 to 9, characterized in that the translucent carrier element (10) has a thickness in the range from 0.5 mm to 3.5 mm at least in the display area (3), and the geometrical structures have an extension in the thickness direction that lies in the range of 10% to 50% of the thickness of the translucent carrier element (10).

11. The display panel according to any one of Claims 1 to 10, characterized in that an essentially light-opaque masking layer (4) is arranged on the inner side (1) of the translucent carrier element (10).

12. An information display that comprises a display panel (31) according to any one of Claims 1 to 11, characterized in that the information display comprises at least one light emitting element (12) arranged for illumination of the display element (21-28) from the inner side (1) of the translucent carrier element (10).

13. The information display according to claim 12, characterized in that the display panel (31) comprises several display elements (21-28) and several light emissions elements (12) that are arranged such that each of the light emitting elements (12) is assigned to only one of the display elements (21-28).

14. An appliance comprising an information display according to Claim 11 or 12 or 13, characterized in that the appliance is a toothbrush (41).

15. A method of manufacturing a translucent carrier element (10) of a display panel (31) that has an inner side (1), an outer side (2), and a display area (3) and at least one display element (21-28) being arranged within the display area (3), the display element (21-28) being formed by geometric structures (5, 6; 60) , characterized in that a translucent material is injected into a mold, the mold providing a negative image of the geometric structures (5, 6; 60), wherein the geometric structures (5, 6; 60) integrally formed as protrusions (60) and/or depressions (5, 6) with the translucent carrier element (10).

16. The method according to claim 15, characterized in that an essentially transparent layer (7) is injection molded as a further injection step onto the at least a part of the outer side (2) of the translucent carrier element (10).

17. The method according to claim 15 or 16, characterized in that an essentially light-opaque masking layer (4) is applied onto the inner side (1) of the translucent carrier element (10) but not onto the geometric structures (5) as e.g. depressions (5) arranged on the inner side (1).

Fig. 1c

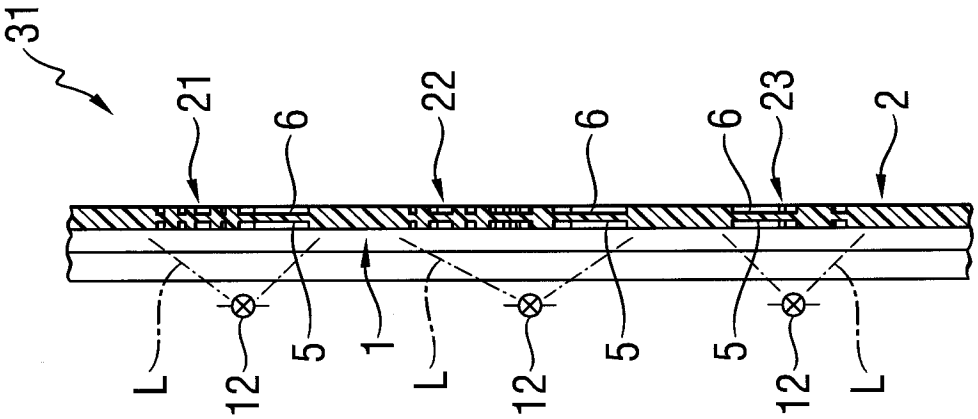


Fig. 1b

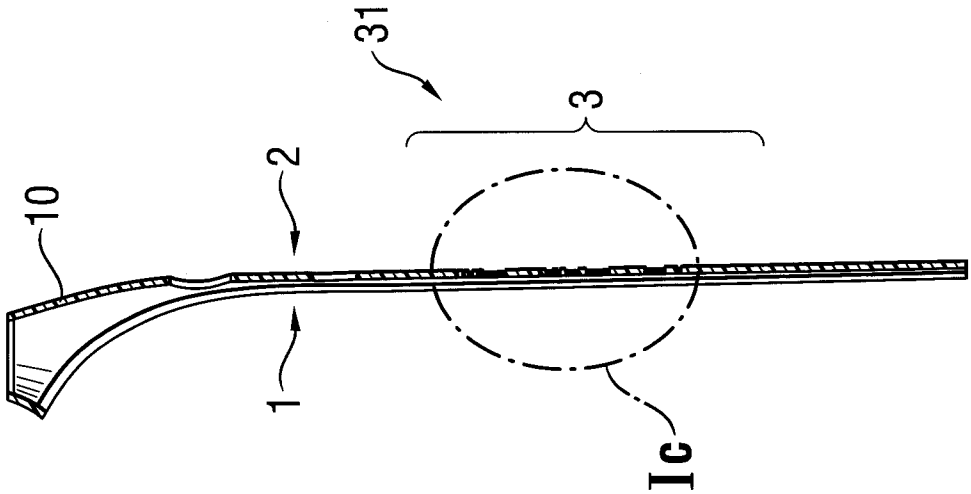
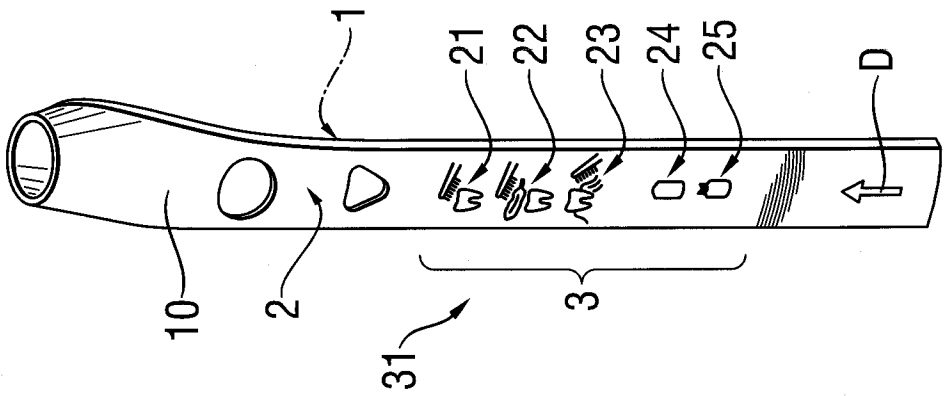


Fig. 1a



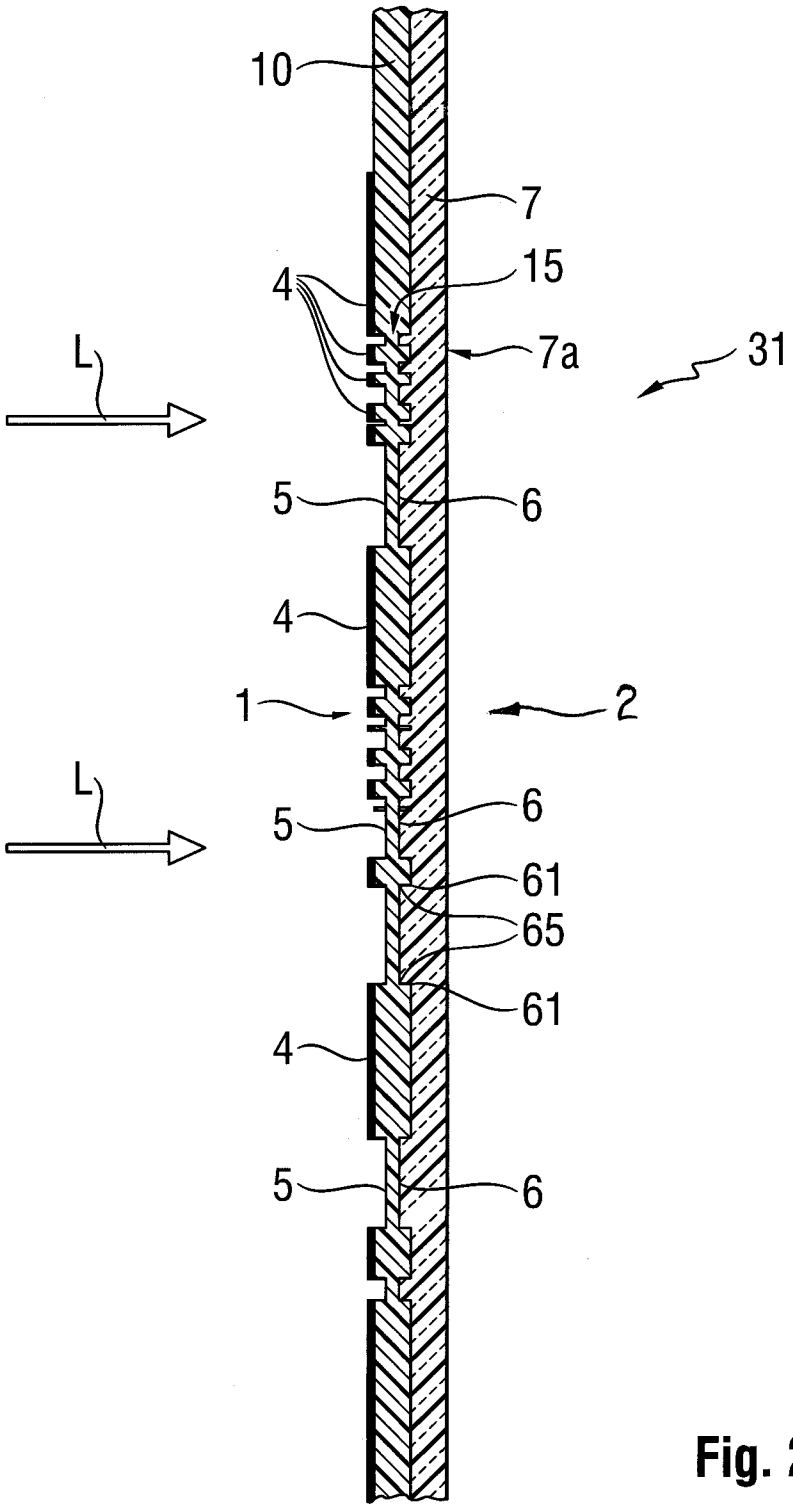


Fig. 2

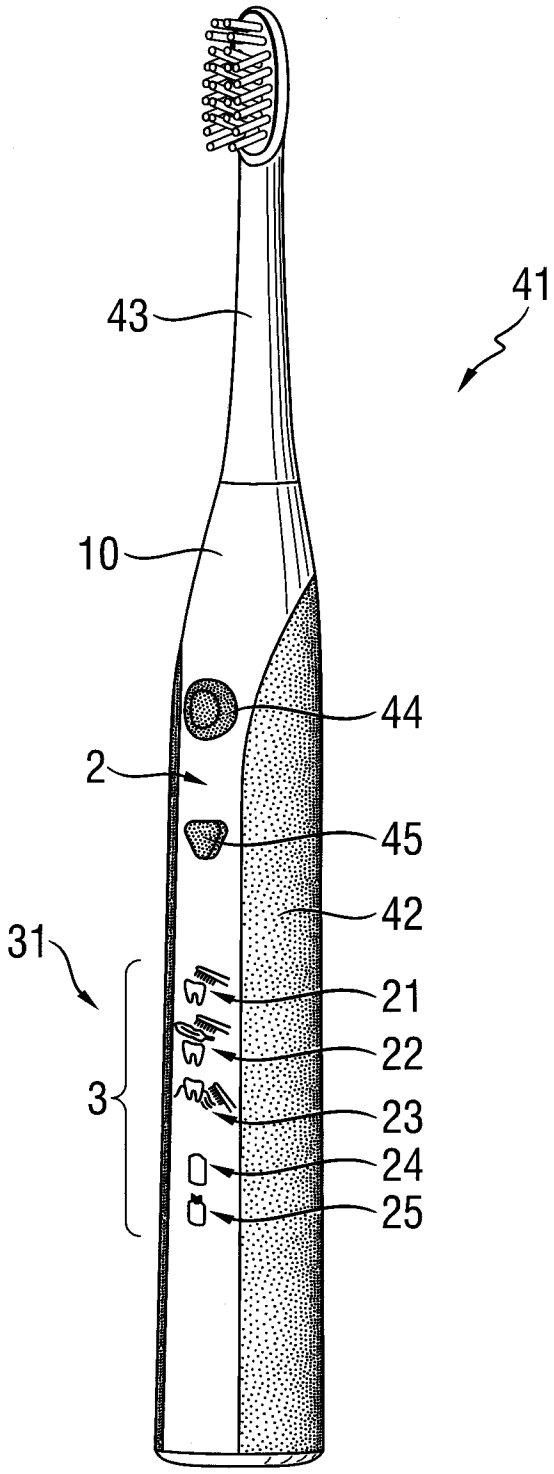


Fig. 2a

Fig. 3c

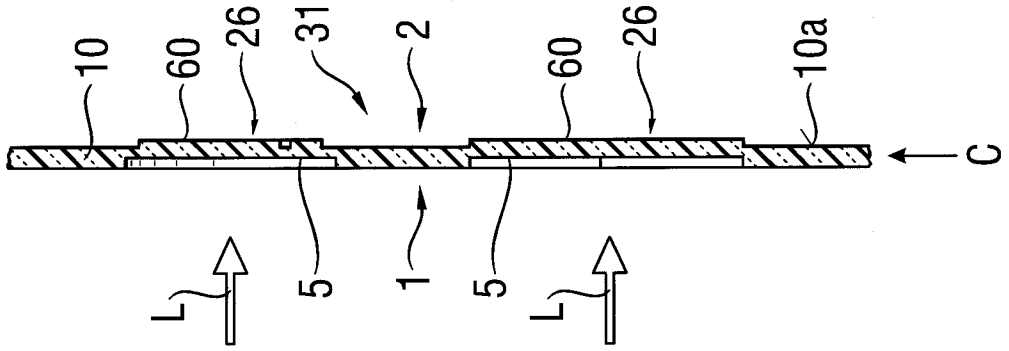


Fig. 3b

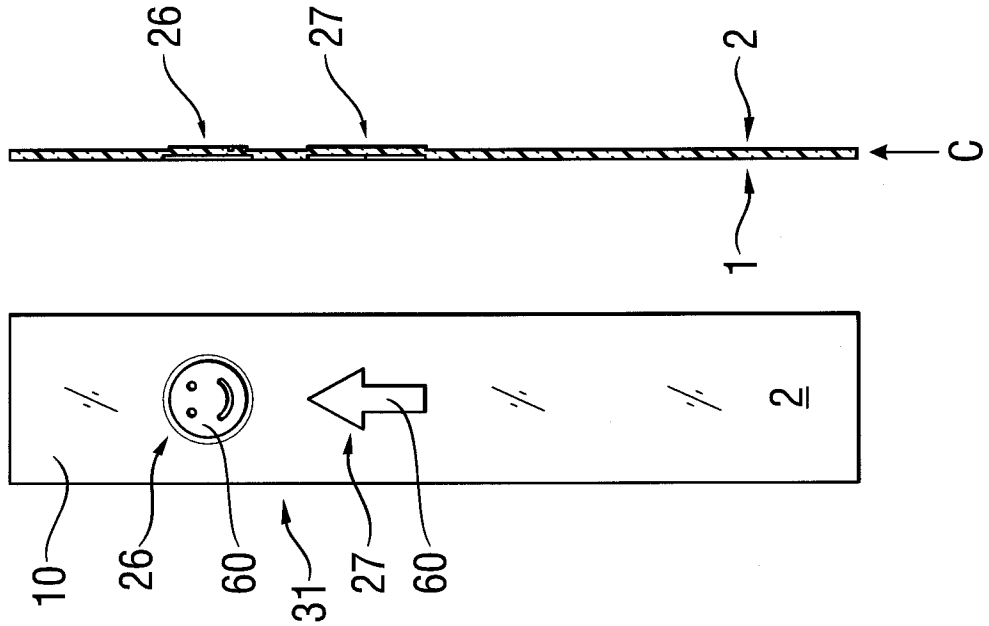


Fig. 3a

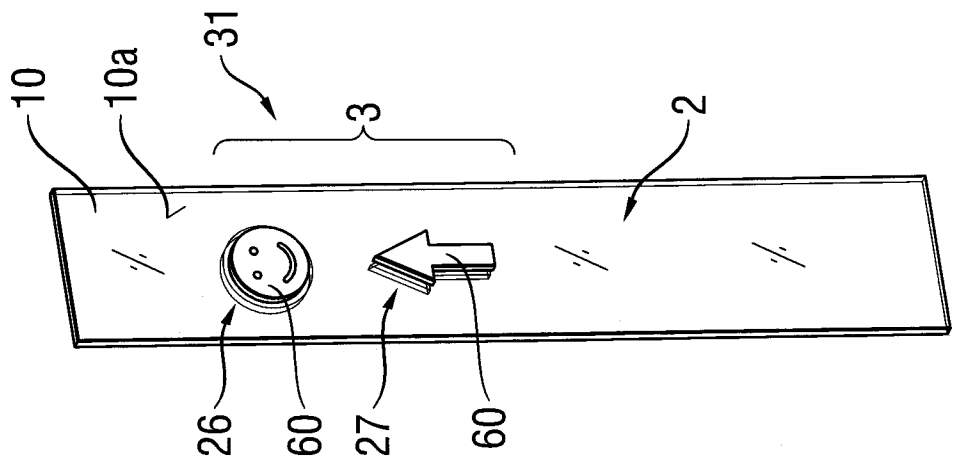


Fig. 4c

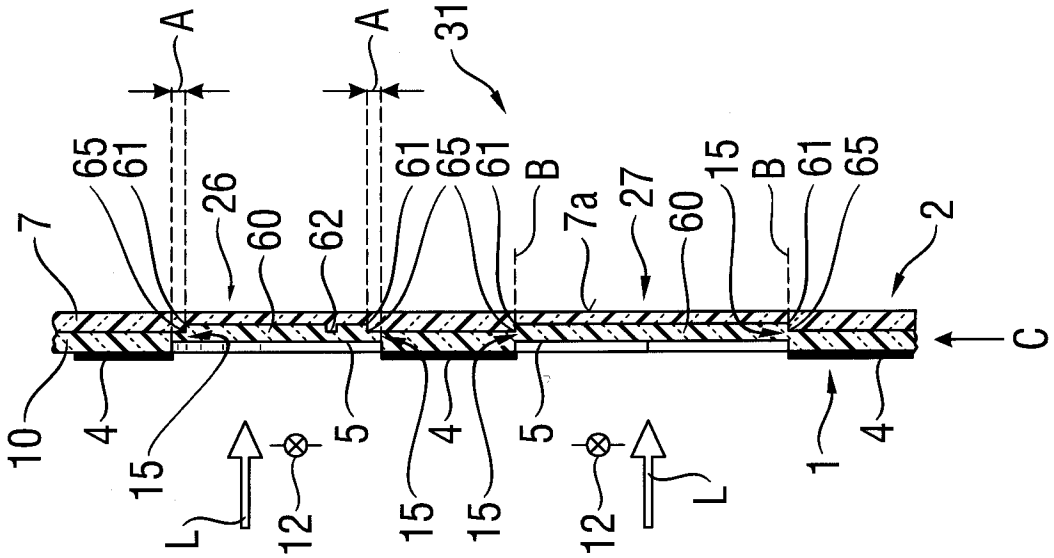


Fig. 4b

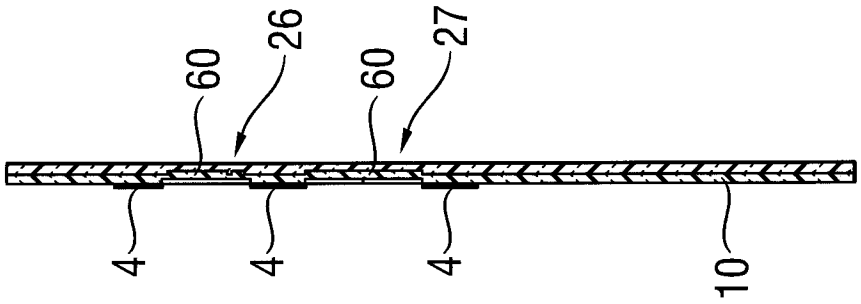
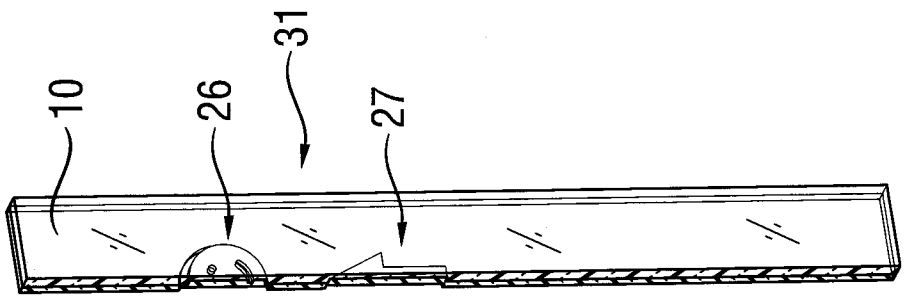


Fig. 4a



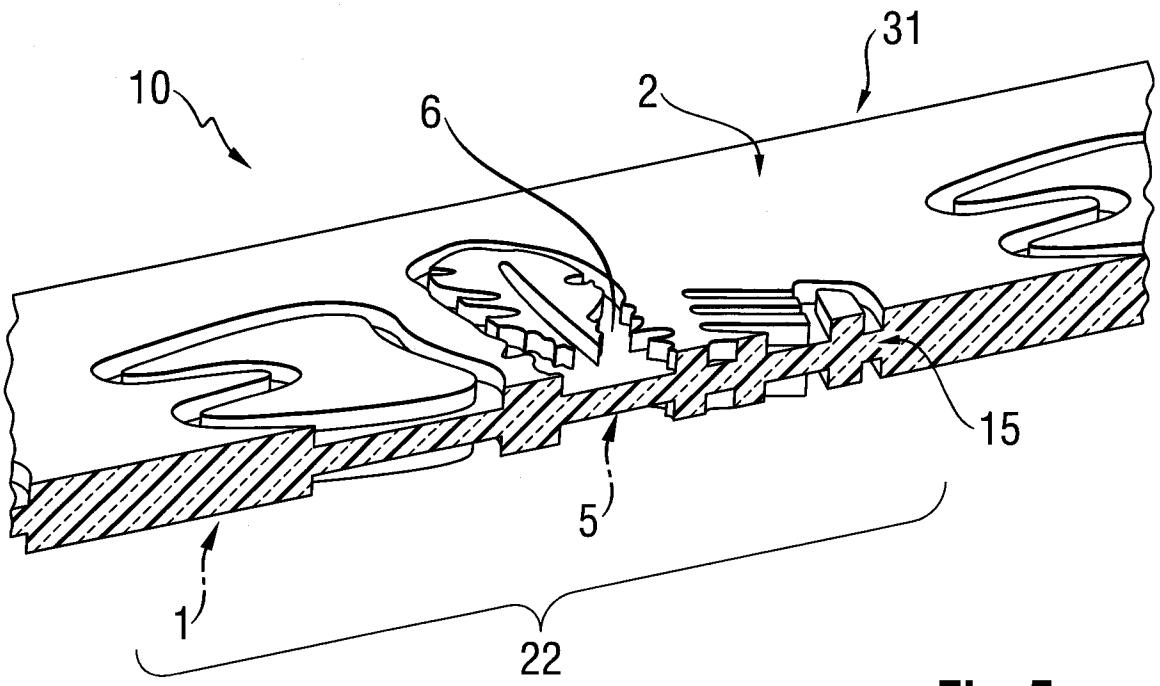


Fig. 5

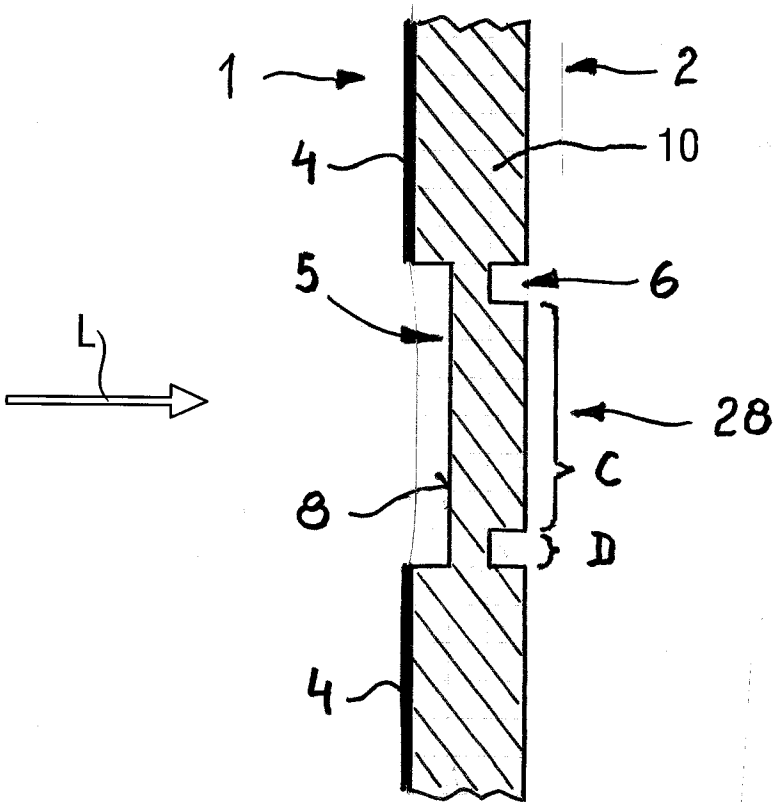


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/054528

A. CLASSIFICATION OF SUBJECT MATTER
INV. G09F13/06 G09F13/08
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G09F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP 1 058 227 A1 (ARTLITE LTD [GB]; LEONIDOU GEORGIOS ANASTASIS [GB]; HAMPSON WILLIAM RO) 6 December 2000 (2000-12-06) the whole document	1-3,5,6, 8-16 4,7,17
Y	US 2006/254702 A1 (EMSLANDER JEFFREY O [US] ET AL) 16 November 2006 (2006-11-16) the whole document	4,17
Y	GB 840 424 A (MACHARG J A) 6 July 1960 (1960-07-06) the whole document	4
Y	EP 0 791 911 A2 (SIEGEL ROBERT INC [US]) 27 August 1997 (1997-08-27) the whole document	4,7

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 November 2010	23/11/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Demoor, Kristoffel

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2010/054528

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