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(54) **LIGHTNING STRUCTURE**

(57) The present invention relates to a lighting structure (1) comprising a frame (2) with at least two support structures (3) and a printed circuit board provided with LED lamps, wherein said lighting structure (1) comprises

at least two supporting profiles (4) for said printed circuit board, wherein at least one supporting profile (4) is detachably attachable to said support structures (3) via at least one fixing element (5).

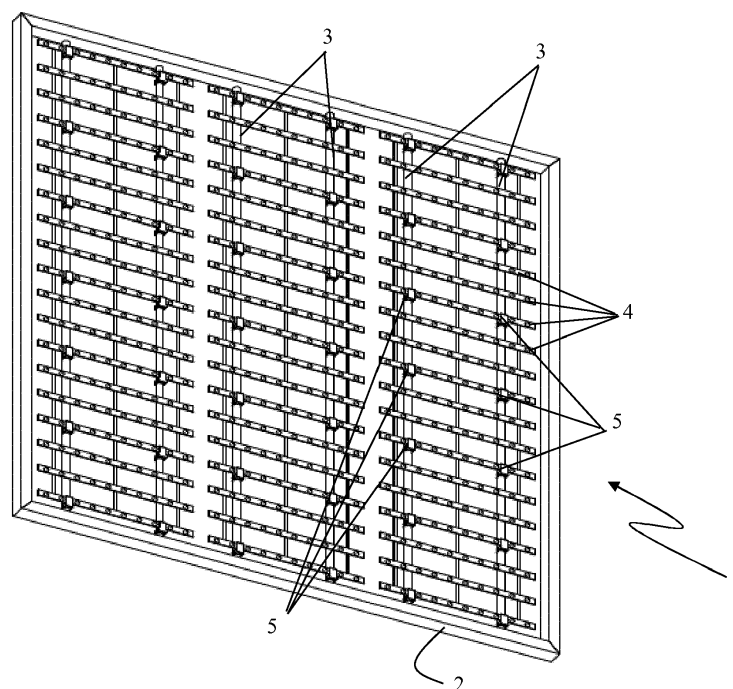


Fig. 1

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Description

[0001] The present invention relates, on the one hand, to a lighting structure comprising a frame with at least two support structures and a printed circuit board provided with LED lamps, wherein said lighting structure comprises at least two supporting profiles for said printed circuit board, wherein at least one supporting profile is detachably attachable to said support structures via at least one fixing element. The present invention relates in particular to a lighting structure which is suitable for commercial purposes, such as a light box, light wall, and the like, for use in for example exhibition stands, as an information panel, interior lighting, (operating) display, etc. On the other hand, the present invention relates to a fixing element suitable for attaching a supporting profile with a printed circuit board provided with LED lamps to a support structure.

[0002] In order to illuminate or light up objects and/or advertising messages on, for example, exhibition stands, so-called light boxes are often used in practice. A light box is generally known, it is a (usually) rectangular structure having at least one transparent side, in which one or several light sources are present. Due to the long service life, availability in various colours, durability and energy efficiency, LED (Light Emitting Diode) lighting means are usually opted for as light source, which are attached to a component of the light box in the form of LED strips. The transparent side, in practice the front panel, is usually a milky white panel or a printed fabric, as a result of which the light produced is distributed evenly in an attractive manner. The transparent surface may be made from milk glass, polycarbonate or another suitable plastic.

[0003] The positioning of the LED strips determines the type of light box, when the LED strips are provided on the rear wall of the light box, this is referred to as a backlight system. Such a light box is described in the international patent publication WO 2008/043025. This publication describes a backlight system comprising several panels. Each panel contains a number of light-emitting diodes (LEDs) which are attached to the panel. The adjacent panels are physically connected to each other by means of a wire.

[0004] The type of light box in which the LED strips are arranged in the edge profiles is known by the term side wall LED lighting. With all types, the LED strips are attached by means of an adhesive or screw connection.

[0005] Both types are used in exhibition stands. However, the light box with background lighting (backlight system) has the drawback that it is transportable with difficulty since the rear wall cannot be folded, due to the lighting. Light boxes in which the LED strips are arranged in the frame profiles are more easily transportable, but in that case the quality of the lighting is significantly lower as the LEDs will light the transparent surface more indirectly.

[0006] Fig. 10 of WO 2008/043025 shows another em-

bodiment of a lighting structure in which supporting profiles provided with LEDs are attached in a groove of a rail structure via fixing elements in the form of a bolt which fits into the groove or in which the groove is adapted to the shape of the foot of the supporting profile. In this way, the supporting profiles may be attached on the rail (support structure) in a manner so as to be displaceable. However, it requires a lot of (installation) time to assemble such a lighting structure.

[0007] It is therefore an object of the present invention to provide a lighting structure which provides excellent lighting and which can easily be fitted and removed.

[0008] The object of the invention is achieved by providing a lighting structure comprising a frame with at least two support structures and a printed circuit board provided with LED lamps, wherein said lighting structure comprises at least two supporting profiles for said printed circuit board, wherein at least one supporting profile is detachably attachable to said support structures via at least one fixing element, wherein said support structures are of tubular design and wherein at least one supporting profile comprises a first and second fixing element provided in order to attach the supporting profile to a first and second support structure, respectively, wherein said fixing elements each comprise a receiving part suitable for receiving a part of a supporting profile and a clamping part suitable for clamping the fixing element to a tubular support structure. By using fixing elements which, on the one hand, will receive a part of the supporting profile with a printed circuit board and, on the other hand, are attachable to the tubular support structures via a clamping connection, the assembly time of such lighting structures is greatly reduced compared to the known systems, as described, inter alia, in WO 2008/043025. The lighting structure may also readily and quickly be disassembled. In addition, far fewer components are required in order to form the lighting structure. Said support structures preferably extend parallel to each other.

[0009] In a first preferred embodiment of the lighting structure according to the invention, the supporting profiles are of elongate design and extend at a distance apart in a direction at right angles to the direction of the support structures. Preferably, the intermediate distance between the various supporting profiles is between 1 cm and 15 cm, in particular, the intermediate distance between the various supporting profiles is between 2 cm and 15 cm, more particularly between 2 and 10 cm.

[0010] By arranging the light source, preferably LED lamps, on supporting profiles which extend at a distance apart and which are detachably connectable to a support structure, a modular system is produced which can readily be installed and uninstalled. Due to the fact that the supporting profiles extend at a certain distance apart, these can easily be rolled up once uninstalled. In addition, the lighting structure is readily reusable.

[0011] In a second preferred embodiment of the lighting structure according to the invention, the supporting profiles are of quadrangular design and extend against

each other. The supporting profiles form separate light modules, as it were, with a quadrangular housing, preferably made of plastic, at least some of the peripheral edges of which are provided with a fixing element. The fixing element is preferably a clamping edge which has a shape which is such that it is accommodable in a support structure in a clamped manner. The modules preferably comprise a wall-shaped part. The printed circuit board with LED lamp, preferably an LED panel which comprises several printed circuit boards with LED strips, is attached to the front side of the wall-shaped part. Optionally, the rear side of the wall-shaped part may be provided with a logo. The module may furthermore comprise a transparent covering element in order to cover the front side of the wall-shaped part. The covering element is preferably formed by a translucent plastic panel, canvas, banner or polyester film. According to the invention, a printed circuit board with LED lamp is opted for as light source in the lighting structure. Such a printed circuit board is known by the term LED strips, such LED strips are produced as a coil (printed circuit tracks) of 1 meter or 5 meters. Every LED strip is provided with electrical connection cables. LED strips are available in warm white, natural white or white as standard. In order to produce several colours, the printed circuit board is provided with RGB LEDs. In a preferred embodiment, instead of using cables to provide power to the LED strips, the LED strips may be provided with power via the tubular support structure. In this case, the fixing elements may be provided with a conducting element so that they form an electrical connection between a printed circuit board provided with LED lamps and electrical conducting means, e.g. semi-insulated conductors (cables), provided in the tubular support structure. The interior of the tubular support structure may optionally be provided with a duct for the respective conducting means.

[0012] LED strips are dimmable, although this would then require an LED strip dimmer. The dimmer is arranged between the LED transformer and the LED strip.

[0013] At their rear side, the LED strips are preferably provided with an adhesive strip. In this way, the LED strip may be attached to the supporting profile. In an alternative embodiment, the LED strip may also be attached to the supporting profile by means of an adhesive, preferably a neutral adhesive.

[0014] The frame of the lighting structure will form the housing of the lighting structure. In a preferred embodiment of the lighting structure according to the invention, the frame comprises a first pair of opposite first and second frame elements which run substantially parallel to each other and extend in a first direction and a second pair of opposite third and fourth frame elements which run substantially parallel to each other and extend in a second direction at right angles to the first direction, wherein said support structures extend along the first or the second direction. The frame elements are preferably of a profile-shaped or panel-shaped design. The frame elements are preferably made from aluminium, steel or

a thermosetting plastic.

[0015] The frame elements may be connected to each other by means of a known connecting system, preferably by means of a bolt connecting system. In this case, preference is given to a method which allows the frame to be installed and uninstalled in a simple manner.

[0016] In a more preferred embodiment of the lighting structure according to the invention, the supporting profiles are made from metal, aluminium or a thermosetting plastic. The supporting profiles and/or frame elements are preferably produced by means of extrusion.

[0017] According to a particular embodiment of the lighting structure according to the present invention, the frame comprises a transparent surface formed by a translucent plastic panel, canvas, banner or polyester film.

[0018] In a more particular embodiment, said support structures are of tubular design. Obviously, the support structures may also be shaped differently, e.g. rectangular. For the sake of saving on materials, the tubular design is often opted for.

[0019] The lighting structure may furthermore also be provided with a control unit for controlling the LED lamps and a switch for switching the LED lamps on or off. In a particular embodiment, the lighting structure comprises a power supply. In an alternative embodiment, the lighting structure has connection cables which allow the structure to be connected to the electricity network.

[0020] Another subject of the present invention is a fixing element suitable for attaching a supporting profile with a printed circuit board provided with LED lamps to a support structure, wherein said fixing element comprises a receiving part suitable for receiving a part of a supporting profile and a clamping part suitable for clamping the fixing element to a support structure. The fixing element is preferably made from plastic.

[0021] In a preferred embodiment, the fixing element comprises a conducting element which is suitable to conduct electricity through the fixing element in order to make it possible to supply power to a printed circuit board provided with LED lamps arranged on a supporting profile by means of the support structure of a lighting structure. The conducting element will preferably conduct electricity to a printed circuit board provided on the supporting profile. As a result thereof, the fixing element will form an electrical connection between a printed circuit board provided with LED lamps and electrical conducting means, e.g. semi-insulated conductors (cables), which are provided in the support structure of the lighting structure. The interior of the support structure may optionally be provided with a duct for the respective conducting means.

[0022] The present invention will now be explained in more detail by means of the following detailed description of a preferred embodiment of a lighting structure and fixing element according to the present invention. The sole aim of this description is to give illustrative examples and to indicate further advantages and features, and can therefore by no means be interpreted as a limitation of the area of application of the invention or of the patent

rights defined in the claims.

[0023] In this detailed description, reference numerals are used to refer to the attached drawings, in which:

- **Fig. 1:** shows a perspective view of a first embodiment of the lighting structure according to the invention;
- **Fig. 2:** shows the arrangement of a first (see Fig. 2.2) and second (see Fig. 2.3) set of supporting profiles with LED strips on tubular support structures of a frame (see Fig. 2.1);
- **Fig. 3:** shows a perspective view of a fixing element according to the invention for attaching a supporting profile with a printed circuit board provided with LED lamps on a tubular support structure;
- **Fig. 4:** shows a perspective view of a second embodiment of the lighting structure according to the invention;
- **Fig. 5:** shows the arrangement of a number of tile-shaped supporting profiles (light modules) (Figs. 5.2 and 5.3) on tubular support structures of a frame (see Fig. 5.1);
- **Fig. 6:** shows a perspective view of the housing of a tile-shaped supporting profile;
- **Fig. 7:** shows the housing illustrated in Fig. 6 provided with an LED panel;
- **Fig. 8:** shows the rear side of a tile-shaped supporting profile on which the fixing elements for attaching to a tubular support structure are visible;
- **Fig. 9:** shows a perspective view of an alternative fixing element for attaching a supporting profile to a tubular support structure, which is provided with a conducting element in order to conduct electricity to a printed circuit board provided on the supporting profile.

[0024] Fig. 1 shows a first possible embodiment of the LED lighting structure (1) according to the invention. The lighting structure (1) comprises, on the one hand, a number of supporting profiles (4) which extend at a distance apart of approximately 2 to 15 cm, preferably 8 cm, are elongate in design and to which an LED strip is attached. The LED strip may be attached to the supporting profiles (4) by means of either a permanent connection, e.g. via an adhesive connection, or a detachable connection, e.g. screws, velcro, etc. On the other hand, the lighting structure (1) comprises a frame-like frame (2) which, as Fig. 2.1 shows, is composed of two horizontally extending frame elements (6a and 6b) and two vertically extending frame elements (6c and 6d). Support structures (3) are fitted between the frame elements. In the illustrated embodiment, the support structures (3) are fitted vertically. It goes without saying that different configurations, e.g. horizontally fitted support structures (3), or differently constructed frames are also covered by the scope of protection of the present invention.

[0025] According to the present invention, at least one supporting profile (4) is detachably attachable to said

support structures via at least one fixing element (5). In the illustrated lighting structures (1), a number of supporting profiles (4) comprise a first and second fixing element (5) provided in order to attach the supporting profile (4) to a first and second support structure (3), respectively. As the supporting profiles are relatively lightweight, it suffices if one in every three successive supporting profiles (4) is provided with fixing elements (5). As shown in Fig. 3, the fixing elements (5) have a receiving part (7) suitable for receiving a part of a supporting profile (4) and a clamping part (8) suitable for clamping the fixing element (5) to a support structure (3). Fig. 3 shows a preferred embodiment of the fixing element (5). A fixing element (5) which is configured in this way will be attached to the support structure by means of clamping.

[0026] Due to the fact that the various supporting profiles extend at a distance apart, the various supporting profiles form an assembly which can easily be rolled up, which is obviously space-saving during transportation. In the non-attached state, the various supporting profiles (4) of one set (assembly) are only connected to each other by means of the electrical cabling which provides electricity to the various LED strips on the supporting profiles (4).

[0027] In order to power the LED strips, these may, in an alternative embodiment, be supplied with electricity via the support structures. To this end, alternative fixing elements (5) as illustrated in Fig. 9 have been developed which form the connection between a printed circuit board provided with LED lamps and an adapted (tubular) support structure in which conductors run. The fixing elements (5) are provided with a conducting element (contact) so that electricity can be conducted to the printed circuit board through the contact in the fixing element via a screw connection between the printed circuit board with the LED lamps and the fixing element. The support structure is preferably an extruded profile made of aluminium and provided with semi-insulated conductors. Every printed circuit board has at least two fixing elements (5) with contacts which are arranged at 180° opposite one another in order thus to achieve a polarity for each of the support structures.

[0028] The relatively simple construction of the frame (2) together with the simple securing arrangement ensures that the lighting structure (1) according to the invention can be installed and uninstalled in a simple manner. In addition, the lighting structure will only take up a relatively small space after it has been uninstalled, as a result of which the transport costs will also be reduced.

[0029] Figs. 2.1 to 2.3 explain how a lighting structure (1) as illustrated in Fig. 1 may be constructed. Firstly, the frame, composed of a first pair (6a and 6b) of opposite first (6a) and second (6b) frame elements which run substantially parallel to each other and extend horizontally and a second pair (6c and 6d) of opposite third (6c) and fourth (6d) frame elements which run substantially parallel to each other and extend vertically. A number of sets, in each case consisting of two tubular elements,

(support structures (3)) is fitted between the horizontally extending frame elements (6a, 6b). To this end, the horizontally extending frame elements may be provided with a holder element suitable for receiving a support structure. Then, as can be seen in Fig. 2.2, a first series (set) of supporting profiles provided with a printed circuit board provided with LED lamps, a so-called LED strip, is attached to the two support structures (3) by means of fixing elements (5) which are provided on the first, fourth, seventh, etc. supporting profile (4).

[0030] Subsequently, a second series of supporting profiles (4) with LED strips is attached to the next set of support structures (3). A third series (set) of supporting profiles (4) with LED strips may also be attached.

[0031] The produced structure may, at its front side, furthermore be provided with a transparent surface made from a translucent plastic panel, canvas, banner or polyester film. The transparent surface may be provided with an advertising message. This may be achieved by printing on the transparent surface (screen printing), arranging a sticker or adhesive letters on the transparent surface, etc.

[0032] In a second preferred embodiment of the lighting structure (1) according to the invention which is illustrated in Figs. 4 and 5, the supporting profiles (4) are of quadrangular design and extend against each other. The supporting profiles form separate light modules, as it were (denoted by reference numeral 9) with a quadrangular or rectangular housing, preferably made from plastic. In order to produce the connection with the support structures (3), at least some of the peripheral edges are provided with a fixing element. In order to connect them to the support structures, the fixing elements (5) may be fitted on the rear side of the supporting profile in a distributed manner, as is illustrated in Fig. 8. The fixing element (5) is preferably a clamping edge which is shaped in such a manner that it is receivable in a tubular support structure in a clamping manner.

[0033] As can be seen in Fig. 6, the separate modules (9) preferably comprise a wall-shaped part (12). The printed circuit board with LED lamp, preferably an LED panel (10) which is composed of several printed circuit boards with LED strips is attached to the front side of the wall-shaped part (12) (see Fig. 7). The rear side of the wall-shaped part may optionally be provided with a logo. The module may furthermore comprise a transparent covering element (not shown) in order to cover the front side of the wall-shaped part (12). The covering element is preferably formed by a translucent plastic panel, canvas, banner or polyester film.

[0034] Figs. 5.1 to 5.3 explain how a lighting structure (1), such as illustrated in Fig. 4, may be constructed. Firstly, the frame, composed of a first pair (6a and 6b) of opposite first (6a) and second (6b) frame elements which run substantially parallel to each other and extend horizontally and a second pair (6c and 6d) of opposite third (6c) and fourth (6d) frame elements which run substantially parallel to each other and extend vertically. A

number of sets, in each case consisting of two tubular elements, (support structures (3)) is fitted between the horizontally extending frame elements (6a, 6b). To this end, the horizontally extending frame elements may be provided with a holder element suitable for receiving a support structure. Then, as can be seen in Figs. 5.2 and 5.3, a number of tile-shaped supporting profiles, in particular light modules (9) provided with an LED panel (10), are attached to the two support structures (3) by means of their clamping edge (11) or, as is illustrated in Fig. 8, by means of fixing elements (5).

[0035] The lighting structure (1) according to the present invention will be available as a light box, light wall, channel letter or light line, has a high degree of reliability and is suitable for use for advertising purposes.

Claims

1. Lighting structure (1) comprising a frame (2) with at least two support structures (3) and a printed circuit board provided with LED lamps, wherein said lighting structure (1) comprises at least two supporting profiles (4) for said printed circuit board, wherein at least one supporting profile (4) is detachably attachable to said support structures (3) via at least one fixing element (5), **characterized in that** said support structures (3) are of tubular design, and **in that** at least one supporting profile (4) comprises a first and second fixing element (5) provided in order to attach the supporting profile (4) to a first and second support structure (3), respectively, wherein said fixing elements (5) each comprise a receiving part (7) suitable for receiving a part of a supporting profile (4) and a clamping part (8) suitable for clamping the fixing element (5) to a tubular support structure (3).
2. Lighting structure (1) according to Claim 1, **characterized in that** the supporting profiles (4) are of elongate design and extend at a distance apart in a direction at right angles to the direction of the support structures (3).
3. Lighting structure (1) according to Claim 2, **characterized in that** the intermediate distance between the various supporting profiles (4) is between 1 cm and 15 cm.
4. Lighting structure (1) according to Claim 1, **characterized in that** the supporting profiles are of quadrangular design and extend against each other.
5. Lighting structure according to any of the preceding claims, **characterized in that** the frame (2) comprises a first pair (6a,6b) of opposite first (6a) and second (6b) frame elements which run substantially parallel to each other and extend in a first direction and a second pair (6c,6d) of opposite third (6c) and fourth

(6d) frame elements which run substantially parallel to each other and extend in a second direction at right angles to the first direction, wherein said support structures (3) extend along the first or the second direction.

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6. Lighting structure (1) according to Claim 5, **characterized in that** the frame elements (6a,6b;6c,6d) are of a profile-shaped or panel-shaped design.

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7. Lighting structure (1) according to any of the preceding claims, **characterized in that** the supporting profiles (4) are made from metal, aluminium or a thermosetting plastic.

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8. Lighting structure (1) according to any of the preceding claims, **characterized in that** the frame (2) comprises a transparent surface formed by a translucent plastic panel, canvas, banner or polyester film.

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9. Lighting structure (1) according to any of the preceding claims, **characterized in that** the printed circuit board provided with LED lamps is connected to the supporting profile (4) via an adhesive connection, screw connection or velcro connection.

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10. Fixing element (5) suitable for attaching a supporting profile (4) with a printed circuit board provided with LED lamps to a support structure (3), wherein said fixing element (5) comprises a receiving part (7) suitable for receiving a part of a supporting profile (4) and a clamping part (8) suitable for clamping the fixing element (5) to a support structure (3).

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11. Fixing element (5) according to Claim 10, **characterized in that** said fixing element (5) comprises a conducting element which is suitable to conduct electricity through the fixing element.

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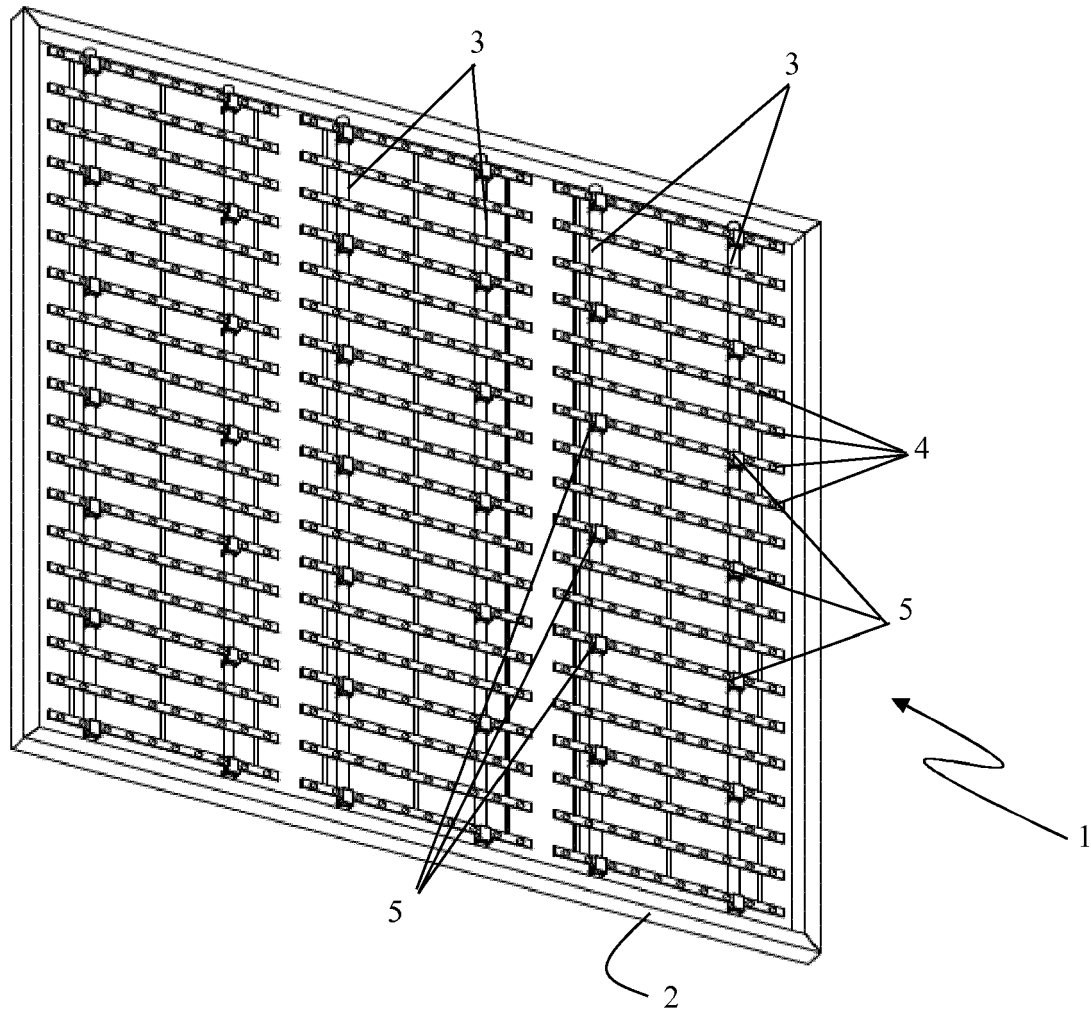


Fig. 1

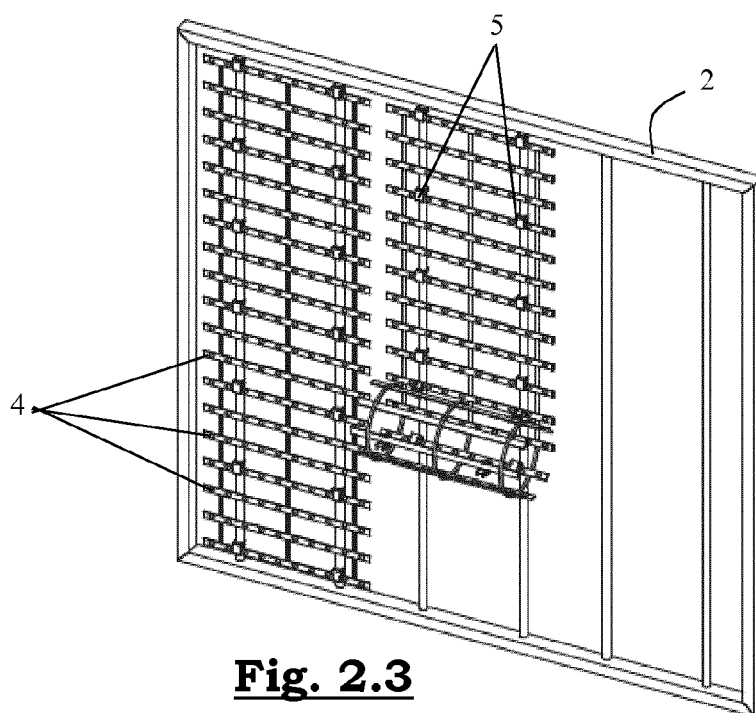
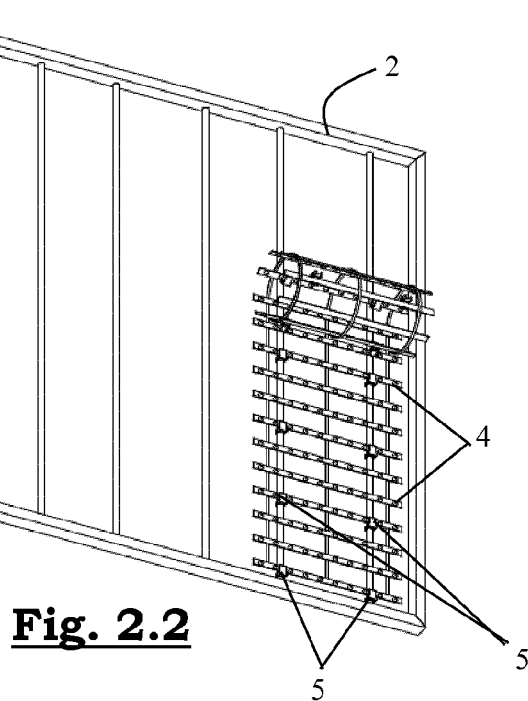
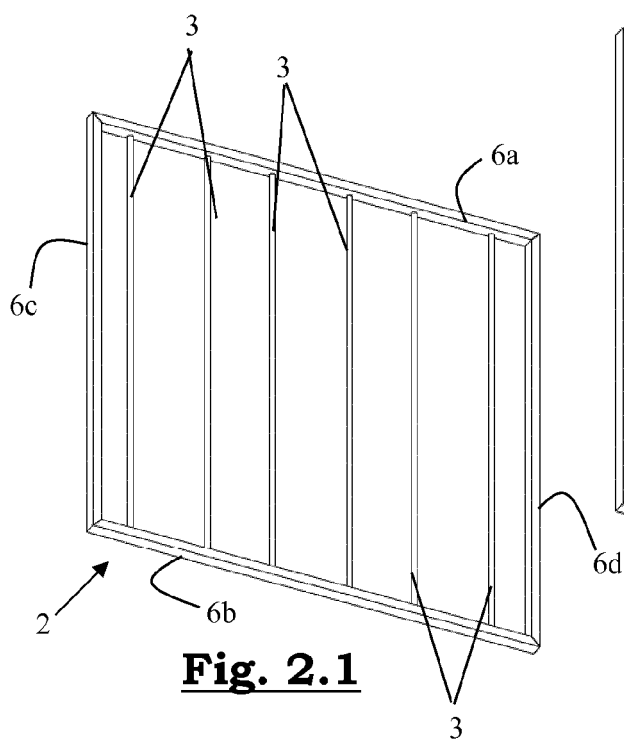
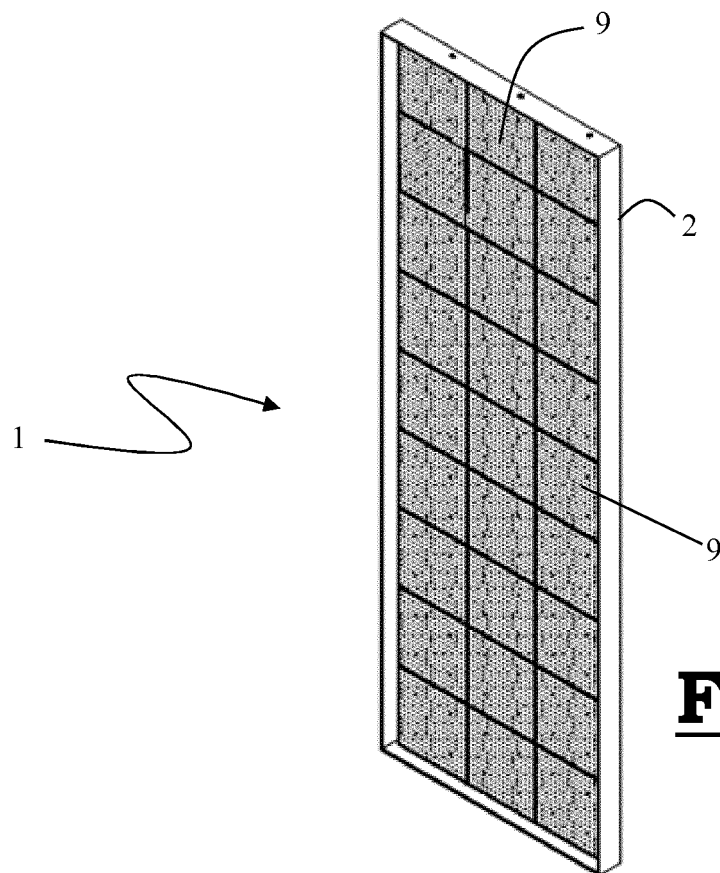
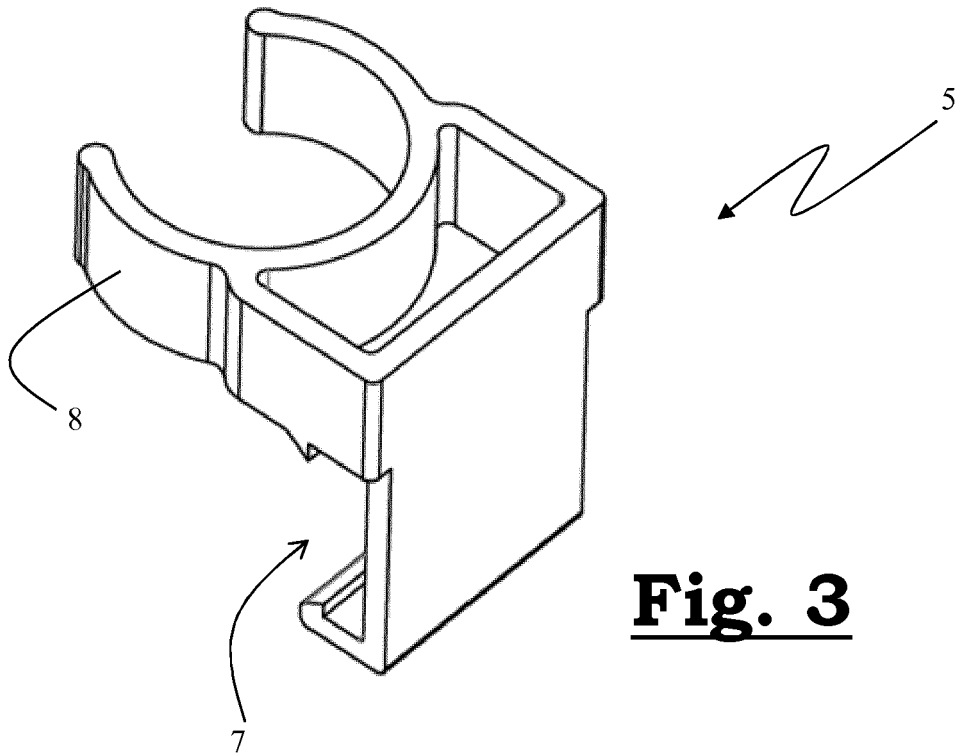


Fig. 2



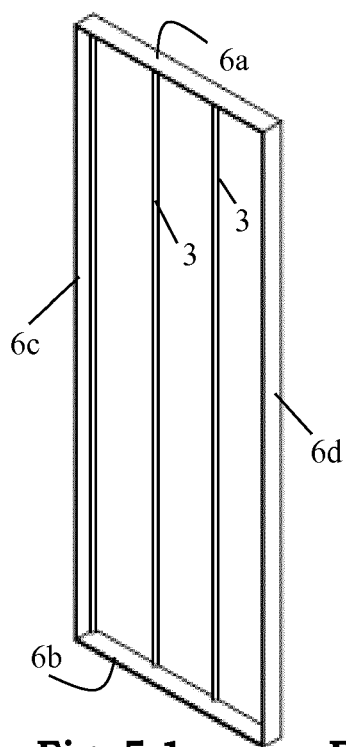


Fig. 5.1

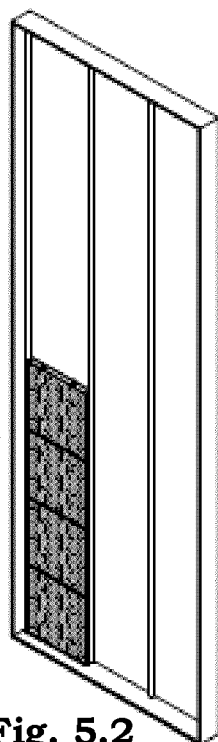


Fig. 5.2

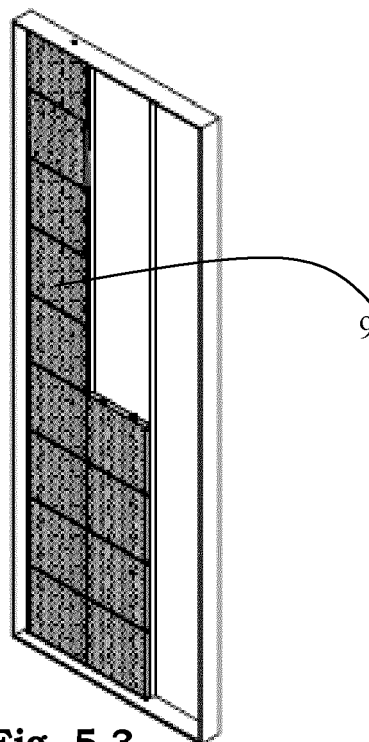


Fig. 5.3

Fig. 5

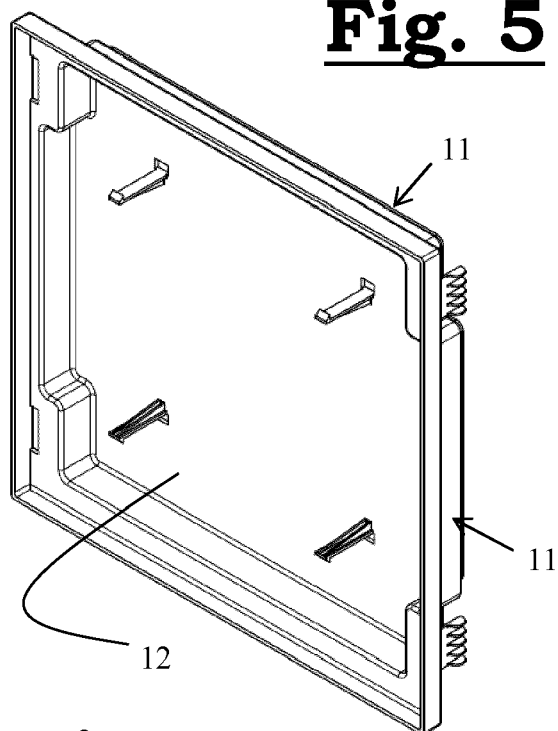


Fig. 6

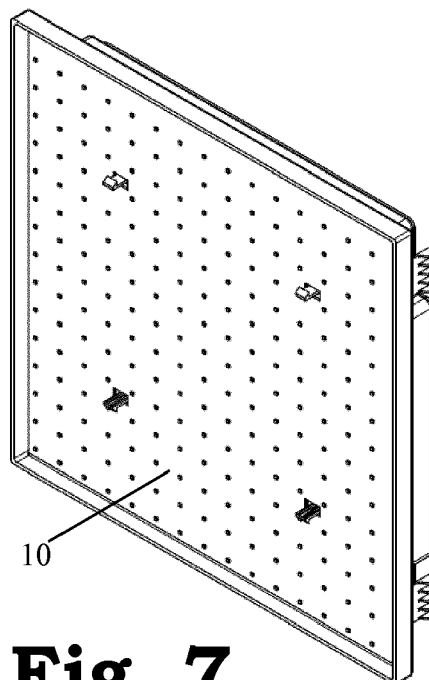


Fig. 7

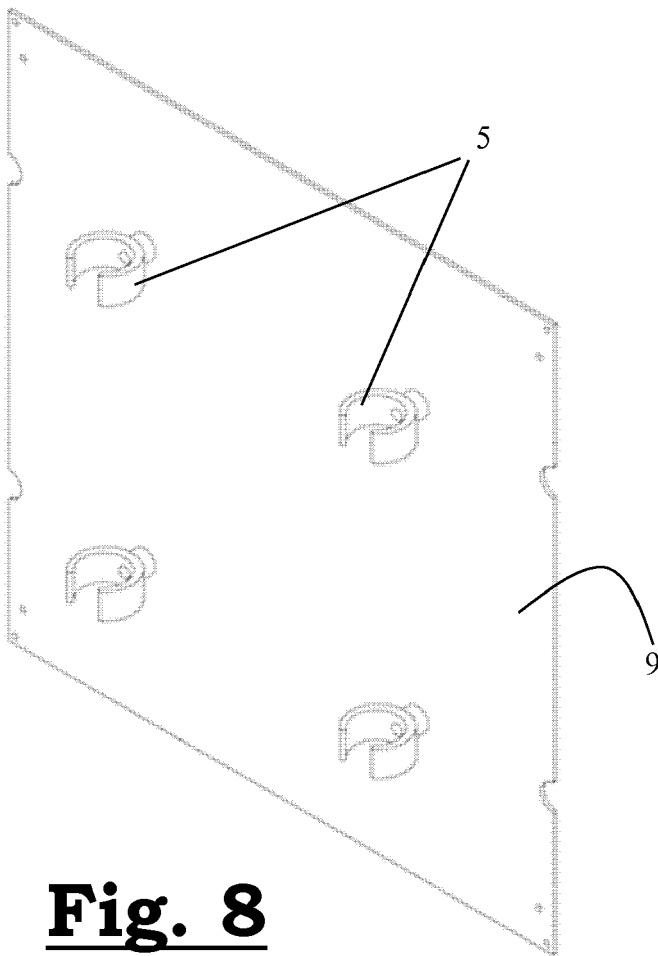


Fig. 8

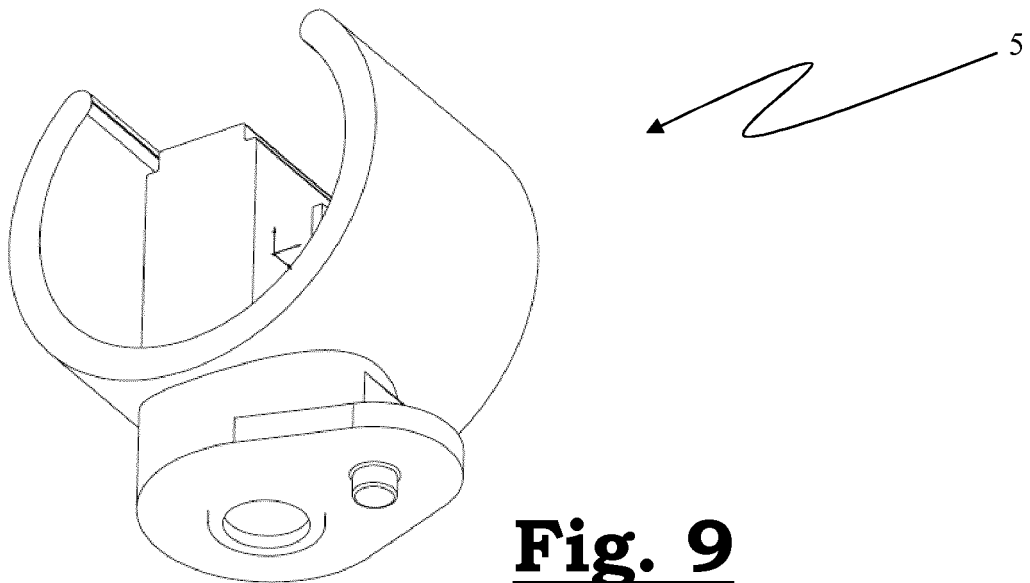


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 19 17 3098

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 September 2019	Examiner Zanna, Argini
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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Patent documents cited in the description

- WO 2008043025 A [0003] [0006] [0008]