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

(11) **EP 2 793 208 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.10.2014 Bulletin 2014/43

(51) Int Cl.:
G09F 13/04 *(2006.01)*

(21) Application number: **13164380.1**

(22) Date of filing: **18.04.2013**

(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

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(54) **Light box and metal profile for the light box**

(57) A light box comprising of a closed frame assembled from metal profiles, whereas the front panel and back panel are fastened to the frame. The front panel is at least partially translucent. The ends of at least two metal profiles are connected to each other with a bracket, which has two branches and the ends of at least two metal profiles are connected to each other with metal screws. The cross-section of the metal profile is designed so that one edge of the metal profile is provided with a groove for fastening of the front surface. At least one connecting element of the bracket is protruding from the inner side of the metal profile, the cross-section of which is designed so that it has an opening, in which a branch of the bracket is inserted, whereas the opening is dimensioned so that the shape and size of the opening are approximately the same as the shape of the cross-section and size of the branch of the bracket and the cross-section of the groove and the cross-section of the opening are provided with generally circular-shaped screw openings, used for driving in metal screws when the metal profiles are connected to one another.

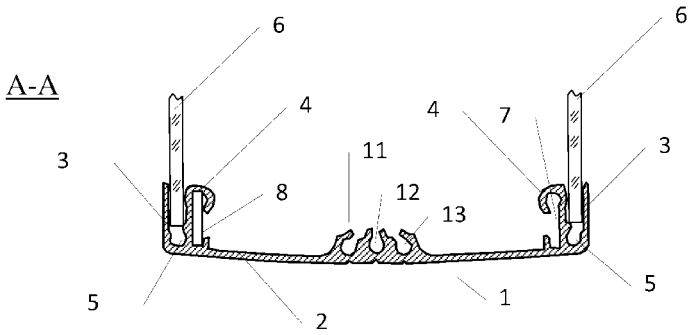

Fig 4

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Description

Technical Field

[0001] The invention relates to metal profiles, in particular to aluminium profiles and products manufactured thereof, in particular to metal profiles suitable to be used for manufacturing light boxes, information boxes and advertising boxes and to connecting systems thereof and to the light boxes, information boxes and advertising boxes manufactured of these.

Background Art

[0002] Known is manufacturing of external borders made of extruded aluminium profiles, PVC profiles and sheet metal profiles. Elements manufactured of extruded aluminium profiles are connected to each other by means of welding, pressing of corners together or with screws. Elements made of PVC profiles are connected by means of welding or a corner element. Elements made of sheet metal profiles are connected by means of welding or they are fastened on the supporting structure.

[0003] Known are various light boxes, information boxes and advertising boxes (hereinafter together as light boxes) used for displaying advertisements, route instructions and other information, also as interior elements in a city or public room (as lighting fixtures). Such light boxes consist of a frame assembled from metal profiles and one or two panels, which may be provided with informative or advertising message (or may also be left empty), whereas this panel is made of transparent or translucent material. In the light box there may be one or several suitable light sources.

[0004] For decades neon or daylight tubes have been used as light sources in light boxes. A daylight tube and neon tube are with a round cross-section and they light the surrounding equally in all directions in relation to the longitudinal axis of the tube. Use of light sources formed of light emitting diodes (LEDs) for lighting light boxes is also known.

[0005] Forming of a light source from power LEDs, for instance 1 W Power LEDs is known. A light source design, where LEDs are installed on an aluminium profile, which functions simultaneously as a supporting structure and a radiator is known (see http://www.leds.de/en/LED-strips-modules-oxid-oxid-oxid-oxid-oxid/High-power-LED-strips/Aluminium-case-set-600mm.html). More powerful LEDs require proper cooling, without which the good properties thereof disappear quickly.

[0006] There is a need for a metal profile for manufacturing light boxes, and a method for connecting of such metal profiles, which would simplify assembly of light boxes, reduce manufacturing time, exclude the necessity to use expensive equipment or engage specialists with specific skills, would have aesthetic appearance and would be suitable to be used with light sources made of LEDs while providing excellent cooling of LEDs.

Summary of invention

[0007] The metal profile for light boxes according to the invention is preferably manufactured by means of extrusion from a suitable metal or metal alloy, preferably from aluminium or aluminium alloys and the cross-section thereof is designed so that the ends of the two metal profiles can be easily connected with at a suitable angle (typically right angle) either with metal screws or with a special bracket or with both at the same time.

[0008] Typically the overall shape of the cross-section of the metal profile is U-, L-or E-shaped. A metal profile has a thin base, from the inner side of which there is at least one connecting element protruding for a bracket. In this patent application the inner side is understood as the side of the base of the metal profile, which remains inside of the light box during manufacturing of the light box made of metal profile and the outer side is understood as the side that remains outside of the light box. The cross-section of the connecting element is designed so that there is an opening for a branch of the bracket. The opening is designed and dimensioned according to the shape of the branch of the bracket and according to its size so, that the branch fits exactly or with a slight tension in the opening. In the preferred embodiment of the invention the overall shape of the cross-section of the connecting element is roughly in the shape of the letter J and the end of the longer branch is connected to the base of the metal profile so that an opening for a branch of the bracket is formed between the shorter branch of the J-shaped element and the base. In addition the base can be provided with an additional element protruding in the direction of the short branch for better fastening of the branch of the bracket in the opening of the connecting element. The claimed connecting element allows quick connecting of metal profiles to each other by means of a bracket. The branches of the bracket are fastened so that one branch is fastened on one metal profile and another branch to another metal profile with metal screws for instance.

[0009] A connecting element for the bracket is preferably designed so that the short branch of the J-shape of the cross-section forms an arch following the circle, forming a screw opening suitable for driving a metal screw. In such a way metal profiles can also be connected to each other by means of metal screws (which are driven via an opening drilled through one base of the metal profile through screw openings of the other metal profile). In the preferred version there is a decorative groove in the back panel of the base of the metal profile, the location of which indicates a suitable location for an opening of the metal screw in relation to the longitudinal axis of the metal profile. The decorative groove also helps to fix the position of the drill end in the base of the metal profile during drilling of the opening for a metal screw.

[0010] The other edge of the metal profile can be provided with another connecting element for the other bracket (in this case the metal profile can be axisymmet-

rical).

[0011] The metal profile is also provided with a suitable connecting element, for instance a groove or a depression for fastening the front panel of the light box. The front panel is made of glass, plastic or other suitable material, of which at least some part is relatively translucent. A similar connecting element groove may also be provided for fastening of the back panel of the light box. Similarly to the front panel also the back panel may be made of material, which is relatively translucent. The back panel may also be made of some other kind of sheet material (including non-translucent), for instance sheet metal. Or for fastening of the back panel there may be an edge protruding from the base of the metal profile, on which the rear panel can be fastened with metal screws or bolts.

[0012] In the central part of the metal profile there may be suitable connecting elements for fastening of a light source, for instance a neon tube, daylight tube or preferably a light source consisting of LEDs. LEDs of the LED light source may also be power LEDs (for instance 1W POWER LEDs or SMD LEDs), which are installed on a radiator-base. Radiator-bases are made of suitable metal, for instance aluminium or aluminium alloy and the cross-section of the radiator-base is designed so, that it fits with the grooves in the central part of the metal profile. The grooves are also used for arranging power cables of LEDs. The diameter of the grooves is chosen so, that a metal screw can be inserted in one end of the grooves.

[0013] Also the cross-section of the connecting element of the front and back panel - a groove or depression - is preferably designed so that a part of the cross-section of the groove follows the circle. The cross-section is dimensioned so, that a metal screw for connecting one metal profile to another (or other objects) can be driven in the formed opening.

[0014] According to one version of the invention the cross-section of the metal profile is axisymmetrical and is provided with a groove for fastening the front panel of the light box, a connecting element of a bracket, a connecting element of a light source (grooves for the radiator-base of the LED light source), another connecting element for a bracket and a groove for fastening the rear panel.

[0015] According to the other version of the invention the cross-section of the metal profile is not symmetrical in relation to the axis and it is provided with a groove for fastening the front panel of the light box, a fastening element of the bracket and a connecting element of the back panel of the light box, which can be a strip arranged crosswise to the base, the width of which is chosen so that a rear panel of the light box can be fastened on it by appropriate means - for instance metal screws. In the second version of the invention the width of the metal profile is preferably half of the width of the first version of the invention, enabling the light box to be assembled with two metal profiles specified in the second version, which are arranged next to one another, instead of one metal profile specified in the first version. The metal profile specified in the second version also suits for manufacturing of a slimmer light box.

[0016] As a LED light source also the so called LED light panel (a radiator made of sheet metal with LEDs arranged in a matrix shape) can be used, which is suitable to be fastened on a strip located crosswise to the base.

[0017] The objective of the invention is also achieved with a light box, which is provided with metal profiles as per the first version, whereas the metal profiles are connected to each other so that they form a frame and at least some part of the front panel of the light box is made of translucent material and there is at least one light source in the light box. At least one metal profile of the light box is connected to a bracket of another metal profile, one branch of which is fastened in an opening of the connecting element of the metal profile and the other branch is inserted in the opening of the connecting element of the other metal profile. The light source is preferably a light source made of LEDs. According to one version a light source consists of a radiator-base, on which a LED with a plate-radiator is fastened and which is fixed on a radiator-base by means of a snap catch, whereas there are fixing rails in the lower part of the radiator-base, the shape of which is adjusted to the shape of the fixing rails of the metal profile. Also at least one metal profile of the light box is connected to the other metal profile with metal screws, which are driven in the openings and screw seats in the grooves.

[0018] The objective of the invention is also achieved with a light box that is made of metal profiles specified in the first and second versions, whereas the width of the metal profiles specified in the second version is half of the width of metal profiles specified in the first version and during assembly of the light box the two narrower metal profiles are placed next to one another. At least one of the narrower metal profiles is fastened with metal screws, which allows easier opening of the light box for maintenance and repair works for instance.

[0019] The objective of the invention is also achieved with a light box that is assembled with the metal profiles specified in the second version, which compared to the previous light boxes is twice as thin. In such light box a LED light panel is preferably used as a light source, which also functions as a back panel of the light box.

Brief description of drawings

[0020]

Fig. 1 depicts a front view of the profile of the light box, whereas the light box is assembled by means of metal profile according to the invention.

Fig. 2 depicts a side view of the light box depicted in Fig. 1.

Fig. 3 depicts a local cross-section of a corner connection of a metal profile.

Fig. 4 depicts a cross-section A-A of a metal profile

marked in Fig. 3.

Fig. 5 depicts the metal profile according to the invention with a radiator-base of LEDs fastened to it.

Fig. 6 depicts an isometric view of the radiator-base.

Fig. 7 depicts a top-view of the LED light source assembled on the radiator-base.

Fig. 8 depicts a cross-section B-B of the LED light source marked in Fig. 7.

Fig. 9 depicts an isometric view of a snap catch of the LED light source.

Fig. 10 depicts a side view of LED used in the LED light source.

Fig. 11 depicts a top-view of LED depicted in Fig. 10.

Fig. 12 depicts an end view of the metal profile according to the invention specified in the second embodiment of the invention.

Fig. 13 depicts one use example of a metal profile depicted in Fig. 12.

Fig. 14 depicts an example of connecting of the metal profiles with screws.

Fig. 15 explains connecting of the metal profiles with screws.

Fig. 16 explains connecting of the metal profiles with a bracket.

Fig. 17 depicts one of the methods of connecting of a metal profile to a wall or other object.

Description of embodiments

[0021] The light box 10 made of metal profiles according to the invention is depicted in Fig. 1 (front view) and Fig. 2 (side view).

[0022] In the given patent application a term "light box" means an information box and advertising box with or without an internal light source and also boxes functioning as a lighting fixture. A light box made according to the first model of invention is made of four metal profiles 1, which are connected to each other so that they form a frame. The light box has a front panel 6, which can be made of glass, frosted glass, plastic and sheet metal for instance. The front panel can be provided with information (advertising text, route instructions, etc.) by means of a suitable method. The light box can be provided with at least one light source.

[0023] A more detailed view of the local cross-section of the corner of the light box is depicted on Fig. 3. Fig. 4 depicts a cross-section A-A of a metal profile marked in Fig. 3. The base of the cross-section of the metal profile is slightly curved. One end of the base is provided with two longitudinal strips 3 and 4 running along the profile. A groove 5 formed in between is meant for fastening the front panel 6 of the light box. The shape of the strip 4 is such, that another groove 7 is formed from the strip along the longitudinal axis of the profile. The groove 7 is provided with a bracket 8 the branches of which are fastened on metal profiles with metal screws (preferably 3 screws per branch).

[0024] There are grooves 11, 12 and 13 in the central part of the profile that can be used for arranging power cables of the light source. Tabs 14, 15, 16 and 17 forming the grooves (see Fig. 5) are formed and dimensioned so that a suitable light source can be fastened there. According to the embodiment of invention it is a LED light source with a special radiator-base 17. The connection is depicted in Fig. 5 and an isometric view of the radiator-base 17 is depicted in Fig. 6. In the lower part of the radiator-base there are fixing rails 18 with a suitable shape, the shape of which matches the shape of tabs 14-17 forming grooves 11-13 on the metal profile. For fastening of the radiator-base the radiator-base is pushed along the grooves to the desired position. The radiator-base is made of suitable metal, for instance aluminium or metal alloy, for instance aluminium alloy.

[0025] For a specialist of the field it is obvious that together with the light box also other light sources of different types may be used. An important benefit of LED light sources is that the metal profiles of a light box function as an additional radiator and thus ensure excellent cooling of LEDs.

[0026] Fig. 7 depicts a design of one LED light source to be used with a metal profile and radiator-base, which according to the given example consists of three LED units 20. For a specialist of the field it is obvious that a LED light source may consist of one up to several LED units. A design of a LED unit is depicted in Fig. 8. A LED unit consists of a snap catch 25 (see Fig. 9) and LED 21, which is equipped with a dome of a light emitting element 22, housing 23 and a sheet radiator 24 (see Fig. 10 and Fig. 11). The function of a snap catch is to apply additional pressure to the sheet radiator of the LED to press it against the radiator-base. The snap catch is fastened to the radiator-base by means of a snap connection. The space between the radiator-base and snap catch 25 can be filled with a suitable filling material 26, which makes the light source more water tight and dust proof.

[0027] Fig. 12 depicts another embodiment of the invention of the metal profile according to the invention, which is not symmetrical in relation to the axis. Such metal profile suits for manufacturing of a one-sided light box. Similar to the wider metal profile 1, the metal profile 27 is provided with strips 3 and 4, which form the first groove 5 for fastening of the front panel 6. The strip 4 is also designed so that a groove 7 is formed for the branch of the bracket. Grooves 5 and 7 are designed so that they form a screw opening 29. On another edge of the metal profile there is a strip 31 located crosswise with the base, which functions as a connecting element of the rear panel. The width of the strip is chosen so, that it is possible to fasten the back panel of the light box to it by using a suitable method - for instance metal screws. Close to the strip near the base of the metal profile there is a screw opening 29.

[0028] Compared to the metal profile 1 depicted in Fig. 1 and Fig. 4 the metal profile 27 of the second embodiment of the invention is preferably made twice as narrow. This enables two narrow metal profiles arranged next to

one another to be used instead of one wider metal profile (see Fig. 13). The metal profiles arranged next to each other are connected to each other with a strip 34 placed in a slot 30 available in both metal profiles. One end of one of the metal profiles 27 is fastened to the metal profile 1 with metal screws, which allows quick opening of the light box for maintenance for instance.

[0029] A suitable light source, for instance a LED light panel, can be fastened on a strip 31 by using a suitable method, metal screws for instance.

[0030] To fasten the metal profile specified in the second model of invention to another metal profile it is also possible to use a solution with a bracket as depicted on Fig. 3. To connect the narrow or wide metal profile also an alternative solution depicted in Fig. 14 may be used. According to this two profiles are connected to each other with metal screws 28. To facilitate driving of screws the shape of grooves 5, 7, 11, 12 and 13 is chosen such that the cross-sections of elements 29 thereof are round.

[0031] Fig. 15 and 16 depict an embodiment of the invention of a bracket connection with screws 28 and a bracket 8. For fastening with screws holes 32 are drilled in the base of the metal profile and screws 28 are driven in the screw openings 29. Openings 32 are drilled with a special device, whereas the location of the openings is preferably chosen so that the same device can be used for both metal profiles (in case of an embodiment depicted on Fig. 15, the location of screws on the two metal profiles is shifted in relation to each other). To simplify finding of the proper place of the screw openings 29 but also to fix the position of the drill tip, there are decorative grooves 33 on the outer side of the metal profile. When a bracket is used, a branch of the bracket is placed in the groove 7, which fixes immediately the correct position of the metal profiles in relation to each other. The bracket is fastened to the metal profiles with metal screws through openings 35 in the branches.

[0032] Fig. 17 depicts a bracket 36 suitable to be fastened on a wall of the metal profile 1 or a side of a similar object 37, the surface of which fits with the shape of the base 2 of the metal profile 1 and a pair of branches 38 located crosswise with this. For fastening on the wall two brackets are used, which are connected to each other with a pair of branches and one bracket is fastened to the base of the metal profile 1 and the other one to a wall or other similar object 37. The fixing points of brackets are depicted with a broken line on the figure.

Claims

1. A light box comprising of a closed frame assembled of metal profiles, whereas the front and back panel are fastened to the frame, whereas the front panel is at least partially translucent, **characterized in that** the ends of at least two metal profiles are connected to each other with a bracket, which has two branches and the ends of at least two metal profiles are connected to each with metal screws, whereas the cross-section of the metal profile is designed so, that one edge of the metal profile is provided with a groove meant for fastening of the front surface and at least one connecting element of a bracket is protruding from the inner side of the metal profile, the cross-section of the connecting element is designed so, that is has an opening for inserting a branch of the bracket, whereas the opening is dimensioned so that the shape and size of the opening are approximately the same as the shape and size of the cross-section of the branch of the bracket and the cross-section of the groove and the cross-section of the opening are provided with generally circular-shaped screw openings, used for driving in metal screws when the metal profiles are connected to one another.

2. A light box according to claim 1, which comprises of at least one light source.

3. A light box according to claim 2, whereas a connecting element of a light source is protruding from the inner side of at least one metal profile.

4. A light box according to claim 3, whereas the light source is a LED light source, which includes a radiator-base, on which at least one LED with a sheet radiator is fastened and which is fastened on a radiator-base by means of a snap catch, whereas in the lower part of the radiator-base there are fixing rails and the connecting element of the light source protruding from the inner side of the metal profile is designed according to the shape of the fixing rails of the radiator-base.

5. A light box according to claims 1 to 2, whereas the light source is a LED light panel, which comprises of a sheet radiator and LEDs fastened on it, a connecting element of the light source is a strip protruding from the inner side of the metal profile and the sheet radiator of the light panel is fastened on the strip.

6. A light box according to claims 1 to 2, whereas the cross-section of at least one metal profile is axisymmetrical and comprises of a groove starting from one edge of the metal profile in the direction of the other for fastening of the front surface of the light box, first connecting element of the bracket, a connecting element of the light source, second connecting element of the bracket and a groove for fastening of the back panel of the light box.

7. A light box according to claims 1 to 7, whereas the cross-sections of metal profiles are unsymmetrical and include a groove for fastening of the front panel of the light box, a connecting element of the bracket and a connecting element of the back panel, which

are stripes protruding from the inner side of the metal profiles.

8. A light box according to claim 7, whereas a LED light panel is fastened on the strip protruding from the inner side, forming the back panel of the light box.

9. A light box according to claim 6, whereas one side of the frame is formed from two metal profiles arranged next to each other, the cross-sections of which are asymmetrical and include a groove for fastening of the front panel of the light box, a connecting element of the bracket and a connecting element of the light source, which are strips protruding from the inner side of the metal profiles, whereas the ends of at least one of the metal profiles arranged next to each another are fastened with metal screws, facilitating easy opening of the light box.

10. A light box according to claims 1 through 9, whereas the metal profile is made of aluminium or aluminium alloy by means of extrusion.

11. A metal profile for a light box, which comprises of a frame assembled from metal profiles, a front and back panel, whereas the metal profile has a thin base, the first edge of which is provided with the first strip protruding in the direction of the inner side of the metal profile and the second strip protruding in the direction of the inner side, in between of which the first groove is formed for fastening of the front panel of the light box, whereas the second strip is approximately J-shaped and the tip of the longer branch is connected to the base of the metal profile so that a groove is formed between the shorter branch of the J-shaped element and the base and the cross-section of the front groove and the branch of the bracket is designed so that they form an opening with a round cross-section for the thread of the metal screw and whereas the metal profile includes a connecting element of the rear wall of the light box.

12. A metal profile according to claim 11, whereas the connecting element of the rear wall is a strip located crosswise to the base protruding from the inner side of the metal profile.

13. A metal profile according to claim 11, which includes a connecting element of the light source, which is a strip crosswise to the base protruding from the inner side of the metal profile.

14. A metal profile according to claim 11, whereas the cross-section of the metal profile is axisymmetrical and comprises of the first groove starting from one edge of the metal profile running in the direction of the other and formed between the first and second strips for fastening of the front panel of the light box, first connecting element of the bracket, which includes first groove for fastening of the bracket, a connecting element of the light source, second connecting element of the bracket, which includes the second groove for fastening of the bracket, and the second groove for fastening of the back panel of the light box, whereas the cross-section of all grooves is designed so that they form an opening with a round cross-section for the thread of the metal screw, whereas the location of the screw opening on the outer side of the metal profile in relation to the longitudinal axis of the metal profile is marked with a decorative groove.

15. A metal profile according to claim 14, whereas the connecting element fo the light source is solved as rails, the cross-section of which is designed according to the shape of the fixing rails of the radiator-base of the LED light source, whereas there is at least one groove combined with the connecting element of the light source, the cross-section of which is designed so that an opening with a round cross-section is formed for the thread of the metal screw, whereas the location of the screw opening on the outer side of the metal profile in relation to the longitudinal axis of the metal profile is marked with a decorative groove.

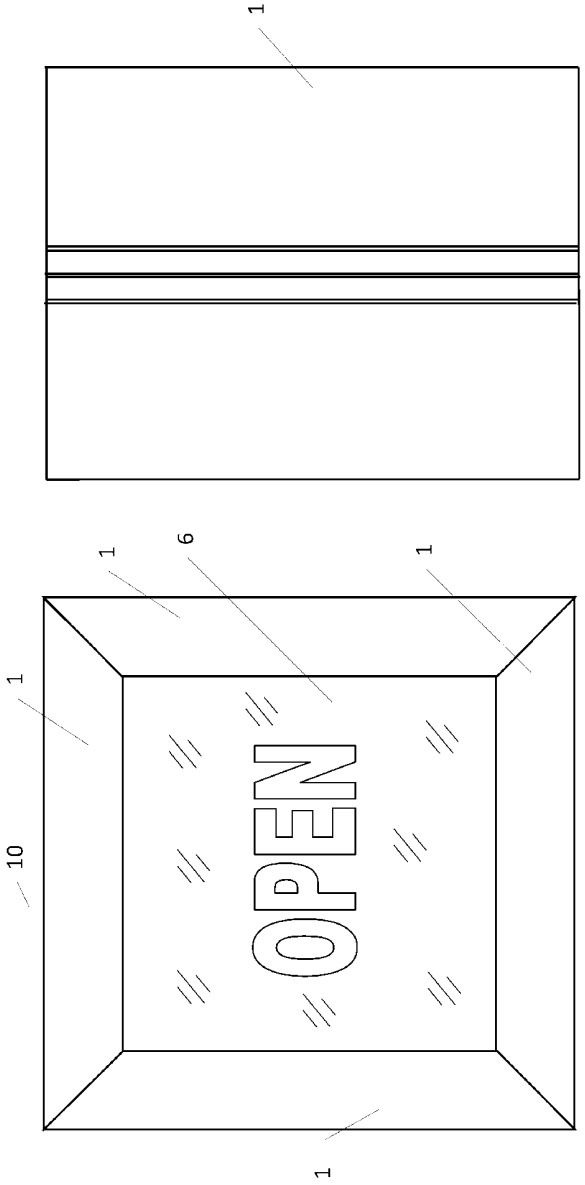

Fig 1

Fig 2

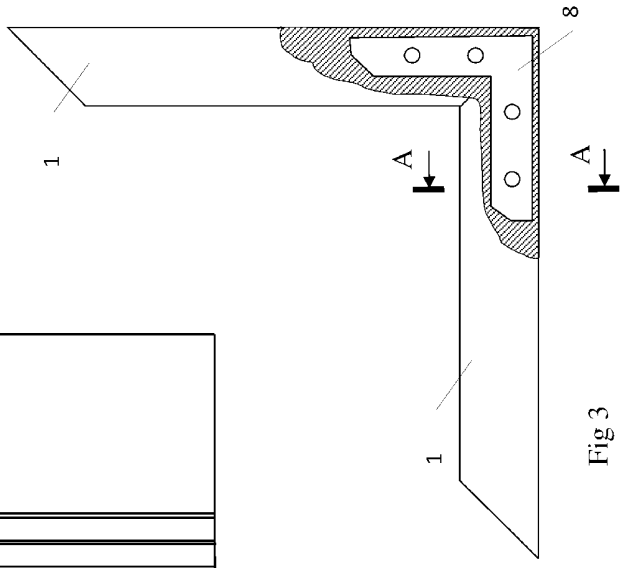

Fig 3

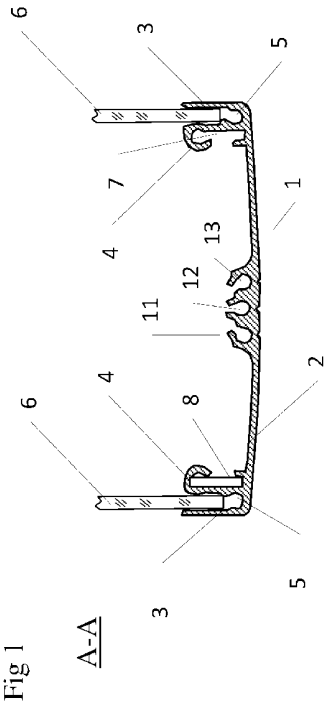

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Fig 4

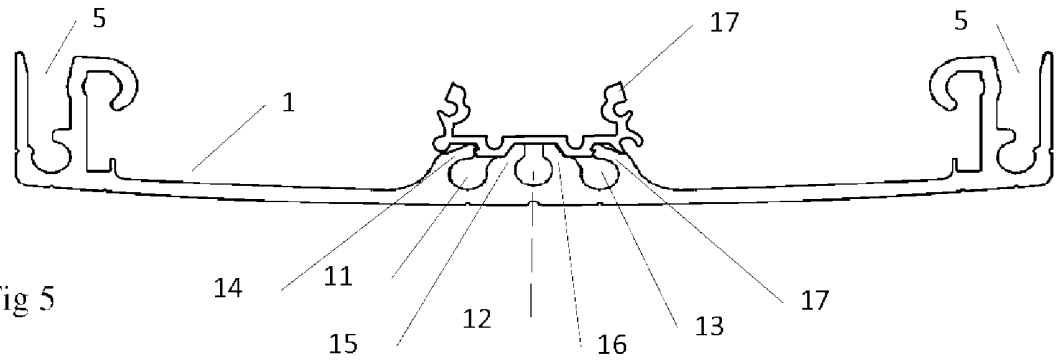

Fig 5

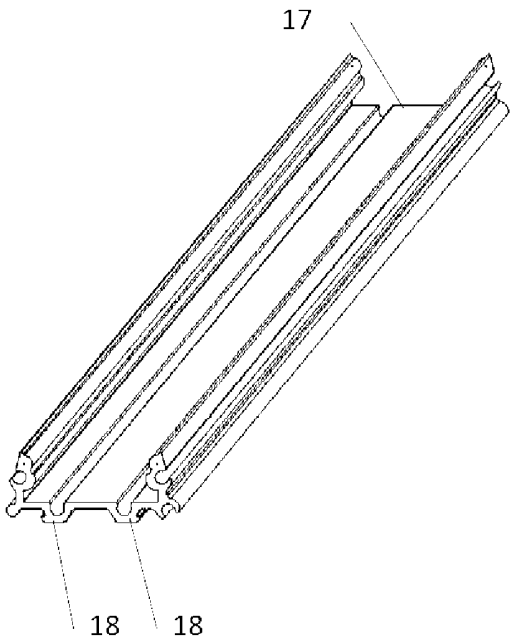

Fig 6

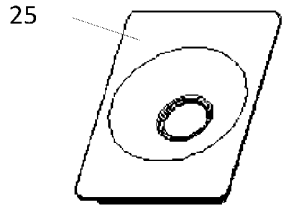

Fig 9

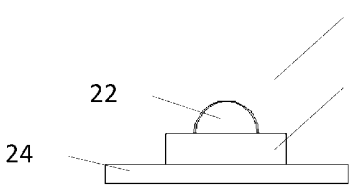

Fig 10

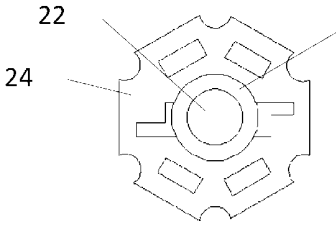

Fig 11

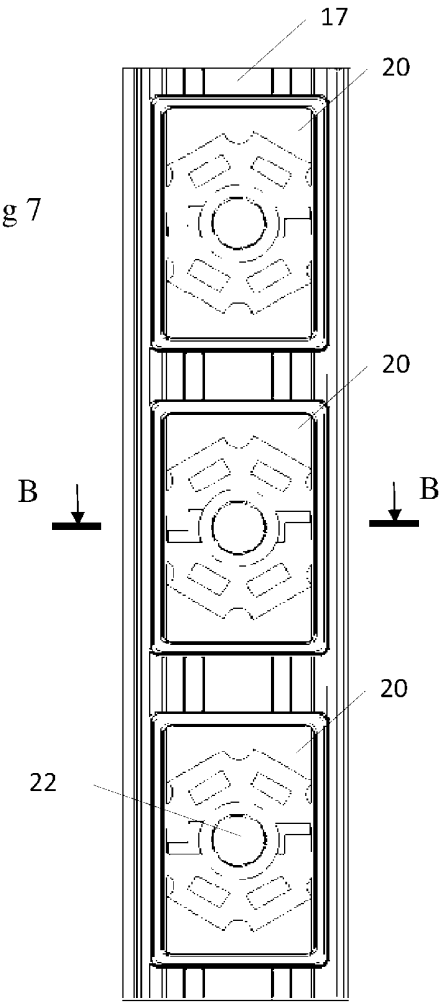

Fig 7

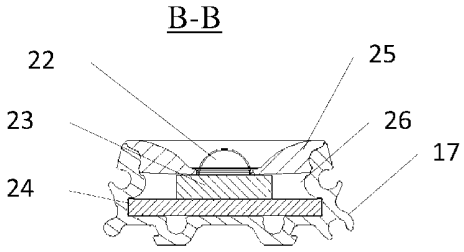

Fig 8

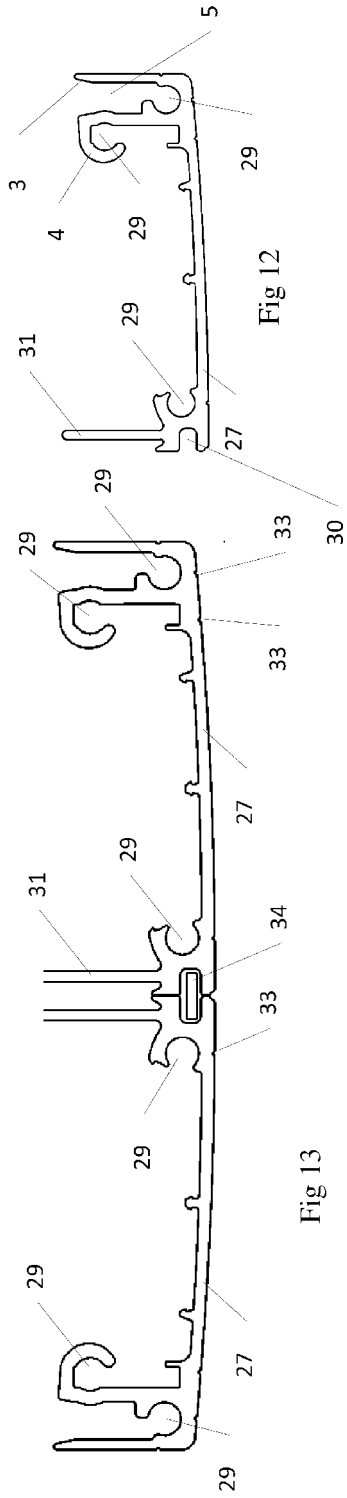

Fig 12

Fig 13

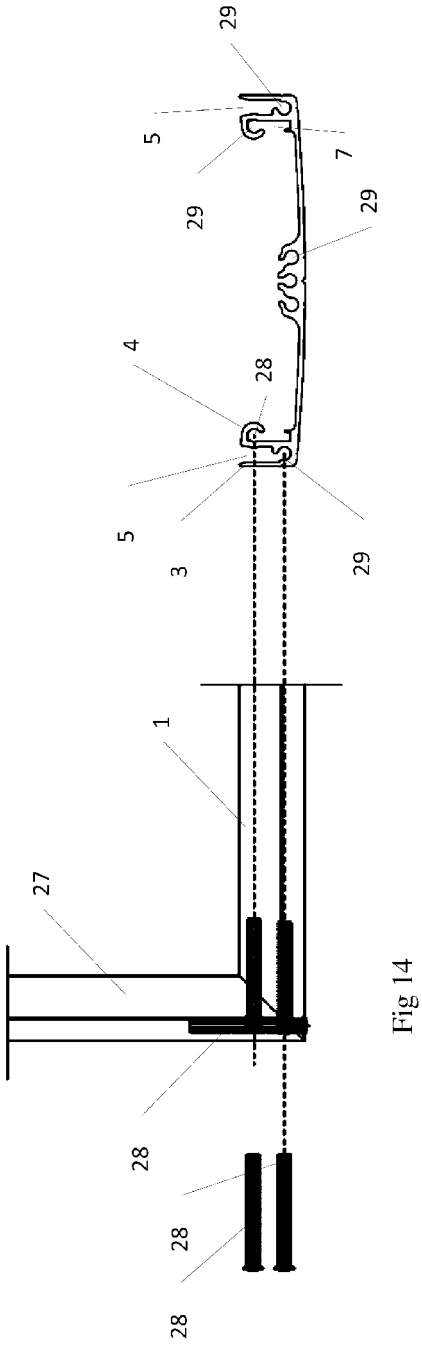

Fig 14

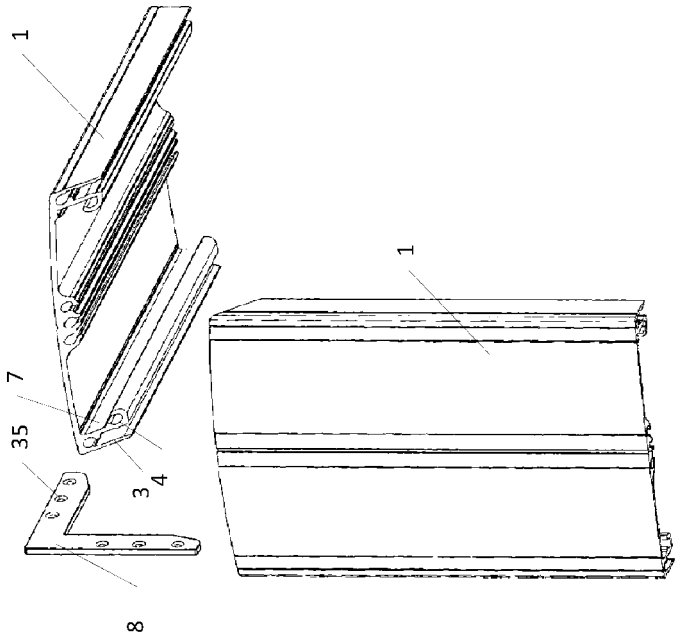

Fig 16

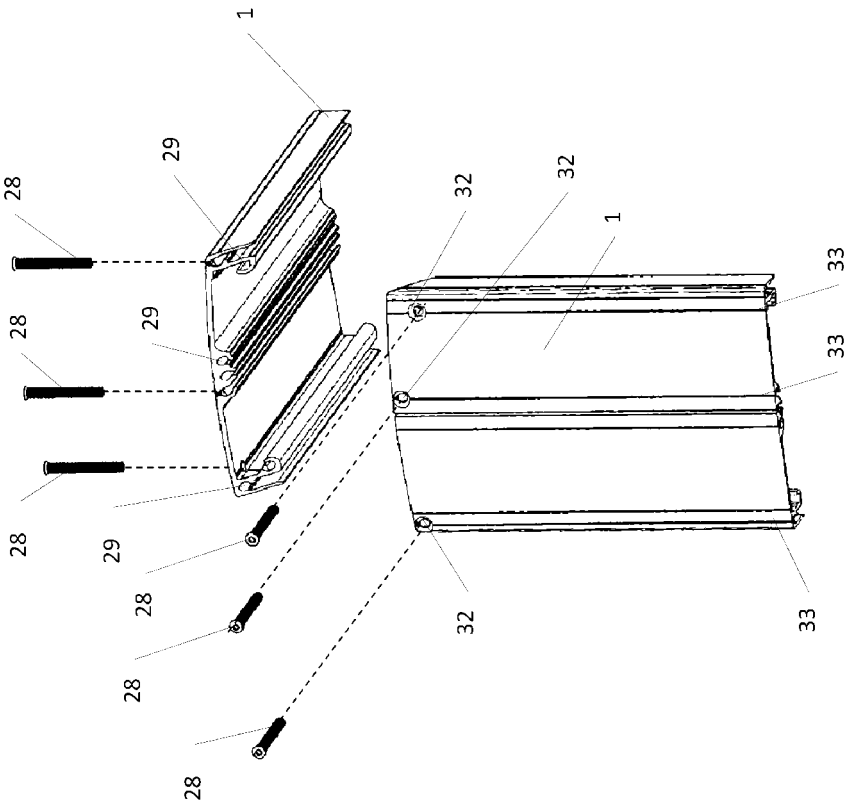

Fig 15

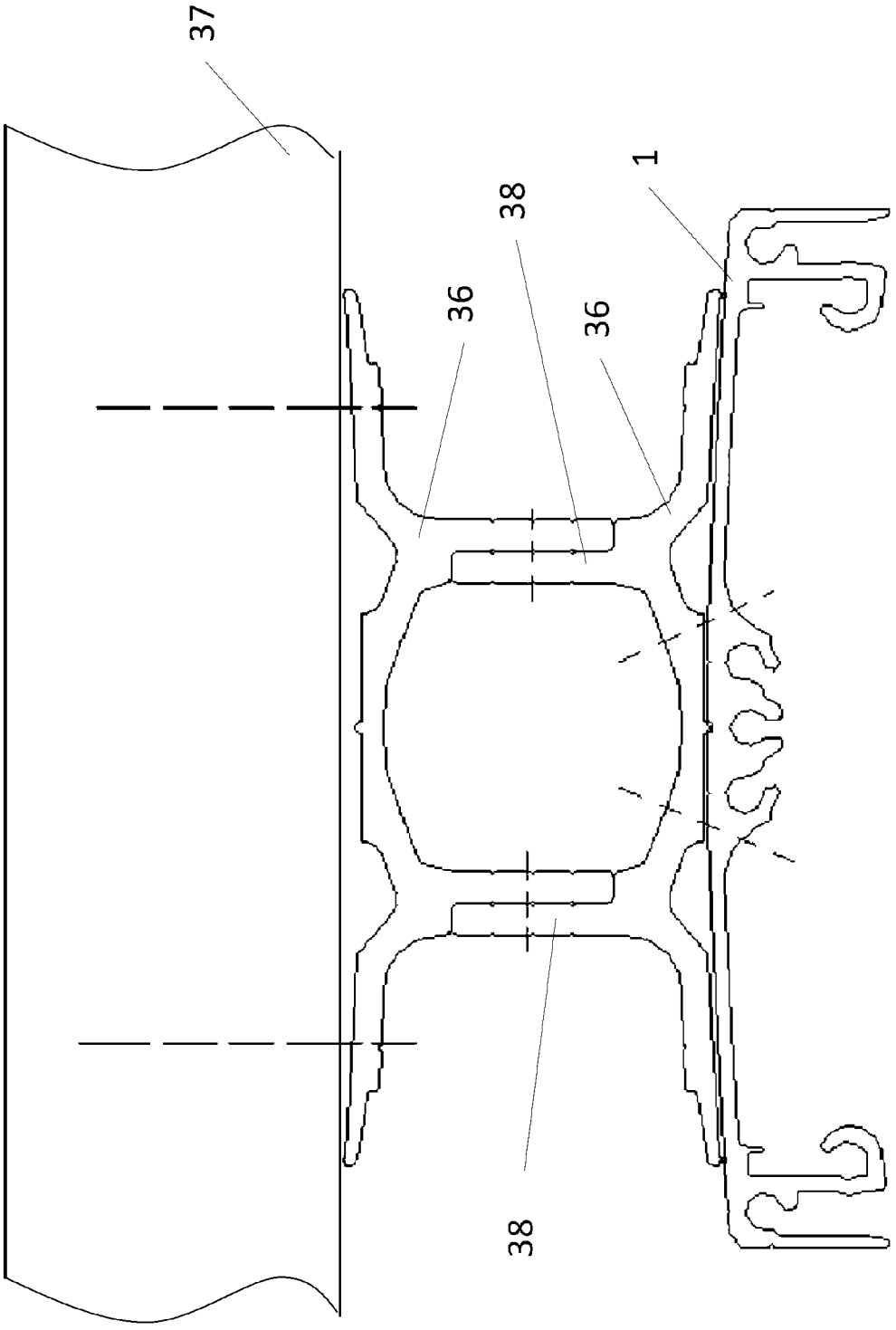

Fig 17

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EUROPEAN SEARCH REPORT

Application Number
EP 13 16 4380

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 October 2013	Demoor, Kristoffel

CATEGORY OF CITED DOCUMENTS

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