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(54) LIGHTING SYSTEM PROVIDED WITH LATERAL ACCESSORIES

(57) Light system (1) comprising
- a light track (2) comprising an aluminium profile (8) with a substantially H-shaped transversal section provided with a groove (10) on each longitudinal side perpendicular to the light-emitting side;
- at least a lateral accessory element (3, 30, 31, 32) being removably fixed to said groove (10) through a fixing system (11) and comprising three elements:
- a vertical element (12) perpendicular to the light-emitting side and comprising two screws or grub screws (16);
- a stabilizing element (13) parallel to the light-emitting side; wherein said vertical element (12) and said stabilizing element (13) are the same for each lateral accessory element (3, 30, 31, 32); and
- a variable support element (14), specific for each lateral accessory element (3, 30, 31, 32), having an L-shape, whose main dimension is about parallel to the light-emitting side of the said light track (2).

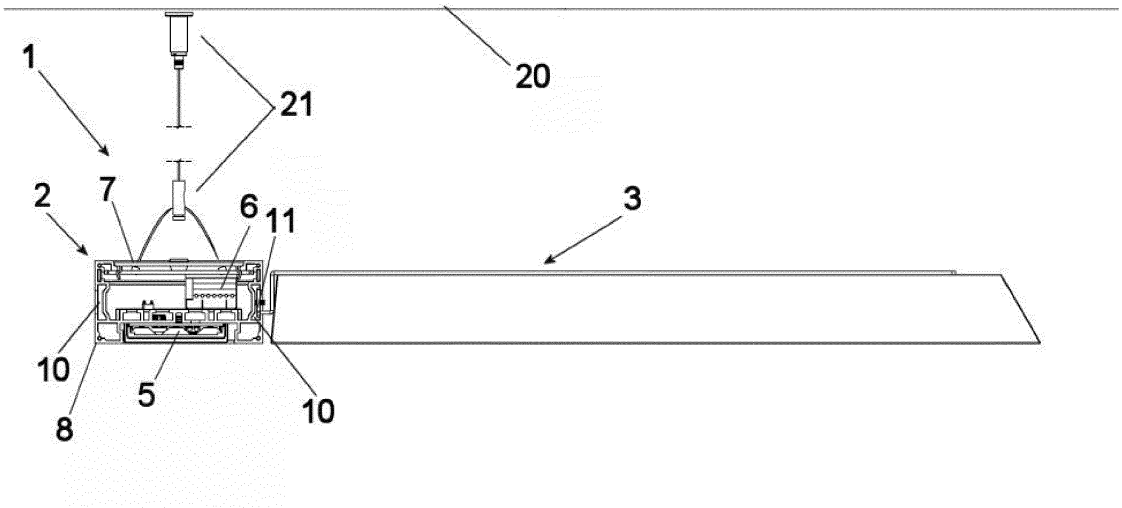

FIG. 1

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Description

[0001] The present invention relates to the technical field of lighting, and in particular to a combination between a light track provided with LED sources and at least one lateral accessory, preferably at least one sound-absorbing element, which can be fixed to said light track after the installation of said light track.

[0002] Lamps using LEDs as light sources have become very popular, due to LED's low cost and high efficiency. In particular, light track are known, which can be fixed to a ceiling both directly and through a hanging system, which use LEDs as light source.

[0003] Noise pollution is caused mainly by an excessive exposition to high-intensity sounds and noises. Italian law n. 447/1995 art. 2 provides the definition of noise pollution: *"the insertion of noise in the living environment or outdoor environment such as to disturb resting and human activities, danger for human health, damage to ecosystems, material goods, monuments, living environment or of the outdoor environment or such as to interfere with the normal functioning of said environments"*.

[0004] The level of acoustic pressure (measured in decibel, dB), is the increase, over a logarithmic scale, of air pressure with respect to a state of stillness in the air. Very generally, a level of noise of 50-60 dB can be perceived as unpleasant.

[0005] Some time ago, two audiology researchers from the University of California in San Francisco decided to measure the noise levels in five different restaurants. The restaurants ranged from bar/restaurants to family restaurants to elegant, upscale settings. Noise levels were measured and averaged over one-hour time periods between 6 and 10 p.m. The researchers found that average noise levels ranged between 50 and 90 decibels on the "A" scale (dBA) (normal conversation is about 45 to 50 decibels). The highest noise levels averaged about 110 dBA, while some peak noise levels actually reached more than 140 dBA - well beyond the tolerance level of any listener.

[0006] It is a common experience that maintaining a conversation in a public place like bars and restaurants can be difficult due to noise. This phenomenon occurs more often in places lacking textile elements like curtains or carpets, as they work as sound-absorbing elements.

[0007] The problem of noise in indoor environments is well known in the art, and there are several documents that propose to solve or limit it using lamps provided with sound-absorbing elements. This has the advantage that textile/decorative elements are not required in a room, allowing architects to design rooms provided with a minimalistic design, which is very fashionable.

[0008] E.g., WO9829683A1 of Hinrichs Heiko and US10359163B1 of USG Interiors LLC show examples of lamps provided with sound-absorbing elements. Nonetheless, such lamps have the disadvantage that said sound-absorbing elements must be present from the start of the service life of the lamp.

[0009] US2007058377 of Zampini et al. discloses a light track having a construction similar to the one of the present invention. The box shaped body comprises four sides: excluding the one from which light is emitted, at the other three sides there are provided mortises which are as long as the track in which tenons having different forms can be inserted (see figures 7-22) and which allows to secure the track to the ceiling or to the walls or to insert accessories in the mortises. As accessories one of the following list of accessories can be provided: heat dissipators, aesthetic covers, decors, accessories being able to modify the optical properties of the system as for example reflectors.

[0010] Also US2013094225A1 of Ecosense Lighting Inc. discloses a lighting track similar to the one disclosed in US2007058377. Also in this case, the box shaped body comprises four sides: excluding the one from which the light is emitted, on the resting three sides there are provided mortises which are as long as the track and in which differently shaped tenons can be inserted. Nevertheless, for the tenons placed at the sides of the box shaped body, the only use suggested is securing the light track to a wall, optionally with variable inclinations (see figure 9).

[0011] EP2314782 of Pinta Acoustic GmbH discloses instead a quadrangular-shaped apparatus to be placed at the ceiling, comprising a sound absorbing panel which is surrounded along the four lateral sides.

[0012] It may happen that an architect designs the decor of a room, including lamps, and after the installation the room is more noisy than expected.

[0013] Aim of the present invention is providing a light system provided with lateral accessories, in particular also sound-absorbing elements, capable of reducing noise in the rooms where it is installed, which is easy to install and wherein said sound-absorbing elements can be added even after the installation of said light system.

[0014] This object is achieved by an apparatus and a method having the features of the independent claims. Advantageous embodiments and refinements are specified in claims dependent thereon.

[0015] The light track provided with lateral accessories among which sound-absorbing elements according to the present invention was designed mainly for lighting offices and public places (bars, restaurants, points of sale). It comprises an aluminium profile that in the side oriented toward ceiling/wall houses the power supply needed for supplying the light sources, while on the light-emitting opposed side, oriented toward the room, comprises said LED light sources and their respective optical elements.

[0016] On the two longitudinal sides perpendicular to the light-emitting side, a plurality of removable accessories is installed/installable, in particular sound-absorbing elements. Said lateral accessories can be provided since the installation of the light track on ceiling or wall, or said lateral accessories can be added successively during the service life of the already installed light track. The connecting system between light track and lateral accesso-

ries is extremely simple and does not require the intervention of a qualified technician.

[0017] Said lateral accessories can be fixed to said light track both on one side and its opposed side. Preferably, in order to balance the weights and for an overall stability of said system, said lateral accessories are fixed in a symmetrical way.

[0018] Said sound-absorbing elements comprise a fixing system for their fixing to the light track and a portion intended for absorbing sounds. Said sound-absorbing portion is provided with an isosceles trapezoid transversal section, with its shorter side oriented toward ceiling/wall, and comprises a layer 3-5 cm high of thermoformed synthetic material, preferably 4 cm high.

[0019] In alternative embodiments, the same fixing system of the sound-absorbing elements can be exploited to fix to said light track other types of lateral accessories, e.g. advertising panels, or lighted panels, or sound diffuser elements (loudspeakers).

[0020] Both the lighted panels and the sound diffuser elements are electrically supplied through a cable that is laterally connected through said light track to a suitable power supply. Alternatively, they can be supplied through batteries.

[0021] The length of the sound-absorbing elements and/or said advertising or lighted panels can be different, e.g. ranging 20-60 cm.

[0022] In an embodiment, the light track, with or without sound-absorbing elements and/or other supplied or non-supplied lateral accessories, is fixed directly to ceiling/wall.

[0023] In an alternative embodiment, the light track, with or without sound-absorbing elements and/or other supplied or non-supplied lateral accessories, hangs from ceiling, i.e. is provided with a fixing system allowing an even minimal oscillation with respect to said ceiling.

[0024] In an alternative embodiment, a light track, with or without sound-absorbing elements and/or other supplied or non-supplied lateral accessories, is fixed to a ground base, which allows to use a single light track in the form of a floor lamp, optionally provided with sound-absorbing elements and/or advertising panels and/or sound diffuser elements.

[0025] The method for installing a light system according to the present invention comprises the following steps:

a) Providing a light track;

b) Fixing to said light track at least a sound-absorbing elements, preferably at least two sound-absorbing elements and/or other supplied or non-supplied lateral accessories, in the desired number and arrangement, in a symmetrical way or anyway a balanced way on the left and on the right of the light track so as to balance the weights;

c) Fixing to a ceiling/wall or to a ground base said light track provided with sound-absorbing elements and/or other supplied or non-supplied lateral accessories.

[0026] In an alternative embodiment, wherein the sound-absorbing elements and/or other supplied or non-supplied lateral accessories are fixed after the installation of the light track in a room (retrofit) the steps b) and c) of the method are inverted.

[0027] A first advantage of the present invention is that said sound-absorbing elements and/or advertising panels and/or lighted panels and/or sound diffuser elements are provided in any number, which adds versatility to the system.

[0028] A second advantage of the present invention is the possibility of installing said sound-absorbing elements and/or advertising panels and/or lighted panels and/or sound diffuser elements even when said light track has already started its service life, which adds further versatility to the system.

[0029] A third advantage of the present invention is that the fixing system of said sound-absorbing elements and/or advertising panels and/or lighted panels and/or sound diffuser elements is mechanically very simple, which allows an easy retrofit installation, without the need of a qualified technician.

[0030] A fourth advantage is the aesthetical attractiveness of the compositions made of said lateral accessories.

[0031] Further advantages and properties of the present invention are disclosed in the following description, in which exemplary embodiments of the present invention are explained in detail based on the drawings:

Figure 1	Transversal section of a light system, which on its right side is provided with a sound-absorbing element;
Figure 2	Top view of a light system, which on its right side is provided with a sound-absorbing element;
Figure 3	Exploded axonometric view of a light system, which on its right side is provided with a sound-absorbing element;
Figures 4	Sound-absorbing element, in a bottom, longitudinal, top, opposed longitudinal, front views;
Figures 5	Fixing system in top, long side, short side views;
Figures 6	Fixing sequence of a lateral accessory to the light system in a transversal section;
Figure 7	Advertising/lighted panel in front view;
Figures 8	Sound diffuser element in bottom, front, top, lateral and axonometric view.

[0032] Figure 1 shows a transversal section of a light system 1 according to the present invention, comprising a light track 2 and a sound-absorbing element 3. Apparently, the light is issued by the bottom side of the light track.

[0033] Figure 2 shows a top view of the same light sys-

tem 1 a comprising a light track 2 and a sound-absorbing element 3. The light track 2 can be provided with any length, as indicated by breakage lines in the Figure.

[0034] Said light system 1 can be fixed directly to ceiling, can hang from said ceiling 20 through a wire system 21 having any length (indicated with breakage lines), or can be fixed directly to a wall, or alternatively can be provided with a ground base and used as a floor lamp (not shown).

[0035] Figure 3 shows an exploded axonometric view of the same light system 1 comprising a light track 2 and a sound-absorbing element 3.

[0036] The light track 2 comprises an H-shaped aluminium profile 8, inside which there are housed: at least a LED board 4, optical elements 5 made of printed PMMA in the form of lenses, at least a driver 6, at least a top closing screen 7, preferably made of extruded polycarbonate.

[0037] As can be observed from Figure 3, the aluminium profile 8 allows the assembling of the element that are housed inside it, and is successively closed with said screen 7 after assembling.

[0038] The LED boards 4 are known modular electronic boards, interconnected to each other in order to get the overall desired length of the light track 2; on said boards, a plurality of LED 9 is arranged. In correspondence of LED 9 there is provided an optical element 5 suitable for conveying the light emitted by said led in the desired direction. Said optical elements 5 are screens comprising lenses, each lens being placed in front to a correspondent LED.

[0039] Said optical elements 5 are known high-efficiency elements, and are chosen according to the performances required from said light system: e.g. they can be symmetrical, asymmetrical or batwings or diffused PMMA optics, with or without luminance control (Unified Glare Rating, UGR).

[0040] Said drivers 6 are known commercial objects, suitable for converting the alternate current into continuous current, current-stabilized or tension-stabilized. Said drivers are intended for electrically supplying said plurality of LEDs 9.

[0041] Each longitudinal side, perpendicular to the plane of light emission of the aluminium profile 8 is provided with a groove 10 for fitting a fixing system 11 for at least one accessory lateral element chosen from the group consisting in sound-absorbing elements 3, advertising panels 30, lighted panels 31, sound diffuser elements 32.

[0042] Said sound-absorbing elements 3 and advertising panels 30 are passive elements not needing electric supply, while said lighted panels 31 and the sound diffuser elements 32 need be electrically supplied or connected to a dedicated plant.

[0043] All the lateral accessory elements, i.e. said sound-absorbing elements 3, advertising panels 30, lighted panels 31, sound diffuser elements 32 are provided with the same mechanical fixing system 11. In the case of lighted panels 31 and sound diffuser elements 32 there must be provided an electric supply system, too: there are provided some slits in the lateral side of the aluminium profile 8 allowing to house plug and play connections intended for transmitting the supply power and optionally signals.

[0044] Figures 4 show different views of a sound-absorbing element 3. In particular, Figure 4A shows said sound-absorbing element in a bottom view, Figures 4B and 4D the sound-absorbing element in a lateral longitudinal view, Figure 4C shows the sound-absorbing element in a top view, Figures 4E and 4F the sound-absorbing element in a front view. The different views allow to better show the fixing element 11 of said sound-absorbing element.

[0045] In particular, the sound-absorbing elements 3 are provided preferably with a variable length ranging 20-60 cm, a width ranging 10-20 cm and a thickness ranging 3-5 cm, preferably 4 cm. They are fixed through said fixing system 11 to said groove 10 provided on the lateral longitudinal walls of said aluminium profile 8.

[0046] The sound-absorbing elements comprise said metal fixing system 11 and a sound-absorbing portion 15 made of thermoformed synthetic material. In a preferred embodiment, said sound-absorbing portion 15 is made of self-supporting panels in polyester with a rectangular shape with end cut at 60°.

[0047] Optionally, the top and bottom sides of said sound-absorbing elements 3 can be provided with a complete or partial cladding with fabrics or a superficial finish suitable for maintaining the sound-absorbing features of said panels. The fabric or finish can be of any colour, which adds to the aesthetical attractiveness of the system. As can be better observed in Figures 4E and 4F, in the preferred embodiment, the sound-absorbing portions 15 are provided with an isosceles trapezoid transversal section, with the shorter side of said isosceles trapezoid oriented toward ceiling or wall.

[0048] The overall length of the light track 2 can be occupied by lateral accessory elements 3, 30, 31, 32, or they can be arranged as desired along the light track. Preferably, for stability reasons, they are arranged symmetrically on the right and on the left of the light track 2, or in a staggered way so as to balance weights.

[0049] Figures 5 show the fixing system 11, which is partially the same for all the lateral accessory elements 3, 30, 31, 32. In particular, Figure 5A shows the fixing system 11 in a bottom view, Figure 5B shows the fixing system 11 in a longitudinal lateral way and Figure 5C shows the fixing system 11 in a side view.

[0050] Said fixing system 11 comprises 3 elements:

- a vertical element 12, which is the same for all fixing systems, which is perpendicular to the light-emitting side;
- a stabilizing elements 13, which is the same for all fixing systems, which is parallel to the light-emitting side;

- a variable support element 14, specific for each lateral accessory element 3, 30, 31, 32 of the light track 2, having a L-shape, whose main dimension is about parallel to the light-emitting side.

[0051] In the case of the advertising panels 30, lighted panels 31, and sound diffuser elements 32, the variable element 14 can take different shapes and sections with respect to the one of the sound-absorbing elements 3 described in detail. Such shapes and sections are more suitable to support said elements 30, 31, 32, which are heavier than the sound-absorbing portion 15 of said sound-absorbing elements 3.

[0052] As can be appreciated by observing Figures 6, said groove 10 is symmetrical with respect to the horizontal plane and is provided with an entrance 60 more restricted with respect to its overall shape. Said groove is closed by two teeth, of which there are provided a top tooth 61 and a bottom tooth 62, and is provided with two cavities, a top cavity 63 and a bottom cavity 64.

[0053] Figures 6 show the fixing sequence of one of the lateral accessory elements 3, 30, 31, 32.

[0054] Figure 6A: the fixing system 11 and the groove 10 placed on the longitudinal side of the aluminium profile 8, are shown as independent at the beginning of the fixing sequence.

[0055] Figure 6B: the fixing system 11 is inserted inside said groove 10 with an angle of about 30° with respect to ground. Initially the top portion of the vertical element 12 of the fixing system is inserted in the top cavity 63.

[0056] Figure 6C: the fixing system 11 is rotated so as to bring the bottom portion of the vertical element 12 of the fixing system inside the bottom cavity 64 of said groove 10.

[0057] Figure 6D: the fixing system 11 is brought perpendicular to the groove 10 and parallel to the longitudinal side of the light track 2, and the weight of the element settles the fixing system on the bottom of the bottom cavity 64; the stabilizing element 13 leans on the bottom tooth 62 of the groove 10.

[0058] Figure 6E: two screws or grub screws 16 are screwed, which once screwed bring the fixing system 11 in a position suitable for preventing the accidental unfixing of the fixing system from said groove 10.

[0059] Apparently, loosening said screws or grub screws 16 is sufficient to allow the sliding of the fixing system 11 inside said groove 10, so allowing a re-positioning of the lateral accessories 3, 30, 31, 32 along the light track 2. Just as obviously, this simple fixing system allows an easy removal of the lateral accessory elements for maintenance (e.g. cleaning).

[0060] In an alternative embodiment, due to the geometries at play, especially when the lateral accessory elements 3, 30, 31, 32 are longer and the light track is fixed directly to ceiling or wall, the lateral accessory elements can be shoved and slid inside said groove 10 up to the desired position.

[0061] Figure 7 shows an advertising panel 30, possibly in a lighted, supplied version 31. The view allows to appreciate that the vertical element 12, stabilizing element 13 and the screw or grub screws 16 are the same as those of the sound-absorbing element 3, while the variable support element 14 can vary its dimension and shape according to the shape of the panel to be supported.

[0062] Figures 8 show a sound diffuser element 32. In particular, Figure 8A shows a bottom view, Figure 8B a front view, Figure 8C a top view, Figure 8D a lateral view and Figure 8E an axonometric view. As can be observed from Figures 8, the vertical element 12 and the stabilizing element 13 are the same as those shown in Figures 5, while the element 14 supporting the specific accessory is varied. Obviously, the fixing sequence remains the same shown in Figures 6.

[0063] The installation method of a light system 1 according to the present invention comprises the following steps:

a) Providing a light system 2;
b) Fixing to said light track 2 at least a sound-absorbing element 3, preferably at least two sound-absorbing elements 3 and/or other supplied or non-supplied lateral accessory elements 30, 31, 32 in the desired number and arrangement, in a symmetrical way or anyway a balanced way on the right and on the left of said light track 2 so as to balance the weights;
c) Fixing to wall or ceiling or to a ground base said light track 2 provided with sound-absorbing elements 3 and/or other supplied lateral accessories 31, 32 or non-supplied 30.

[0064] In an alternative embodiment wherein said sound-absorbing elements and/or other supplied or non-supplied lateral accessory elements are fixed after the installation of said light track (retrofit), the steps b) and c) of the method are inverted.

[0065] In a not shown alternative embodiment, there are provided lateral accessory elements 3, 30, 31, 32 that are provided with a pair of fixing systems 11 on their opposed sides. In this case, the two fixing systems 11 are fixed to two light tracks 2 forming an H-shaped structure, wherein the parallel H arms are the light tracks 2, while the connection arm of the H is the lateral accessory element. This system, mechanically more stable than the preferred embodiment, has nonetheless the disadvantage that all the lateral accessory elements must be provided with the same length.

1 light system with at least one lateral accessory element
2 light track
3 sound-absorbing element
4 LED board
5 optical element
6 driver
7 top closing screen

8 aluminium profile
9 LED
10 groove
11 fixing system
12 vertical element
13 stabilizing element
14 variable support element
15 sound-absorbing portion
16 grub screw or screw
20 ceiling
21 hanging system
30 advertising panel
31 lighted panel
32 sound diffuser system
60 entrance
61 top tooth
62 bottom tooth
63 top cavity
64 bottom cavity

Claims

1. Light system (1) comprising:

- A light track (2) in its turn comprising an aluminium profile (8) with a substantially H-shaped transversal section provided with a groove (10) on each longitudinal side perpendicular to the light-emitting side ;
- At least a lateral accessory element chosen from the group consisting of:

  - a sound-absorbing element (3);
  - an advertising panel (30);
  - a lighted panel (31);
  - a sound diffuser element (32);

characterized in that
said lateral accessories (3, 30, 31, 32) are removably fixed to said groove (10) through a fixing system (11)
and in that
said fixing system (11) comprises three elements:

- a vertical element (12) that is the same for the fixing systems of all lateral accessory elements (3, 30, 31, 32), which is perpendicular to the light-emitting side said vertical element comprising two screws or grub screws (16);
- a stabilizing element (13) that is the same for the fixing systems of all lateral accessory elements (3, 30, 31, 32), which is parallel to the light-emitting side;
- a variable support element (14), specific for each lateral accessory element (3, 30, 31, 32) of the light track (2), having a L-shape, whose main dimension is about parallel to the light-emitting side of the said light track (2).

2. Light system (1) according to claim 1, wherein said groove (10) is symmetrical with respect to the horizontal plane and is provided with an entrance (60) more reduced with respect to its overall shape, closed by two teeth, a top tooth (61) and an a bottom tooth (62), and is provided with two cavities a top cavity (63) and a bottom cavity (64).

3. Light system (1) according to one or more of the preceding claims, wherein said light track (2) comprises inside said aluminium profile (8):

- at least a LED board (4) on which a plurality of LEDs is mounted,
- optical elements (5) in printed PMMA in the form of lenses;
- at least one driver (6),
- at least a top closing screen (7) preferably in extruded polycarbonate.

4. Light system (1) according to one or more of the preceding claims, wherein said at least one sound-absorbing element (3) comprises said fixing system (11) for fixing to said light track (12) and a sound-absorbing portion (15) intended for absorbing sounds, which sound-absorbing portion is provided with an isosceles trapezoid transversal section, with its shorter side oriented toward ceiling or wall, and comprises preferably a layer 3-5 cm thick of thermoformed synthetic material, preferably 4 cm thick, a length ranging 20-60 cm and a width ranging 10-20 cm.

5. Light system (1) according to one or more of the preceding claims, wherein said lighted panel (31) and said sound diffuser element (32) must be electrically supplied through electric connection to a driver (6) housed in said light track (2), which is provided with slits in its longitudinal lateral sides to allow a plug and play connection.

6. Light system (1) according to one or more of claims 1-6, comprising:

- A pair of light tracks (2);
- At least a lateral accessory element (3, 30, 31, 32) provided with a pair of fixing systems (11) on its opposed sides,

which are fixed each to one of the pair of light tracks (2), forming an H-shaped structure.

7. Assembling method of at least one lateral accessory element (3, 30, 31, 32) to said light track (2) of said light system (1) according to one or more of claims 2 to 6, comprising the following steps:

a) Inserting the top portion of the vertical element

(12) of the fixing system (11) inside the top cavity (63) of the groove (10) with an angle of about 30° with respect to the ground;
b) Rotating said fixing system (11) so as to bring the bottom portion of the vertical element (12) of the fixing system inside the bottom cavity (64) of the groove (10);
c) Bringing said vertical element (12) of the fixing system (11) parallel to said groove (10) and perpendicular to the light-emitting side of the light track (2);
d) Settling said fixing system (11) on the bottom of the bottom cavity (64), leaning the stabilizing element (13) on the bottom tooth (62) of the groove (10);
e) Screwing two grub screws or screws (16), which once screwed bring the fixing system (11) in a position preventing the accidental unfixing of the fixing system (11) from the groove (10).

8. Assembling method of said light system (1) according to one or more of claims 1 to 6to be used when in combination with lateral accessory elements which are longer (3, 30, 31, 32) and in which the light track (2) is fixed directly to ceiling or wall, the said method provides to shove the lateral accessory elements (3, 30, 31, 32) into the groove (10) of the already installed light track (2) sliding them to the desired position.

9. Assembling method of said light system (1) comprising a light track (2) and at least a lateral accessory element (3, 30, 31, 32) according to claims 1-6, comprising the following steps

a) Providing a light track (2);
b) Fixing to said light track (2) at least a sound-absorbing element (3), preferably at least two sound-absorbing elements (3) and/or other supplied or non-supplied lateral accessory elements (30, 31, 32) in the desired number and arrangement, in a symmetrical way or anyway a balanced way on the right and on the left of said light track (2) so as to balance the weights;
c) Fixing to wall or ceiling or a ground base said light track (2) provided with sound-absorbing elements (3) and/or other supplied or non-supplied (30) lateral accessories (31, 32);

optionally the steps b) and c) of said method are inverted.

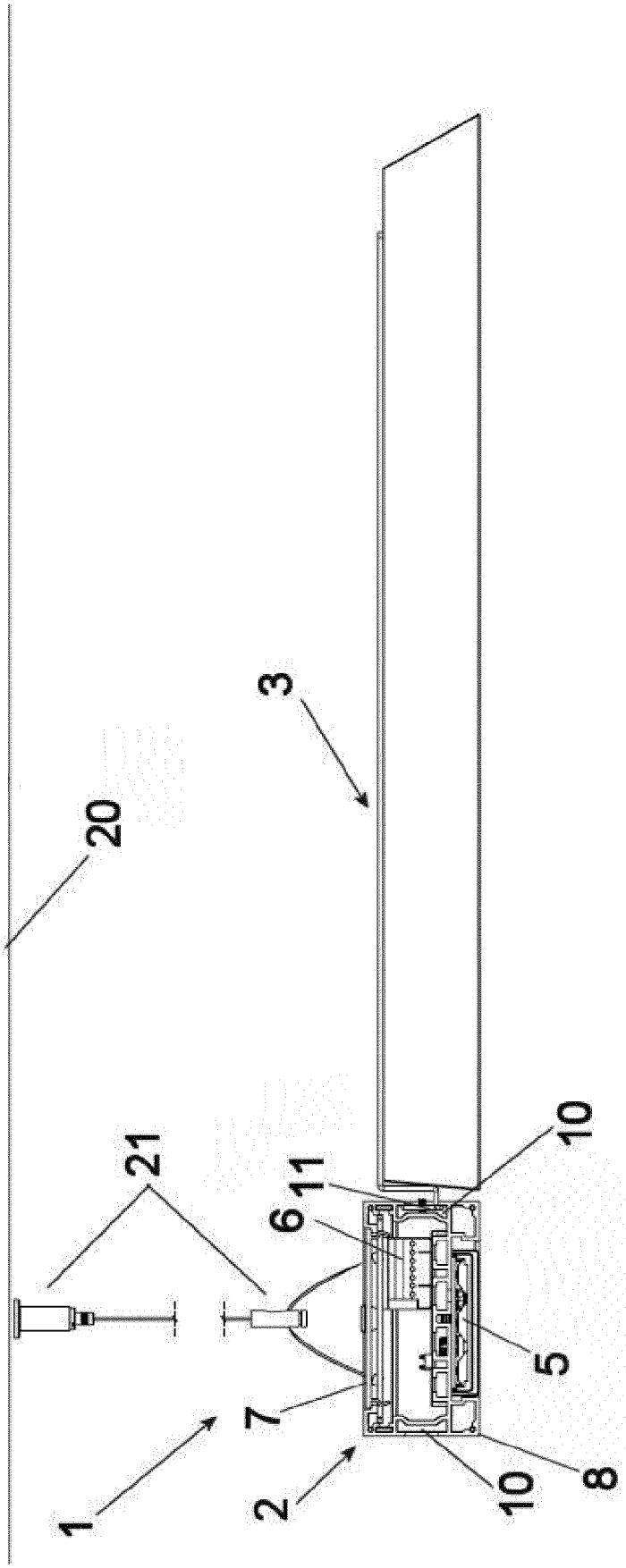


FIG. 1

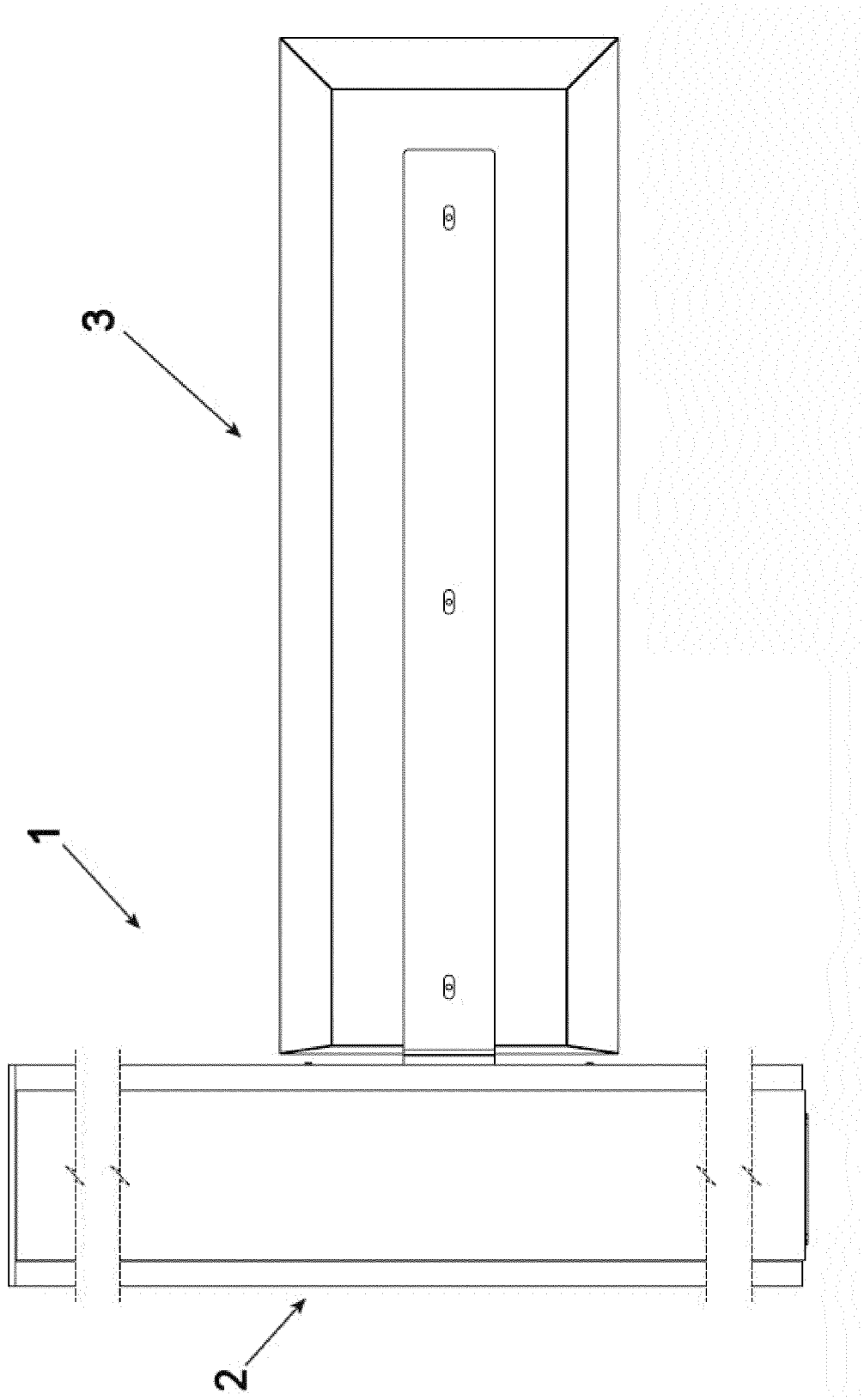
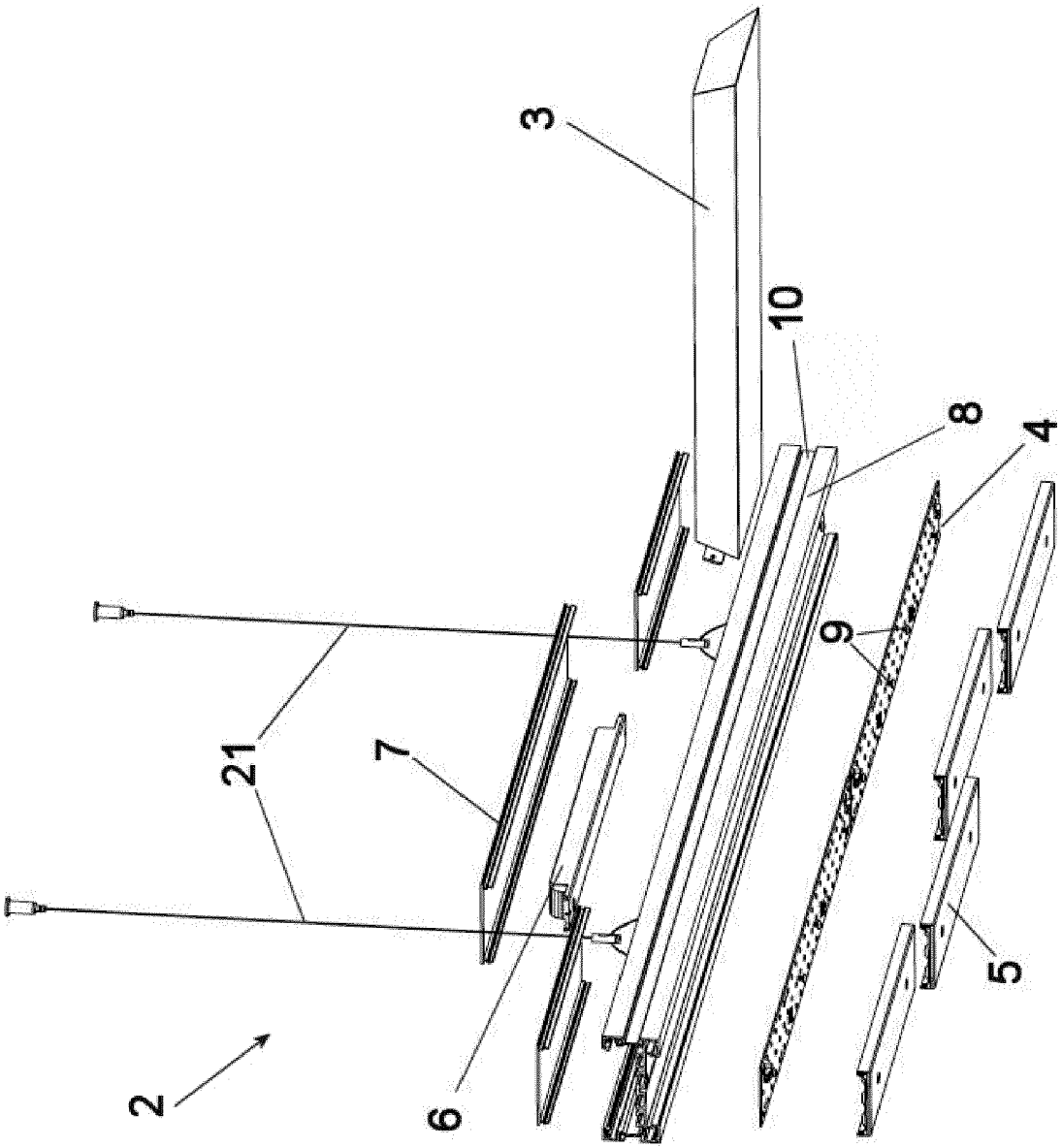


FIG. 2

FIG. 3



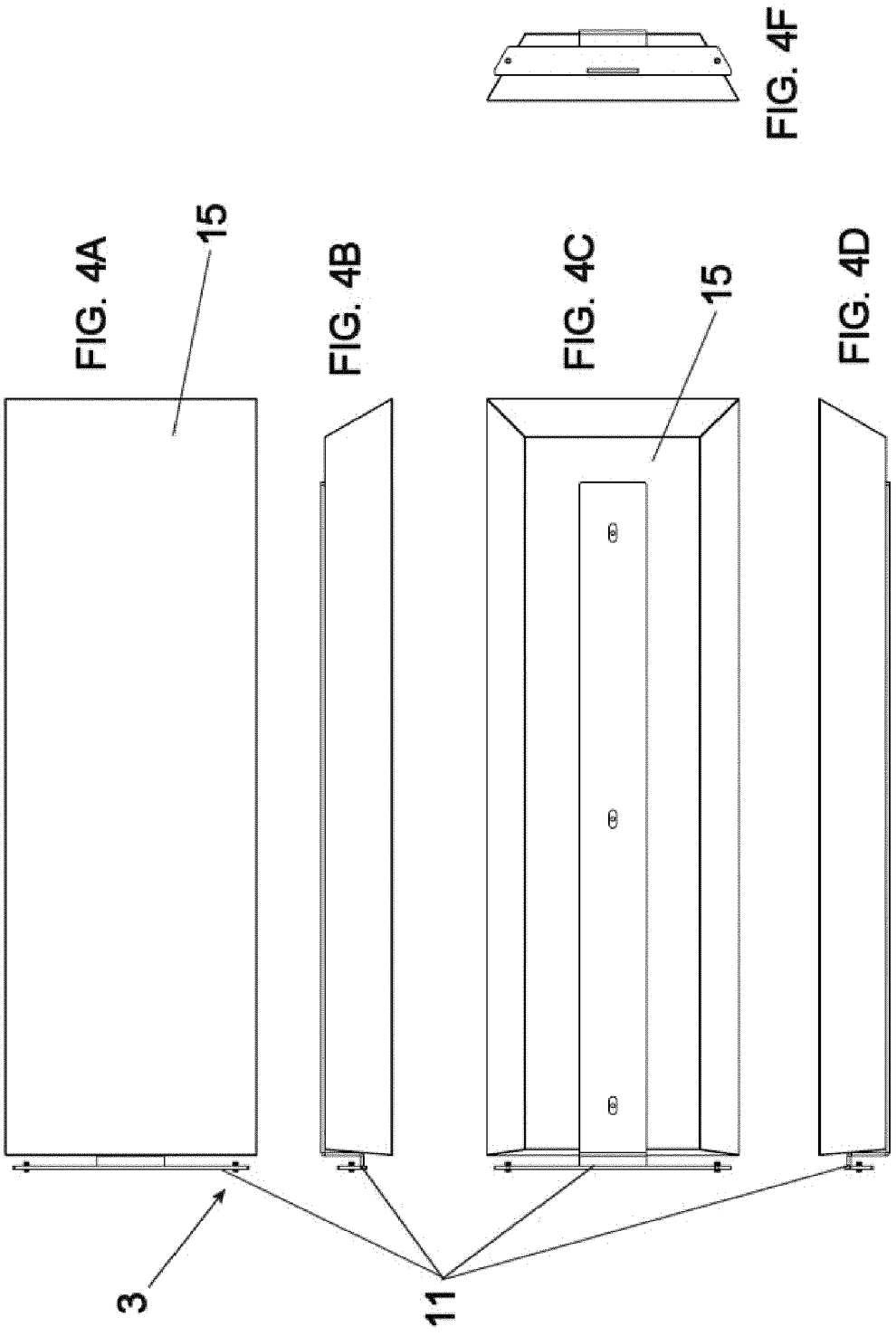


FIG. 4F

FIG. 4E

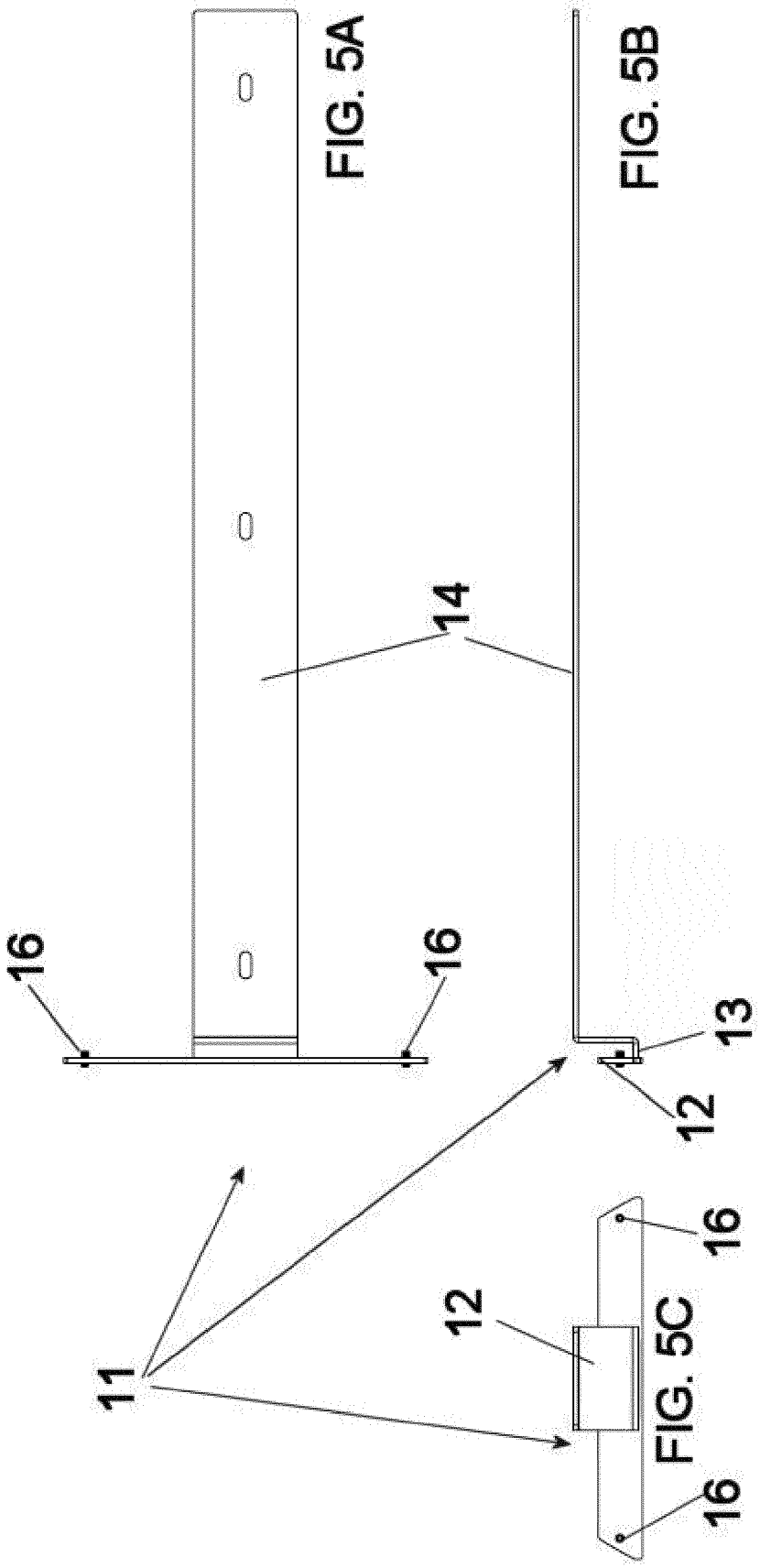


FIG. 5A

FIG. 5B

FIG. 5C

FIG. 6A

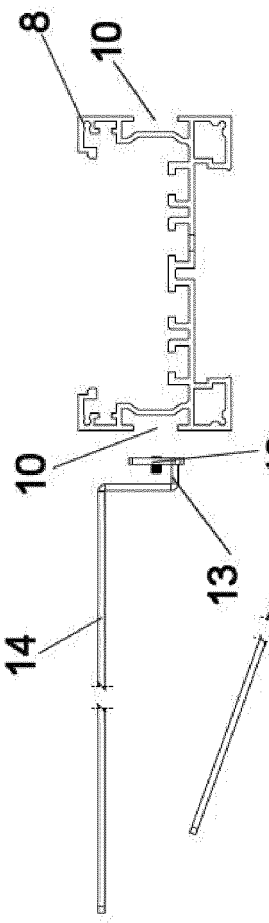


FIG. 6B

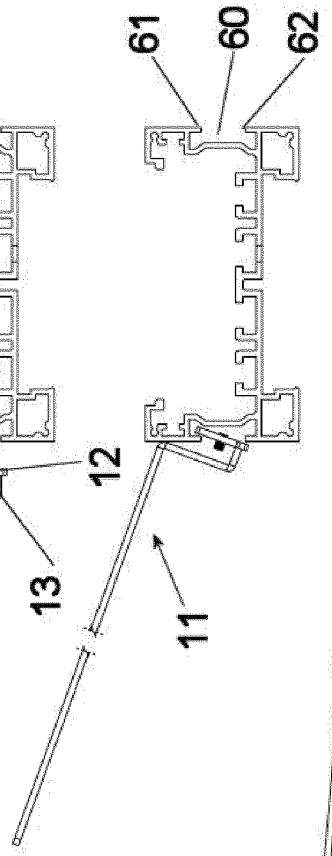


FIG. 6C

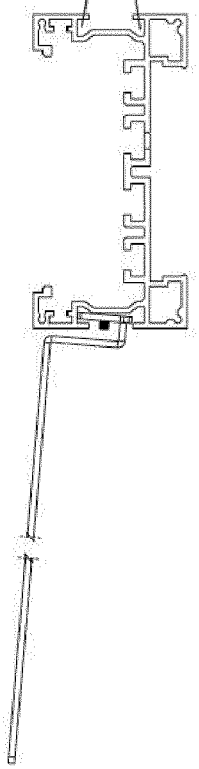


FIG. 6D

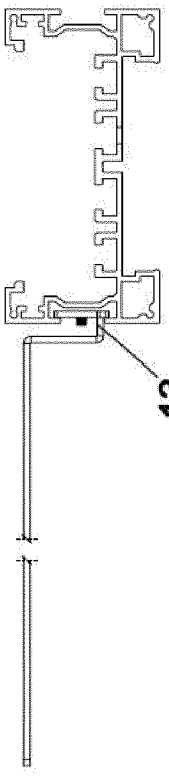
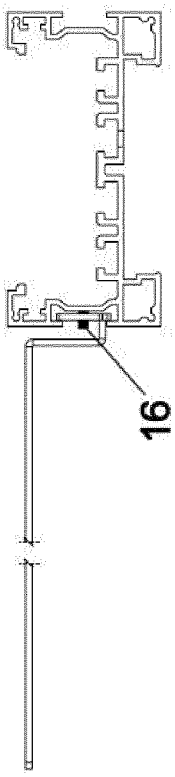


FIG. 6E



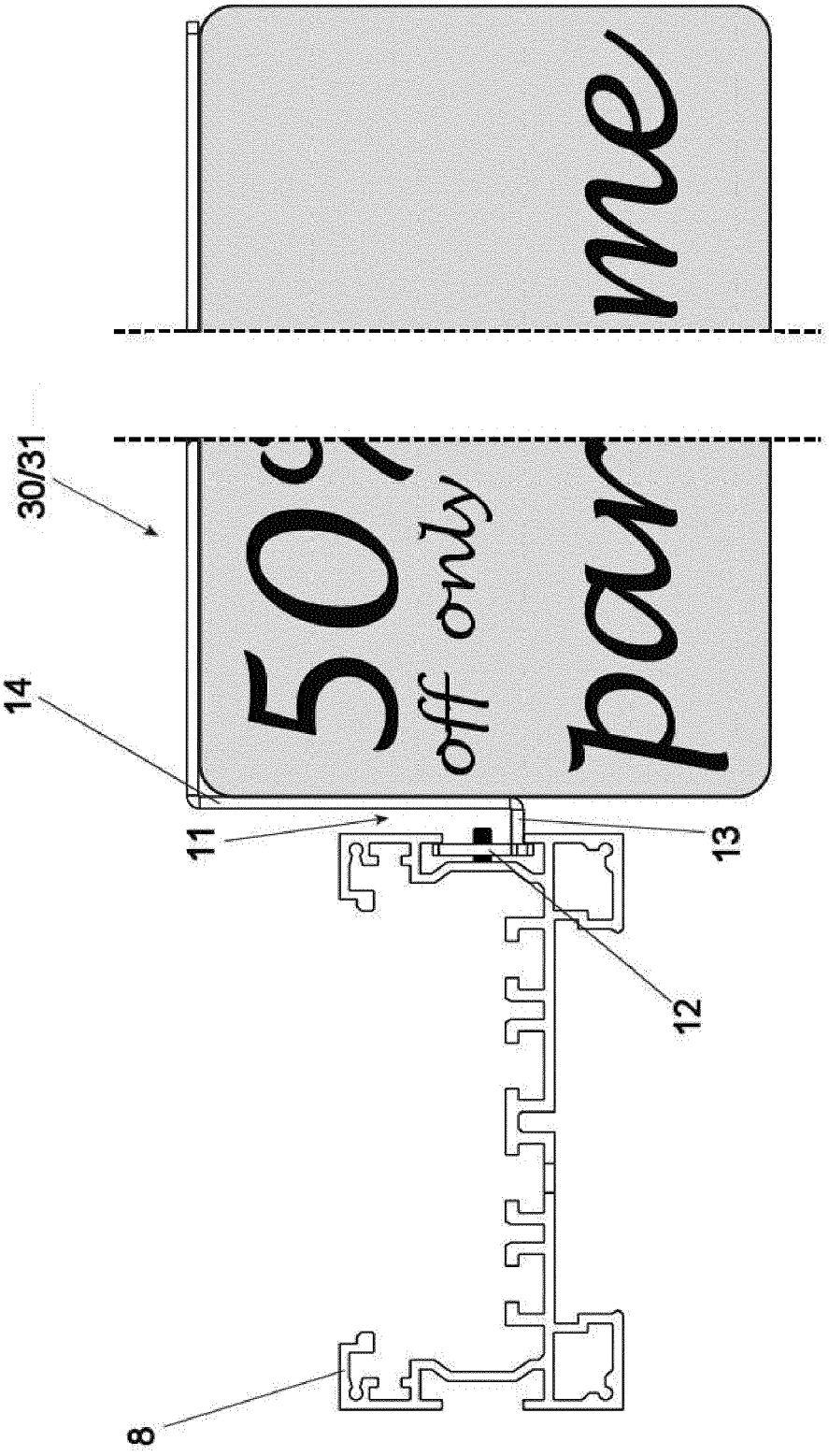


FIG. 7

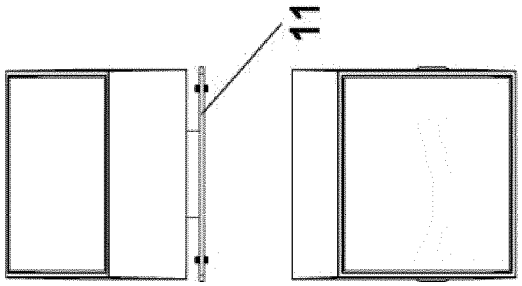


FIG. 8A

FIG. 8B

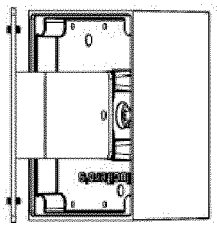


FIG. 8C

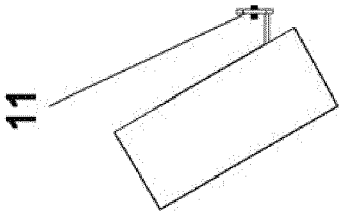


FIG. 8D

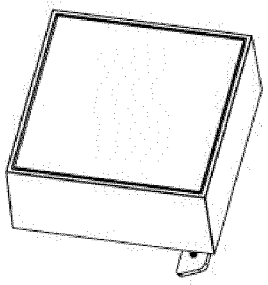


FIG. 8E

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EUROPEAN SEARCH REPORT

Application Number
EP 21 15 6183

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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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	21 June 2021	Menn, Patrick

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