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## (54) LIGHT GUIDING SYSTEM COMPRISING A SHAFT ARRANGEMENT, AND METHOD OF PROVIDING SUCH A SHAFT ARRANGEMENT IN A MOUNTED CONDITION

(57) A light guiding system (1) is provided to form a shaft arrangement (6) which may create a light conduit between an inclined roof of a building and an interior building room with a ceiling. The light guiding system (1) comprises a roof module (4), a ceiling module (5), and the shaft arrangement (6). Two or more of the sections (61, 62, 63, 64) are formed as a piece of cloth of a flexible cloth material from a number of non-coherent parts.

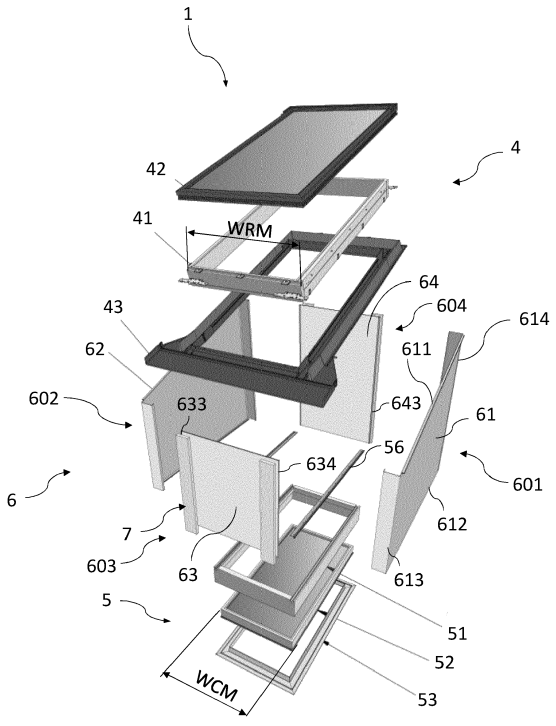


Fig. 3

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## Description

### Technical Field

**[0001]** The present invention relates to a light guiding system of the kind mentioned in the preamble of claim 1. The invention furthermore relates to a method of providing such a shaft arrangement in a mounted condition.

### Background Art

**[0002]** To provide light to an interior room of a building located directly under the roof of the building, roof windows are typically mounted in a roof surface of the roof, such that incident light falls into the room. In rooms in the building which are separated from the roof surface by a ceiling, façade windows are typically applied as there is no immediate access to the roof surface, or only artificial light if the room has no access to an outer wall. However, as many roof windows are typically installed in inclined or more or less flat roof surfaces, such roof windows provide for more light than a corresponding façade window and most often provide an unhindered view of the sky.

**[0003]** As the incidence of natural light is desirable for several reasons, it has been sought to provide access to natural light also to an interior room with a ceiling, typically located in the ground floor of the house. Thus, it is known to provide a system with a light conduit extending from a top unit located in or at the roof surface to a bottom unit positioned in the ceiling of the interior room. Examples of prior art systems are found in Applicant's European patents EP 1 756 481 B1, EP 1756482 B1 and EP 1 841 931 B1, which also provide for ventilation solutions, and from US 5,613,333, US 6,604,329, and US 2005/0081462 A1. Even though these arrangements provide for viable solutions, the provision of the light conduit which must be installed in the roof structure renders the installation cumbersome and costly.

### Summary of Invention

**[0004]** With this background, it is therefore an object of the invention to provide a light guiding system by which the installation is rendered more flexible and cost-effective.

**[0005]** In a first aspect of the invention, this and further objects are achieved with a light guiding system with the features of the characterising portion of claim 1.

**[0006]** By forming the light guiding system of a plurality of non-coherent parts, a large degree of flexibility and cost-efficiency is achieved, since in principle any cross-sectional shapes and lengths of the light guiding system may be accommodated.

**[0007]** Forming at least two and possibly all sections of the shaft arrangement by parts of a piece of cloth of a flexible cloth material, a particularly flexible installation is provided. The configuration of the shaft arrangement may in principle be carried out independently of the configuration of other components of the light guiding system, including for instance a roof module and a ceiling module, depending on the field of application of the light guiding system, the distance between the ceiling and the roof, and of any inclination of the roof surface.

**[0008]** It is noted that the terms "parts" of the light guiding system and "sections" of the shaft arrangement in the mounted condition within the context of the present invention should be interpreted in its respective broadest sense. Thus, in addition to any number of parts having individual, distinguished edges facing each other in the mounted condition and thus coinciding with the respective sections of the formed shaft, also coherent parts are included in the definition, whether such parts are prejoined to form two or more adjacent sections in the finished shaft, or integrally formed, as long as at least two non-coherent parts are provided. Additionally, it is noted that by the term "section", within the context of the present invention, is meant a flat two-dimensional geometric surface, extending in a single plane and being substantially without depths or highs.

**[0009]** The shaft provided by the sections of the shaft arrangement in the mounted condition of the light guiding system defines a general longitudinal direction extending between the roof and a ceiling or inner wall of a building. Depending on the configuration, the longitudinal direction may be perpendicular to one or both of the roof and the ceiling or inner wall, but it is also conceivable that the longitudinal direction forms an angle other than 90°. A transverse direction of the shaft is defined as perpendicular to the longitudinal direction.

**[0010]** In a presently preferred embodiment, each part of said plurality of parts comprises two opposing first and second side edge portions, and wherein the first side edge portion of one part is adjacent to the second side edge portion of a neighbouring part in the mounted condition of the shaft arrangement such that the side edge portions are:

- overlapping,
- wrapped into each other,
- abutting, or
- located at a distance from each other,

to form corner edges of the shaft arrangement in the mounted condition of the light guiding system. This increases the flexibility in designing the light guiding system even further, since different solutions may be selected depending on the installation requirements at the specific field of application.

**[0011]** The light guiding system may in principle be used wherever there is a need for guiding light from one location to the other, but is particularly advantageous when, in the mounted condition, the light guiding system is configured to provide a light conduit between a roof of a building and an interior building room with a ceiling, the shaft arrangement of the light guiding system extending between a top at the roof and a bottom at the ceiling.

**[0012]** In order to facilitate the installation process, the top of the shaft arrangement is, in a presently preferred embodiment, connected to a frame at the roof and/or the bottom of the shaft arrangement to a frame at the ceiling. Such a frame renders the connection of the shaft arrangement to the roof and/or the ceiling easier, and also provides stability to light guiding system during installation and in the mounted condition.

**[0013]** In one development of this presently preferred embodiment, the frame at the roof is a roof module frame of a roof module comprising a roof module pane, said roof module frame defining a length and a width of the roof module in a roof module plane and being configured to be mounted in a surface of the roof in the mounted condition, with the roof module plane substantially parallel to the roof surface, said roof module optionally comprising an openable roof module sash encasing the roof module pane. Such a roof module makes it possible to provide an easy-to-install cover of the light guiding system and thus has a positive impact on the entire installation process and the performance of the light guiding system in use.

**[0014]** In an additional or alternative development of this presently preferred embodiment, the frame at the ceiling is a ceiling module frame of a ceiling module, said ceiling module frame defining a length and a width of the ceiling module in a ceiling module plane and being configured to be mounted in the ceiling in the mounted condition, with the ceiling module plane substantially parallel to the ceiling, said ceiling module optionally comprising a pane, preferably an insulating pane, more preferably encased in a ceiling module sash openable relative to the ceiling module frame. In addition to facilitating installation, this also provides for added flexibility in the design of the light guiding system according to for instance building regulations including insulation requirements. Specifically, the configuration of the ceiling module may be chosen to form only a single frame in the ceiling, thus forming a base for the shaft arrangement but being otherwise open, leaving an unimpeded view to the roof module through the interior of the shaft. Alternatively, an opaque panel may be mounted in the frame, thus admitting light into the interior room. In case the ceiling module comprises a pane, preferably an insulating pane, the ceiling module of the system has been found to insulate the interior very efficiently from the loft in a comparably cheap manner. This is of particular advantage if the shaft arrangement runs through a not well insulated space. In case there is no ceiling module, or a ceiling module with no insulating pane, insulation surrounding the shaft arrangement is typically provided for.

**[0015]** Even though the light guiding system may in principle be used for forming shaft arrangements of an arbitrary cross-sectional shape, it is presently preferred that the cross-sectional shape of the shaft arrangement in the mounted condition is substantially rectangular. This makes it possible to fit for instance standard roof windows of a variety of sizes at the top and/or bottom of the shaft arrangement, i.e. in the roof and/or in the ceiling. The light guiding system may thus be seen as providing an add-on kit to supplement a product range. The number of parts in the plurality of non-coherent parts may thus be two, three or four to form four sections of the shaft arrangement in the mounted condition. Of the plurality of parts, two, three or four parts may comprise a piece of cloth of a flexible cloth material. In the finished shaft arrangement, the parts of flexible cloth material thus constitute two, three or all four sections.

**[0016]** Since it is often desirable to provide openings of differing sizes and dimensions in the roof and the ceiling, respectively, the cross-sectional shape of the shaft arrangement in the mounted condition may be non-uniform, preferably diverging, from the top to the bottom. This provides for the possibility of having a large incidence of natural light even from a relatively small opening in the roof, the shaft arrangement thus forming a pyramidal frustum shape in the mounted condition.

**[0017]** In a further development of this presently preferred embodiment, a width of the shaft arrangement at the top substantially corresponds to a width of the shaft arrangement at the bottom. This configuration makes it possible to install the light guiding system in roof structures including rafters or a framework of roof trusses, since the entire shaft arrangement is accommodated between neighbouring rafters or trusses.

**[0018]** The shaft arrangement does not necessarily fulfil the requirements to a geometrically picture-perfect rectangle in cross-section, but a slight rounding at the edges is foreseen as well. Similarly, the edges may be slightly curved without deviating from the fundamental principles underlying the invention

**[0019]** The roof light system according to the invention is applicable to a variety of configurations of the roof module, the shaft arrangement and the ceiling module

**[0020]** In a further presently preferred embodiment, the shape of each part of said plurality of non-coherent parts is quadrilateral, including being shaped as a trapezoid, a trapezium, a parallelogram and a rectangle. That is, opposing edge portions of each part may be parallel or non-parallel and makes it possible to form sections of the finished shaft arrangement within a wide range of shapes and dimensions.

**[0021]** Preferably, at least some parts of said plurality of non-coherent parts has over-dimensions relative to the respective shaft section of the shaft arrangement in the mounted condition of the light guiding system, preferably including an extended portion at one or two side edge portions and/or a surplus length portion at a top or bottom edge portions. This increases the scope of the range of shapes and dimensions of the shaft arrangement that may be accommodated by the light guiding system.

**[0022]** In order to enhance corner edges of the shaft arrangement in the mounted condition, a sealing strip may be provided. In addition to cover any space present between neighbouring sections, such a sealing strip may

also improve the smoothness of the sections.

**[0023]** In an alternative embodiment, the shaft arrangement comprises two parts of a substantially U-shaped configuration and which are configured to overlap partly in the mounted condition to form the side sections of the shaft arrangement, the first end section being formed from one part and the second end section from the other part.

**[0024]** In a further alternative embodiment, the shaft arrangement comprises four parts of a shape substantially corresponding to the shape of the respective shaft section of the shaft arrangement in the mounted condition, preferably comprising three parts of flexible cloth material and one part of a rigid material.

**[0025]** In a second aspect of the invention, a method of providing a shaft arrangement of a light guiding system is provided.

**[0026]** Other presently preferred embodiments and further advantages will be apparent from the subsequent detailed description and drawings.

## Brief Description of Drawings

**[0027]** In the following description embodiments of the invention will be described with reference to the schematic drawings, in which

Fig. 1 is an isometric view of a roof structure, with the roofing removed for clarity, and in which a light guiding system in an embodiment of the invention is shown in its mounted position;

Fig. 2 is a side view of the light guiding system of Fig. 1;

Fig. 3 is an exploded perspective view of details of a light guiding system in an embodiment of the invention;

Fig. 4 is a partial perspective view of details of the lower right-hand corner of a light guiding system in an embodiment of the invention during a step of installation;

Fig. 5 is a view corresponding to Fig. 4, on a larger scale, with parts of the roof structure removed for clarity;

Fig. 6 is a schematic cross-sectional view of details of a roof module frame and of a shaft arrangement of an embodiment of the light guiding system;

Fig. 7 is a perspective view of a detail of the embodiment of Fig. 6;

Fig. 8 is a schematic cross-sectional view of details of a ceiling module frame and of a shaft arrangement of an embodiment of the light guiding system, during a step of installation;

Fig. 9 is a view corresponding to Fig. 8, in a mounted condition;

Fig. 10 is a partial perspective view seen from the inside of details of the lower half of a light guiding system in an embodiment of the invention during a step of installation;

Fig. 11 is a partial perspective view corresponding to Fig. 10, in another step of installation;

Figs 12a and 12b are partial perspective views of details of the shaft arrangement during steps of installation;

Fig. 13a, 13b and 13c are partial perspective views of details of the shaft arrangement during further steps of installation;

Fig. 14 is an end view, on a larger scale, of an embodiment of the shaft arrangement with a support assembly;

Fig. 15 is a schematic side view of a side section of the shaft arrangement in an embodiment of the invention, indicating side and bottom edges in the supply and the mounted conditions, respectively;

Fig. 16 is a cross-sectional view of details of a ceiling module frame and a shaft arrangement of an embodiment of the light guiding system according to the invention, in the mounted condition;

Fig. 17 is a view corresponding to Fig. 16, of an alternative embodiment of the light guiding system according to the invention, with a more simple configuration of the roof module;

Fig. 18 is a schematic side view of an alternative configuration of the light guiding system in the mounted condition;

Figs 19a to 19d are schematic views of a further alternative embodiment of the shaft arrangement of the light guiding system according to the invention;

Fig. 20 is a schematic view of a yet further alternative embodiment of the shaft arrangement of the light guiding system according to the invention;

Fig. 21 is a side view, on a larger scale, of a detail of the light guiding system according to the invention; and

Fig. 22 is a perspective view of an embodiment of the light guiding system in which the ceiling module sash is connected to the ceiling module frame in a hinged connection.

## Description of Embodiments

**[0028]** In the figures of the drawings, embodiments of a light guiding system according to the invention are shown.

**[0029]** Referring initially to Fig. 1, a mounted light guiding system 1 according to a first embodiment of the invention is shown. The light guiding system 1 is mounted in a roof structure of an inclined roof generally designated 2 within a framework of trusses 21, 22, 23, 24, counter-battens 25, battens 26 and a vapour barrier 27. The trusses 21, 22, 23, 24 form, in a manner known *per se*, the load-bearing structure of the roofing (not shown) and the counter-battens 25 are arranged in parallel to the trusses, either on the same line as the trusses or offset therefrom. In the shown figure the battens 26 of the roof 2 are arranged perpendicularly to the counter-battens 25, yet the arrangement thereof can also be in any other plane di-

rection. The light guiding system 1 can be mounted centrally in the roof 2, as shown in the drawing figures, or at the top edge of the roof 2, at the lower part of the roof 2 or at the outer edges of the roof 2. There may be more than one light guiding system 1 installed in the inclined roof 2. The light guiding system 1 is here shown installed in an installed roof 2 as will be described in further detail below. The light guiding system 1 is also applicable to flat roofs, however.

**[0030]** Turning now to Fig. 2 and Fig. 3, a light guiding system 1 according to the first embodiment of the invention is shown. The light guiding system 1 is configured to provide a light conduit between the inclined roof 2 of a building and an interior building room 3 with a ceiling 31.

**[0031]** As such, the light guiding system could in principle comprise only a shaft arrangement with a plurality of shaft sections. In the embodiment shown, the shaft arrangement is generally designated 6. To form the shaft arrangement 6 of the light guiding system, a plurality of at least two, here four, non-coherent parts 601, 602, 603, 604 is provided. Of the plurality of non-coherent parts, two, three or even all four parts comprise respective pieces of cloth of a flexible cloth material, and at least two shaft sections of the finished shaft arrangement 6, i.e. in the mounted condition, are constituted by the parts of flexible cloth material.

**[0032]** The light guiding system 1 here comprises a roof module 4 with a roof module frame 41 and a roof module pane 42. The roof module frame 41 defines a length LRM and a width WRM of the roof module in a roof module plane and is configured to be mounted in a surface of the roof 2, e.g. connected to counter-battens 25 and/or the battens 26. Referring briefly to Fig. 4, a mounting bracket 44 is shown for installation of the roof module 4 on battens 26 of the roof 2. The mounting bracket 44 might be configured to fit to battens 26 of different sizes and comprise holes for protruding means such as screws or other attachment means. Depending on the size or the weight of the roof module 4, the amount of mounting brackets 44 can be increased but typically comprise one mounting bracket 44 at each corner. The roof module pane 42 may comprise any at least partially translucent panel element of a suitable material. Typically, the roof module pane 42 comprises a glazing unit with one or more clear sheets of glass or a plastic material.

**[0033]** In a mounted condition of the light guiding system 1, the roof module plane is substantially parallel to the surface of the roof 2. The light guiding system 1, in the embodiment shown, further has a ceiling module 5 with a ceiling module frame 51. In the embodiment shown, the ceiling module 5 is also provided with a ceiling module pane 52. The ceiling module frame 51 defines a length LCM and a width WCM of the ceiling module 5 in a ceiling module plane and is configured to be mounted in the ceiling 31, e.g. connected to the trusses 21, 22, 23 and 24. In the mounted position, the ceiling module plane is substantially parallel to the ceiling 31.

**[0034]** As mentioned in the above, the light guiding system 1 comprises the shaft arrangement 6, which in the embodiment shown extends between the roof module 4 and the ceiling module 5. In the mounted condition, the shaft arrangement 6 is defined by two side sections 61, 62, a first end section 63 and a second end section 64.

**[0035]** The side sections 61, 62 are formed from a first part 601 and a second part 602, respectively, of which only the first part 601 will be described in detail below and with particular reference also to Fig. 15. The end sections 63 and 64 are configured to be formed from a third part 603 and a fourth part 604.

**[0036]** The first part 601 has a top edge portion 611 with a length which either substantially corresponds to or exceeds a length of the roof module 4 such that the corresponding side section 61 of the shaft arrangement 6 in the mounted condition extends along substantially the entire length of the roof module 4. The first part 601 configured to form the side section 61 also comprises a bottom edge portion 612 with a length either substantially corresponding to or exceeding a length of the ceiling module 5 such that the corresponding side section 61 of the shaft arrangement 6 in the mounted condition extends along substantially the entire length of the ceiling module 5. The first part 601 further has a first side edge portion 613 and a second side edge portion 614 such that the first side edge portion 613 is intended to be positioned adjacent to a second side edge portion 634 of a neighbouring part, i.e. here the third part 603 configured to form end section 63. Correspondingly, the second side edge portion 614 is intended to be positioned adjacent to a first side edge portion 641 of the fourth part 63. The end sections 63, 64 and the side sections 61, 62 in the mounted state form the shaft arrangement 6 of the light guiding system according to the invention, which in the embodiment shown extends between the roof module 4 and the ceiling module 5.

**[0037]** Each of the first and second end sections 63, 64 of the light guiding system 1 is substantially rectangular in the mounted condition and has a predefined width substantially corresponding to the width WRM of the roof module 4 and the width WCM of the ceiling module 5. The width WRM of the roof module 4 is substantially equal to the width WCM of the ceiling module 5.

**[0038]** The configuration of the shaft arrangement 6 may be chosen in any suitable manner as long as at least two of the sections 61, 62, 63, 64 of the shaft arrangement each comprises a piece of cloth, the cloth being of a suitable flexible cloth material. The person skilled in the art will be aware of suitable materials including for instance plastic materials. In the embodiment shown, there are two sections formed by a piece of cloth, namely the side sections 61, 62.

**[0039]** In the embodiment shown, tightening means are provided to hold the section or sections comprising a piece of cloth of flexible cloth material between the roof module and the ceiling module in a stretched state in the mounted condition, i.e. in the longitudinal direction of the shaft formed by the shaft arrangement 6. Such tightening

means may be present at several positions of the components of the light guiding system, typically at the roof module, the ceiling module and/or in the shaft arrangement itself. Here, tightening means comprising tightening elements 45, 55, 56, 65, 66 to be described in further detail below are provided to hold the two side sections 61, 62 between the roof module 4 and the ceiling module 5 in a stretched state.

**[0040]** Although not shown in detail in Figs 2 and 3, the light guiding system 1 furthermore comprises a support assembly 7 in the embodiments shown, to support the shaft arrangement 6 in the mounted condition by connecting the roof module 4 with the ceiling module 5 by means of said support assembly 7. In principle, the support assembly could have a simple configuration including for instance only four wires extending between opposite corners of the roof module 4 and the ceiling module 5, respectively.

**[0041]** The terms "left-hand", "right-hand" etc. are used for facilitating the reading and is not to be considered limiting. In the present context, the left-hand side is the side of the light guiding system seen from the inside and in the direction from the high end to the low end such that the left-hand side section is the side section denoted 61.

**[0042]** The terms "mounted condition" and "supply condition" should be interpreted in their broadest sense. Generally, the mounted condition includes such conditions where the roof module 4 is positioned in the roof 2, the ceiling module 5 in the ceiling 31 and the shaft arrangement 6 extends between the roof module 4 and the ceiling module 5. Not all elements need be in their final conditions for a condition to qualify as a mounted condition. Correspondingly, the supply condition encompasses the conditions which the parts of the kit for forming the light guiding system can have during transportation and assembly.

**[0043]** The term "section" is generally to be understood broadly. In the present context, the sections of the shaft arrangement are to be considered separate units which may or may not be joined at their respective side edges. In particular adjacent side edge portions of neighbouring parts may have the following configurations in the mounted condition:

- overlapping,
- wrapped into each other,
- abutting, or
- located at a distance from each other.

**[0044]** In all configurations of this embodiment, adjacent side edge portions form corner edges 6a, 6b, 6c, 6d of the shaft arrangement 6 in the mounted condition.

**[0045]** It is common to all of the embodiments that each section extends substantially between the roof module and the ceiling module. It is however conceivable to provide the light guiding system with a shaft arrangement which has a shorter length, for instance being connected to an adapter piece forming part of a frame at the roof and/or the ceiling.. It is furthermore common to all of the embodiments that each individual section may be tailored to the specific configuration of the roof light system. While the two side sections are typically adapted to have the same shape and dimensions, the shape and dimensions are typically different from the shape of the end sections. The end sections, while being both rectangular, typically have different lengths as they need to be adjustable to different heights at the depending on the roof inclination. The only exception is a configuration in which the roof module and the ceiling module are parallel to each other and the side sections are rectangular, that is when the shaft formed by the shaft arrangement is a prism.

**[0046]** In the embodiments shown in the drawings, the third and fourth parts 603 and 604 comprise pieces of cloth of a flexible cloth material as well, however these parts also comprise rigid elements such that the first and second end sections 63, 64 of the finished shaft arrangement 6 are not constituted solely of flexible material, as opposed to the side sections 61, 62. Thus, in addition to flexible pieces of cloth material, the support assembly 7 comprises that the flexible cloth material of each of the first and second end sections 63, 64 is connected to a plate of board material. Alternatively, the first and second end sections 63, 64 themselves are formed as plates of a board material such that the end sections 63, 64 are rigid in themselves. The board material can be made of any suitable material which provides the necessary stability, e.g. plastic, wood, styrene, organic fiber or insulation material. As a further alternative, the first and second end sections 63, 64 are formed as pieces of cloth of flexible cloth material as well, or one of the end sections as a piece of cloth of flexible cloth material and the other as a rigid element.

**[0047]** The support assembly 7 is here furthermore provided with a set of brackets 71, 72, 73, 77. The brackets 71, 72, 73, 77 are connected to or connectable to the roof module frame 41 and to the ceiling module frame 51. Thus the brackets 71, 72, 73, 77 may be connected to the roof module frame 41 in the supply condition, or be provided separately and configured to be connected to the roof module frame 41 during installation. Furthermore, a set of four corner posts 81, 82, 83, 84 are fastened to the set of brackets to extend from the ceiling module 5 to the roof module 4 in the mounted condition. The corner posts 81, 83 can be adjusted in length to correspond the length of the shaft arrangement 6. Additionally or alternatively, the set of brackets 71, 72, 73, 77 can be formed manually to extend in the desired direction before installing the corner posts 81, 82, 83, 84. The corner posts 81, 82, 83, 84 can be fastened to the set of brackets 71, 72, 73, 77 by any means of protruding or non-protruding elements, e.g. clip-on or screws.

**[0048]** In order to bring the light guiding system from a supply condition to a mounted condition to provide a light conduit between a roof surface of a building and a ceiling or inner wall of an interior building room, installation of the light guiding system 1 in the embodiment de-

scribed in the above will be described in some detail.

**[0049]** Following the steps of providing the roof module 4 with its roof module frame 41 and roof module pane 42, the ceiling module 5 with its ceiling module frame 51 and ceiling module pane 52, the shaft arrangement 6, the tightening means, and the support assembly 7 have been provided, an aperture in the roof surface is formed and an aperture in the ceiling. The roof module 4 is mounted in the aperture in the roof surface. The ceiling module 5 is mounted in the ceiling and the shaft arrangement 6 is mounted to extend between the roof module 4 and the ceiling module 5. The mounted condition is attained by connecting the top edge portions 611 of the side sections 61, 62 to the roof module 4, connecting the bottom edge portions 612 to the ceiling module 5, and by connecting the end sections 63, 64 to extend between the side sections 61, 62. The cloth material for the side sections 61, 62 and end sections 63, 64 can in principle be attached to the roof module 4 and ceiling module 5 by any suitable fixing means, e.g. screws or staples. It may additionally or alternatively be said that the order of installing the roof module 4 and the ceiling module 5 is independent from another.

**[0050]** In Fig. 5 and Fig. 6, an arrangement for connecting the side sections 61, 62 to the roof module 4 is shown. To this end, the light guiding system 1 comprises a set of connector clips 45 configured to be fastened to a respective side member 411 of the roof module frame 41. In the mounted condition it is arranged so that the top edge portion 611 of each side section 61, 62 is connected to the roof module frame 41 by the set of connector clips 45. In order to increase the retention of the top edge portion 611 in the connector clips 45, the top edge portion 611 of each side section 61 may as shown be connected to a top cloth rail 65, or the cloth may be rolled up on itself such that it forms a durum bar-like structure. The top cloth rail 65 has a length substantially corresponding to the length LRM of the roof module 4. The top cloth rail 65 and the top edge portion 611 of each side section 61 are held on the respective side member 411 by a set of for instance two to six connector clips 45. The advantage of this arrangement is an easy but tight connection of the side sections 61, 62 to the roof module frame 41. It also provides easy replacement of the side sections 61, 62 by new side sections 61, 62 if required. The dimensions of the top cloth rail 65 can be adapted to the thickness and material used for the side sections 61, 62. The cross section of the top cloth rail 65 can be adapted to match the dimensions of the connector clips 45 and can e.g. be circular, round, triangular or rectangular. The connector clips 45 might furthermore be attached to the side member 411 by attachment means, e.g. glue, nails or screws.

**[0051]** Fig. 7 shows the connector clip 45 for fastening side sections 61, 62 in more detail. The connector clip 45 comprises a main portion 451, a flange portion 452 at one end of the main portion, a bent retention portion 453 at the other end, and a grip portion 454 adjoining the bent retention portion. It may additionally or alternatively be said that the proportions of the portions can be adapted to fasten side sections 61, 62 of different thickness or material. The connector clip 45 can be made of any material suitable to fasten the side sections 61, 62, e.g. any plastic or metal. Depending on the length of the clip 45, the clip 45 can contain more than one hole for connection means, e.g. screws, such as 2, 3 or more holes.

**[0052]** In the embodiment shown, the first and second parts 601, 602 configured to form each side section 61, 62 of the shaft arrangement 6 is each provided with over-dimensions in the supply condition. In the mounted condition, the piece of cloth of the first and second parts 601, 602 has dimensions exceeding the dimensions of the shaft side sections, and has extended portions 615, 616 extending beyond the respective side edge portions 613, 614, and a surplus length portion 617 extending beyond the bottom edge portion 612 of the first part 601, and a surplus length portion 618 extending beyond the top edge portion 611 of the first part 601. An overview of the configuration and the various portions of the first part 601 configured to form one of the side sections is shown in Fig. 15.

**[0053]** Following attachment of the side sections 61, 62 to the roof module 4 as described in the above, the side sections 61, 62 are connected to the ceiling module 5.

**[0054]** Reference is now made to Figs 8 and 9, which show an embodiment of the light guiding system 1, wherein the tightening means comprise an expandable spring 66, e.g. a foam spring 66. Other types of springs which are capable of performing an expandable action are also conceivable. The spring 66 is connected to the bottom edge portion 612 of each side section 61, 62 of the shaft arrangement 6. In this context, the term "connected" is intended to encompass contact with and subsequent wrapping of the cloth material. Depending on the length of the ceiling module 5, the number of springs 66 used in the installation can vary, but is typically a single spring 66 extending throughout the length.

**[0055]** In the embodiment shown in Figs 8 and 9, a groove profile 55 is connected to a side member 511 of the ceiling module frame 51. A similar groove profile is connected to the opposite side member 513. The groove profiles 55 may be formed in or, as shown, connected to the member 511 of the ceiling module frame 51. Each groove profile 55 has a groove section 551, a fastening section 552, and a length substantially corresponding to the length LCM, or the width WCM in case also the end sections are to be connected to the ceiling module in this manner, of the ceiling module 5. In the mounted condition, the bottom edge portion 612 of each section 61, 62 of a piece of the flexible cloth material is connected to the ceiling module frame 51 in the groove profile 55. The bottom edge portion 612 of the side section 61 is folded in the groove profile 55 and in contact with the expandable spring 66. The groove profiles 55 can be made of any material e.g. plastic or metal. Preferably the groove profiles 55 have a length corresponding to ceiling module

sash 53.

**[0056]** Also shown in Figs 8 and 9 is a compression profile 56. The compression profile 56 is configured to be connected to the groove profile 55 and has a compression section 561 and a fastening section 562. The compression profile 56 retains the expandable spring, e.g. a foam spring 66, in the groove section 551 of the groove profile 55. After mounting, that is once the bottom edge portion 612 of the side section 61 together with the expandable spring 66 is retained in the groove section 551, the bottom edge portion 612 is held to the member 511 of the ceiling module frame 51 in a resilient connection. The compression profile 56 can be made of any suitable material, e.g. plastic or metal. The number of installed compression profiles 56 might depend on the number of installed springs 66. Alternatively, the compression profiles 56 have a length corresponding to the length of the springs 66 or longer.

**[0057]** The steps of providing and connecting the support assembly 7 to the roof module 4 and the ceiling module 5 is described in the following.

**[0058]** Referring now to Fig. 10 and Fig. 11, it can be seen that the set of brackets 71, 72, 73, 77 are connected to the roof module frame 41 and to the ceiling module frame 51, respectively, such that one bracket is connected to each corner of the roof module frame 41 and the ceiling module frame 51. Also indicated in these figures are a side member 411 and bottom member 412 of the roof module frame 41, and a first end member 512 adjoining the side member 511 of the ceiling module frame 51. The roof module frame 41 has an opposite side member (not indicated) corresponding to side member 411 and the ceiling module frame 51 has a second end member 514 opposite the first end member 512.

**[0059]** After cutting the corner posts 81, 82, 83, 84 to the appropriate length, each corner post 81, 82, 83, 84 is mounted so that one end of the corner post 81, 82, 83, 84 is connected to the ceiling module 5 and that another end of the corner post 81, 82, 83, 84 is connected to the roof module 4. Thus, the four corner posts of which a first corner post 81 of the support assembly 7 is shown, extend from the ceiling module 5 to the roof module 4 in the mounted condition. Referring briefly to Figs 13a, 13b and 13c, a second corner post 82, a third corner post 83 and a fourth corner post 84 are shown as well. Each of the corner posts 81, 83 is fastened to a sub-set of brackets 71, 72, 73, 74, for instance as shown corner post 81 extending between brackets 71 and 72. Alternatively or additionally it can be said that the brackets 71, 72, 73, 74 are made of any material which provides good stability but also can be formed to correspond a configuration suitable to install a corner post 81 when the angle of the brackets 71, 72, 73, 74 in their original state is not compatible.

**[0060]** Referring now to Fig. 12a and Fig. 12b, it is shown how the flexible cloth material of the first part 601 intended to form the side section 61 of the shaft arrangement 6 is wrapped about the corner post 81 with its extended portion 615. When mounted, the extended portion 615 is pulled taut in a direction corresponding to the transverse direction of the shaft formed by the shaft arrangement 6 in the mounted condition and subsequently fixed in place to the corner post 81. Suitable fixing means can be staples, brackets or nails and screws, possibly with washers. The first part 601 intended to form the side section 61 further can comprise vertical lines to indicate equal pulling or stretching of the cloth on the side facing away from the shaft. Once the first extended portion 615 has been pulled taut at the first side edge portion 613, the extended portion 616 at the high end of the shaft arrangement 6 is pulled taut at the second side edge portion 614. The first side edge portion 613 and the second side edge portion 614 are subsequently fixed in place to the respective corner posts 81.

**[0061]** Referring now jointly to Figs 13a to 13c and Fig. 14, mounting of the third and fourth parts 603, 604 intended to form the end sections 63, 64 in an embodiment of the light guiding system 1 will be described. In this embodiment, the support assembly 7 comprises that the third part 603 and the fourth part 604 intended to form each end section 63, 64 of the shaft arrangement 6 is provided with a plate 93. The plate 93 of the respective third and fourth part 603, 604 is covered on the shaft-facing side by a piece of cloth 630, preferably of substantially the same flexible cloth material as the first and second parts 601, 602 forming the side sections 61, 62. It may additionally or alternatively be said that the length or width of the cloth material of the piece of cloth 630 exceeds the length or width of the plate 93, respectively. The piece of cloth 630 can be attached to the plate 93 by any suitable means of attachment, such as hook and loop fasteners, glue or staples.

**[0062]** As a further detail, it is noted that in the supply condition of the third and fourth parts 603, 604 configured to form the end sections 63, 64, the side edges 6301 of the piece of cloth 630 are not attached at corresponding side edges 931 of the plate 93. A strip of adhesive tape 933 covers the end section 63, 64. The side edges 6301 are preferably extending beyond the side edges 931 of the plate 93. In practice, each end sections 63, 64 may be formed as a plate of a suitable board material and the strips of adhesive tape 933 are fastened to the side edges 931 of the plate. The strips of adhesive tape are typically covered by a non-sticky release layer. Adhesive, of the same kind or of another kind, may be applied to the central portions of the plate between the strips of adhesive tape at the side edges, and a piece of cloth having an appropriate width, here wider than the width of the plate, is adhered to the plate. In this way, the piece of cloth 630 adheres to the central portions of the plate but is unattached at the edges 6301. The strip of adhesive tape 933 can contain predrilled holes or tape-free portions to receive connecting means for attachment of the end section 63, 64 to the corner posts 81, 83.

**[0063]** The third and fourth parts 603, 604 configured to form the end sections 63, 64 of the shaft arrangement

6 of the light guiding system 1 may be provided as single plates of board material in the supply condition. The width of the single plates of board material advantageously corresponds to the predefined width of the end sections 63, 64 in the mounted condition. It is also possible to cut the end sections 63, 64 from a single plate of board material which exceeds the combined lengths of the first and second end sections 63, 64 in the mounted condition. For practical reasons, such a single plate may be provided with a folding line in the area which is not to be used. The side of the single plates of board material facing the shaft can have prints with similar visual appearance as the cloth material used for the side sections 61, 62. The single plate of board material may have horizontal markings or pits to cut or break the material for fitting the length of the board to the length of the shaft, i.e. the respective height dimension between the first end member 512 of the ceiling module frame 51 and the bottom member 412 of the roof module frame 41 on the one hand, and between the second end member 514 and the top member 414 on the other.

**[0064]** As shown in Figs 13a to 13c, the end sections 63, 64 of the shaft arrangement 6 are mounted by fixing the end sections 63, 64 to the shaft facing side of the corner posts 81. The fixing of the end sections 63, 64 can be carried out by any suitable fixing means, e.g. staples, screws, glue, hook and loop. It may additionally or alternatively be said that the order of above steps for installing the shaft arrangement 6 are carried out independently from another.

**[0065]** After removing the strips of adhesive tape 933 the side edges 9321 of cloth are tucked in at the corners such that no visible edges of the cloth of material are present in the shaft. The remaining portions near the side edges 6301 are glued to the adhesive tape 933 to cover the fixing means which connect the plate 93 with the corner posts 81, 83. Additionally or alternatively, the side edges 6301 are glued to the adhesive tape 933 with the help of a suitable tool to push the side edges 6301 down on the glue. Excess portions of the side edges 6301 can be removed from the shaft arrangement after adhesion on the tape 933.

**[0066]** Fig. 13a, Fig. 13b and Fig. 13c show a further embodiment, where each side section 61, 62 is connected to a sub-set of a first and a second corner post 81, 82 and to a third and a fourth corner post 83, 84 respectively. Thereby the end section 63, 64 is connected to a subset of a first and a third corner post 81, 83, and to a second and fourth corner post 82, 84, respectively. The corner posts might have dimensions corresponding to e.g. circular, round, triangular or rectangular cross sections. The end section 63 can be attached to the corner posts 81, 82, 83, 84 by any fixing means such as glue, staples, screws, nails, or any other protruding or non-protruding connection elements. Additionally or alternatively it can be said that the end sections 63, 64 have predrilled holes for the connection elements.

**[0067]** Fig. 15 shows an overview of the left-hand side section 61 of an embodiment of the light guiding system 1 where each side section 61, 62 of the shaft arrangement 6 is shown in a supply condition. The piece of cloth has dimensions exceeding the dimensions of the shaft side sections in the mounted condition. In this configuration. the piece of cloth can have dimensions exceeding the dimensions of the side sections by more than 5 cm, more than 10 cm, more than 20 cm, or preferably more than 30 cm. It may additionally or alternatively be said that the exceeding dimensions of the cloth have openings which enable manual pulling of the cloth before subsequent fixing on the corner posts, or connected to end sections in cases in which no corner post is present. Thus, the piece of cloth of the first and second parts 601, 602 configured to form each side section 61, 62 has extended portions 615, 616 extending beyond the respective side edge portions 613, 614. In the supply condition, the piece of cloth here additionally has a surplus length portion 617 extending beyond the bottom edge portion 612 of the respective side section 61, 62. It may additionally or alternatively be said that a portion of the surplus length portion 617 differs from the remaining parts of the cloth with regard to thickness or surface texture adapted to the corresponding groove profile 55 and/or compression profile 56. The side sections may be provided as a roll of cloth, in which the piece of cloth to constitute the side section 61 is rolled up on a roll-up bar 67 or on itself. The roll-up bar 67 can be attached in parallel to the top edge portion of the side section 61. It may additionally or alternatively be said that the roll-up bar 67 can be removed after unrolling and installing the cloth and/or that the roll-up bar 67 can be connected to the roof module 4 during installation of the side sections 61, 62 to replace the top cloth rail 65 described in the above.

**[0068]** Fig. 16 shows another embodiment of the light guiding system where a trim profile 57 is provided. The trim profile 57 is connected to the ceiling module frame 51 by a set of clips 58. The trim profile 57 is here formed with a wall portion 571 adjoining a first flange portion 572 inserted below the clips 58 and a second flange portion 573 bridging the gap to the frame 51 of the ceiling module 5. The wall portion 571 extends from just above the pane 52 and inclined upwards into the shaft arrangement 6. The length of each trim profile 57 substantially corresponds to the length of the respective frame members of the ceiling module frame 51. In this way, a coherent trim profile frame is formed to hide the inner side of the frame members and any elements located therein, so that a visually unimpaired appearance is achieved in that a user looking up will experience a more smooth transition into the shaft arrangement 6 (not shown in Fig. 16).

**[0069]** In a further embodiment a ceiling trim frame 59 is connected to the ceiling module frame 51 to span the transition to the ceiling 31 in the mounted condition. It may additionally or alternatively be said that the ceiling trim frame 59 is supplied in a single piece with the dimensions of the ceiling module frame 51 or that the ceiling trim frame 59 consists of four units. The ceiling trim frame

59 can be attached to the ceiling module 5 by any means of protruding or non-protruding elements, e.g. clip-on or screws or magnets.

**[0070]** In one embodiment of the light guiding system, the ceiling module 5 comprises a ceiling module sash 53 which is hinged to the ceiling module frame 51, preferably at a side member 511 in a hinge connection 54. This arrangement allows the ceiling module sash 51 to swing out of the ceiling module frame plane in a mounted position. The hinge might be located at any suitable position to allow opening and closing of the ceiling module sash 51 and/or allow complete removal of the ceiling module sash 51 from the ceiling module, e.g. for cleaning or exchange of the window or ceiling module sash 51. A hinge in the ceiling module frame allows cleaning of the surfaces of the roof module pane, the ceiling module pane and the portions of the shaft arrangement. Furthermore, the arrangement enables maintenance of the light guiding system from the interior without being exposed to rain or other weather disturbances, and allows air circulation between the light guiding system and the interior to e.g. prevent a high degree of moisture in the light guiding system.

**[0071]** In yet another embodiment the ceiling module 5 comprises a locking mechanism. The locking mechanism is connected to the ceiling module frame 51 and the ceiling module sash 53, and enables to lock in place the ceiling module sash 53 relative to the ceiling module frame 51. The locking mechanism can for example be controlled by a key or a simple handle-bar. The locking mechanism furthermore can comprise several configurations where the ceiling module sash 53 can be locked in one or more configurations which enables air exchange between the interior room 3 and the shaft of the light guiding system 1.

**[0072]** In a further embodiment, the pane 52 of the ceiling module 5 of the light guiding system comprises two or three ceiling module pane layers. A light guiding system 1 with two or three ceiling module pane layers allows for improved insulation.

**[0073]** The angle between the roof module plane and the ceiling module plane typically lies in the interval of 0-45°, preferably 15-25°. It may additionally or alternatively be said that the light guiding system 1 can also be installed when the angle between the roof module plane and the ceiling module plane is lower than 15° or above 25°. In particular, it is noted that the roof module may be installed in a substantially flat roof, thus rendering the roof module plane substantially parallel with the ceiling module plane in the mounted condition. In a further embodiment of the light guiding system 1, the roof module 4 has a length LRM that its projected length is substantially the same as the length LCM of the ceiling module 5. It may additionally or alternatively be said that the LCM and/or LRM can be chosen independently from another. The ratio between LCM and LRM can be chosen as e.g. 1:2, 2:1, 1:1, 10:9, 10:8, 10:7, 10:6, 6:10, 7:10, 8:10 or 9:10. Houses where the angle between the roof and the ceiling is rather small, such as in the interval of 15-25°, often face high costs for installing a conventional roof window since the insulation of the loft area is complex and expensive. The advantage of the light guiding system of the present invention is that it provides roof light without the necessity of further insulation of the roof and loft area.

**[0074]** In an alternative embodiment of the light guiding system according to the invention, a ceiling module 1005 is of a more simple structure as shown in Fig. 17. Thus, the ceiling module 1005 only comprises a ceiling module frame 1511, whereas no pane or sash are present. As in the first embodiment described in the above, a shaft arrangement extends between a roof module and the ceiling module 1005. One or more sections of flexible cloth material is also here present and held to the roof module and ceiling module, here the holding includes tightening means as in the first embodiment, represented by a tightening element in the form of groove profile 1055. Furthermore, trim profile 1057, clip 1058 and ceiling trim frame 1059 are present.

**[0075]** Within the context of the present invention the term "frame" as used in connection with the ceiling module above should be interpreted as encompassing any structure capable of forming a suitable transition between the shaft and the ceiling. Hence, while a frame somewhat resembling a traditional roof window frame is indicated in the drawing figure, any other structures including for instance profiles, bars, lists or strips of an arbitrary material are conceivable as well.

**[0076]** Turning now to Fig. 18, a further detail of an embodiment of the light guiding system 1 is shown. According to this embodiment, a maximum ceiling module displacement D is defined as the projected distance between the roof frame bottom member 412 and the ceiling frame first end member 512. The shaft height H is defined as the maximal distance between the ceiling module frame second end member 514 and the top member 414 of the roof module 4. It may additionally or alternatively be said that the displacement D and the shaft height H are chosen independently from another. The module location and ratio between the lengths of the roof module 4 and the ceiling module 5 can influence the displacement D and the shaft height H. Therefore, the total volume of the shaft can be adapted depending on the location and the dimensions of the roof module 4 and the ceiling module 5.

**[0077]** Thus, the roof module 4 of the light guiding system may be offset from the ceiling module 5 so that the first end section 63 and/or the second end section 64 extends non-perpendicularly to the ceiling module plane. A non-perpendicular extension of one or both end section(s) 63, 64 from the ceiling module 5 can be in the range with any angle within 0-90 °, preferably within 70-90°. By arranging the roof module of the light guiding system offset from the ceiling module, the installation of the light guiding system is possible even if there are structural obstacles in the roof structure, meaning that the roof module or the ceiling module can be installed in a location

offset from another if the surrounding roof structures or other obstacles make this necessary. Furthermore, it enables to install light guiding systems where the projected length of the roof module differs substantially from the length of the ceiling module.

**[0078]** Referring to Figs 19a to 19d, showing a further alternative embodiment, the shaft arrangement 1006 comprises two shaft parts 1601, 1602. Each shaft part 1601, 1602 is of a substantially U-shaped configuration, including a bottom and opposed protruding legs. The material of the shaft parts 1601, 1602 may be chosen arbitrarily and needs not be identical; for instance, one shaft part 1601 could be formed from one flexible cloth material and the other shaft part 1602 from another material. It is also possible to include three parts instead, for instance two parts of a flexible cloth material, and one part of a board material. Bringing the shaft parts 1601, 1602 from the position in Fig. 19a to the position of Fig. 19b, the shaft parts are overlapped partly in that portions of the facing legs of the respective U-shape are put on top of each other to the desired shape. In case the shaft is to assume a uniform, rectangular shape throughout its height, the position of Fig. 19b corresponds to the mounted condition. If the final shape of the shaft arrangement is trapezoidal, one or both shaft part 1601 is placed at an angle to the other shaft part 1602 as shown in Fig. 19c, following which the shaft parts 1601, 1602 are cut at upper and lower cutting lines 1603, 1604. Alternatively, or additionally, reinforcement boards 1701, 1702 forming part of a support assembly are placed within the shaft. In the mounted condition, the side sections 1061, 1062 of the shaft arrangement are formed by the combined shape of the legs of the U-shape of the two shaft parts 1601, 1602, and the first end section 1063 is formed from the bottom of the one shaft part 1601 and the second end section 1064 from the bottom of the U-shape of the other shaft part 1602.

**[0079]** A further alternative embodiment is shown in Fig. 20, in which the shaft arrangement 2006 comprises four parts 2601, 2602, 2603, 2604 of a shape substantially corresponding to the shape of the respective shaft section 2061, 2062, 2063, 2064 of the shaft arrangement 2006 in the mounted condition. The side edge portions of the respective parts 2601, 2602, 2603, 2604 are shown at a slight distance from each other, but they could also be abutting. In the embodiment shown, three of the parts 2601, 2602, 2603 are made solely of flexible cloth material and one part 2604 of a rigid material, for instance as a board material, possibly covered by a piece of cloth of the same flexible cloth material as the other parts.

**[0080]** To cover the corner edges 6a, 6b, 6c, 6d of any of the shaft arrangements described in the above, a sealing strip 69 may be provided, a cross-sectional shape being shown in Fig. 21.

**[0081]** Finally, and turning now to Fig. 22, it is shown how, in a further embodiment of the light guiding system, the ceiling module sash 53 is hingedly connected to the ceiling module frame 51 of the ceiling module 5, here at the side member 511 by means of hinge connection 54, allowing the ceiling module sash 53 in a mounted position to swing out of the ceiling module frame plane. A lifting assembly may be provided to modulate the swinging movement of the ceiling module sash 53. The lifting assembly 10 can be configured to help the user operating the ceiling module sash 53 in a comfortable way, particularly when the ceiling module 5 is located in an interior building room 3 with a high ceiling 31. Furthermore, the lifting assembly can be configured to provide a smooth transition of the ceiling module sash 53 from an open to a closed configuration and vice versa. During closing of the module sash 53 the lifting assembly can be configured to ensure a smooth and silent operation.

**[0082]** The following is an itemised list of further embodiments:

S1. A light guiding system, wherein a support assembly (7) is provided to support the shaft arrangement (6) in the mounted condition.

S2. A light guiding system according to embodiment S1, wherein the support assembly (7) comprises a set of brackets (71, 72, 73, 77) configured to be connected to the roof module frame (41) and to the ceiling module frame (51), and a set of four corner posts (81) adapted to extend from the ceiling module (5) to the roof module (4) in the mounted condition.

S3. A light guiding system according to embodiment S2, wherein each side section (61, 62) is connected to a sub-set of a first and a second corner post (81), and to a third and a fourth corner post (83), respectively, and each end section (63, 64) is connected to a sub-set of a first and a third corner post (81, 83), and to a second and fourth corner post, respectively, each of the corner posts (81, 83) being fastened to a respective sub-set of brackets (71, 72, 73; 74).

S4. A light guiding system, wherein the light guiding system comprises a set of connector clips (45) configured to be fastened to a respective side member (411) of the roof module frame (41), and wherein the top edge portion (611) of each side section (61) is connected to the roof module frame (41) by the set of connector clips (45) in the mounted condition.

S5. A light guiding system according to embodiment S4, wherein each connector clip (45) comprises a main portion (451), a flange portion (452) at one end of the main portion, a bent retention portion (453) at the other end, and a grip portion (454) adjoining the bent retention portion.

S5. A light guiding system according to embodiment S4 or S5, wherein the top edge portion (611) of each side section (61) is connected to a top cloth rail (65) or forms a durum bar having a length substantially corresponding to the length (LRM) of the roof module such that the top cloth rail (45) with the top edge portion (611) of each side section (51) is held on the respective side member (411) by said set of connector clips (45) in the mounted condition.

S6. A light guiding system, wherein tightening means (45, 55, 56, 65, 66) are provided to hold said at least one section (61, 62, 63, 64) comprising a piece of cloth of flexible cloth material between the roof module (4) and the ceiling module (5) in a stretched state in the mounted condition, the tightening means preferably comprising a plurality of tightening elements including an expandable spring (66), such as a foam spring (66), in contact with, optionally wrapped in, a bottom edge portion (612) of a section (61, 62) of the shaft arrangement comprising a piece of flexible cloth material.

S7. A light guiding system according to embodiment S6, wherein the light guiding system furthermore comprises a number of groove profiles (55) formed in, connectable or connected to the respective member (511) of the ceiling module frame (51), each groove profile (55) including a groove section (551) and a fastening section (552), and having a length substantially corresponding to the length (LCM) or the width (WCM) of the ceiling module (5), and wherein the bottom edge portion (612) of each section (61) of a piece of flexible cloth material is connected to the ceiling module frame (51) in the respective groove profile (55) in the mounted condition, and the bottom edge portion (612) of the side section (61) is folded in the groove profile (55) and in contact with the expandable spring (66) in the mounted condition of the roof light system.

S8. A light guiding system, wherein the light guiding system furthermore comprises a compression profile (56) configured to be connected to the groove profile (55) and including a compression section (562) and a fastening section (562) so as to retain the expandable spring, such as the foam spring (66), in the groove section (551) of the groove profile (55) such that the bottom edge portion (612) is held to the respective member (511) of the ceiling module frame (51) in a resilient connection in the mounted condition.

S9. A light guiding system according to embodiment S1, wherein the support assembly (7) comprises a set of plates (93) of a board material which constitutes or is connectable to each of the first and second end sections (63, 64), and wherein each end section (63, 64) of the shaft arrangement (6) is provided in a supply condition, in which the plate (93) of the respective end sections (63, 64) is covered on the shaft-facing side by a piece of cloth (630), preferably of substantially the same flexible cloth material as the side sections (61, 62).

S10. A light guiding system according to embodiment S9, wherein side edges (6301) of the piece of cloth (630) covering the end sections (63, 64) are unattached at corresponding side edges (931) of the plate (93) and covered by a strip of adhesive tape (633) in the supply condition, the side edges (6301) preferably extending beyond the side edges (931) of the plate (93).

S11. A light guiding system, wherein the angle between a roof module plane and a ceiling module plane lies in the interval of 0-45°, preferably 15-25°.

S12. A light guiding system according to embodiment S11, wherein the roof module (4) has such a length (LRM) that its projected length is substantially the same as the length (LCM) of the ceiling module (5).

S13. A light guiding system according to embodiment S11, wherein the roof module (4) is offset from the ceiling module (5) such that the first end section (63) and/or the second end section (64) extends non-perpendicularly to the ceiling module plane.

S14. A light guiding system according to embodiment S13, wherein a maximum ceiling module displacement (D) is defined as the projected distance between the roof frame bottom member (412) and the ceiling frame first end member (512).

S15. A light guiding system, wherein each piece of cloth is rolled up on a roll-up bar (67), or on itself, in the supply condition

S16. A method, whereby a support assembly (7) is provided with a set of brackets (71, 72, 73, 77) which are connected to or connectable to a roof module frame (41) and to a ceiling module frame (51), and a set of four corner posts (81, 82, 83, 84) fastened to the set of brackets to extend from the ceiling module (5) to the roof module (4).

S17. The method of embodiment S14, whereby each side section (61, 62) of the shaft arrangement (6) is provided with over-dimensions in the supply condition, in which the piece of cloth has dimensions exceeding the dimensions of the shaft side sections in the mounted condition, comprising extended portions (615, 616) extending beyond the respective side edge portions (613, 614), and a surplus length portion (617) extending beyond the bottom edge portion (612) of the respective side section (61, 62) in the mounted condition, and whereby the step of connecting the support assembly to the roof module comprises the steps of:

mounting the corner posts (81), with one end of the corner post (81) connected to the ceiling module (5) and another end of the corner post (81) connected to the roof module (4),

pulling taut the extended portion (615) at first side edge portion (613) and the extended portion (616) at the second side edge portion (613) and subsequently fixing in place the first side edge portion (613) and the second side edge portion (613) to corner posts (81),

mounting the end sections (63, 64) of the shaft arrangement (6), by fixing the end sections (63, 64) to the shaft facing side of the corner posts (81).

S18. The method of embodiment S15, comprising the additional steps of providing each end section (63, 64) of the shaft arrangement (6), in the supply condition, as a plate (93) covered by a piece of cloth (630) of substantially the same flexible cloth material as the side sections (61, 62), in which side edges (6301) of the piece of cloth (630) covering the end sections (63, 64) are unattached at corresponding side edges (931) of the plate (93) and extend beyond the side edges (931) of the plate and covered by a strip of adhesive tape (933) in the supply condition, whereby the strips of adhesive tape (933) is removed and the side edges (931) of cloth are tucked in at the corners.

**[0083]** The invention is not limited to the embodiments shown and described in the above, but various modifications and combinations may be carried out.

List of reference numerals

**[0084]**

1 light guiding system
2 roof
21 truss
22 truss
23 truss
24 truss
25 counter-batten
26 batten
27 vapour barrier
3 interior building room
31 ceiling
32 wall
4 roof module
41 roof module frame
411 side member
412 bottom member
414 top member
42 roof module pane
43 flashing
44 mounting bracket
45 tigthening element / connector clip
5 ceiling module
51 ceiling module frame
511 side member
512 first end member
513 side member
514 second end member
52 ceiling module pane
53 ceiling module sash
54 hinge
55 tightening element / groove profile
551 groove section
552 fastening section
56 tightening element / compression profile
561 compression section
562 fastening section
57 trim profile
571 wall portion
572 first flange portion
573 second flange portion
58 clip (for trim profile)
59 ceiling trim frame
1005 ceiling module (alternative embodiment)
1055 tightening element / groove profile
1057 trim profile
1058 clip
1059 ceiling trim frame
1511 frame side member
6 shaft arrangement
601 first part
602 second part
603 third part
604 fourth part
61 side section (left-hand)
611 top edge portion
612 bottom edge portion
613 first side edge portion (low) of first part
614 second side edge portion (high) of first part
615 extended portion
616 extended portion
617 surplus length portion
618 surplus length portion
62 side section (right-hand)
63 first end section (low)
630 piece of cloth
6301 side edge of piece of cloth
633 first side edge portion of third part
634 second side edge portion of third part
64 second end section (high)
643 first side edge portion of fourth part
65 tightening element / top cloth rail
66 tigthening element / foam spring
67 roll-up bar
6a corner edge
6b corner edge
6c corner edge
6d corner edge
69 sealing strip
1006 shaft arrangement (alternative embodiment)
1601 first shaft part
1602 second shaft part
1603 upper cutting line
1604 lower cutting line
1061 side section
1062 side section
1063 first end section
1064 second end section
2006 shaft arrangement (further alternative embodiment)
2601 first part
2602 second part
2603 third part
2604 fourth part

2061 side section
2062 side section
2063 first end section
2064 second end section
7 support assembly
71 bracket
72 bracket
73 bracket
74 bracket
77 bracket
81 first corner post
82 second corner post
83 third corner post
84 fourth corner post
93 plate (of board material)
931 side edge of plate
933 strip of adhesive tape
1701 reinforcement board
1702 reinforcement board
LRM length of roof module
WRM width of roof module
LCM length of ceiling module
WCM width of ceiling module
H shaft height
D ceiling module displacement
A arrow

## Claims

**1.** A light guiding system for providing a light conduit between a roof of a building and a ceiling or inner wall of an interior building room, comprising a shaft arrangement with a plurality of shaft sections,
**characterised in that**
the light guiding system comprises a plurality of at least two non-coherent parts (601, 602, 603, 604; 1601, 1602; 2601, 2602, 2603, 2604) configured to form the shaft sections (61, 62, 63, 64; 1061, 1062, 1063, 1064; 2061, 2062, 2063, 2064) of the shaft arrangement (6; 1006; 2006) in a mounted condition of the light guiding system, that
at least two parts (601, 602; 1601, 1602; 2601, 2602, 2603) of said plurality of non-coherent parts each comprises a piece of cloth of a flexible cloth material, and that
at least two shaft sections (61, 62; 1063, 1064; 2061, 2062, 2063) of the shaft arrangement in the mounted condition are constituted by said parts (601, 602; 1601, 1602; 2601, 2602, 2603) of flexible cloth material.

**2.** A light guiding system according to claim 1, wherein each part (601, 602, 603, 604; 1601, 1602; 2601, 2602, 2603, 2604) of said plurality of parts comprises two opposing first and second side edge portions (613, 614, 633, 634), and wherein the first side edge portion (613) of one part (601) is adjacent to the second side edge portion (634) of a neighbouring part (603) in the mounted condition of the shaft arrangement (6) such that the side edge portions are:

- overlapping,
- wrapped into each other,
- abutting, or
- located at a distance from each other,

to form corner edges (6a, 6b, 6c, 6d) of the shaft arrangement (6) in the mounted condition of the light guiding system.

**3.** A light guiding system according to any one of the preceding claims, wherein, in the mounted condition, the light guiding system is configured to provide a light conduit between a roof (2) of a building and an interior building room (3) with a ceiling (31), the shaft arrangement (6) of the light guiding system extending between a top at the roof (2) and a bottom at the ceiling (31).

**4.** A light guiding system according to claim 3, wherein the top of the shaft arrangement (6) is connected to a frame (41) at the roof (2) and/or the bottom of the shaft arrangement (6) to a frame (51) at the ceiling (3).

**5.** A light guiding system according to claim 4, wherein the frame at the roof is a roof module frame (41) of a roof module (4) comprising a roof module pane (42), said roof module frame (41) defining a length (LRM) and a width (WRM) of the roof module in a roof module plane and being configured to be mounted in a surface of the roof (2) in the mounted condition, with the roof module plane substantially parallel to the roof surface, said roof module (4) optionally comprising an openable roof module sash encasing the roof module pane (42).

**6.** A light guiding system according to claim 4 or 5, wherein the frame at the ceiling is a ceiling module frame (51) of a ceiling module (5), said ceiling module frame (51) defining a length (LCM) and a width (WCM) of the ceiling module in a ceiling module plane and being configured to be mounted in the ceiling (31) in the mounted condition, with the ceiling module plane substantially parallel to the ceiling, said ceiling module (5) optionally comprising a pane (52), preferably an insulating pane, more preferably encased in a ceiling module sash (53) openable relative to the ceiling module frame (51).

**7.** A light guiding system according to any one of the preceding claims, wherein the cross-sectional shape of the shaft arrangement (6) in the mounted condition is substantially rectangular.

**8.** A light guiding system according to claim 7, wherein

the cross-sectional shape of the shaft arrangement (6) in the mounted condition is non-uniform, preferably diverging, from the top to the bottom.

**9.** A light guiding system according to claim 8, wherein a width of the shaft arrangement (6) at the top substantially corresponds to a width of the shaft arrangement (6) at the bottom.

**10.** A light guiding system according to any one of the preceding claims, wherein the shape of each part of said plurality of non-coherent parts (601, 602, 603, 604; 1601, 1602; 2601, 2602, 2603, 2604) is quadrilateral, including being shaped as a trapezoid, a trapezium, a parallelogram and a rectangle.

**11.** A light guiding system according to claim 10, wherein at least some parts of said plurality of non-coherent parts (601, 602, 603, 604; 1601, 1602) has overdimensions relative to the respective shaft section (61, 62, 63, 64; 1061, 1062, 1063, 1064) of the shaft arrangement (6; 1006) in the mounted condition of the light guiding system, preferably including an extended portion (615, 616) at one or two side edge portions (613, 614) and/or a surplus length portion (617, 618) at a top or bottom edge portions (611, 612).

**12.** A light guiding system according to any one of claims 2 to 11, wherein a sealing strip (69) is provided at the corner edges (6a, 6b, 6c, 6d) of the shaft arrangement (6) in the mounted condition of the light guiding system.

**13.** A light guiding system according to any one of the preceding claims, wherein the shaft arrangement (1006) comprises two parts (1601, 1602) of a substantially U-shaped configuration and which are configured to overlap partly in the mounted condition to form the side sections (1061, 1062) of the shaft arrangement, the first end section (1063) being formed from one part (1601) and the second end section (1064) from the other part (1602).

**14.** A light guiding system according to any one of claims 1 to 12, wherein the shaft arrangement (2006) comprises four parts (2601, 2602, 2603, 2604) of a shape substantially corresponding to the shape of the respective shaft section (2061, 2062, 2063, 2064) of the shaft arrangement (2006) in the mounted condition, preferably comprising three parts (2601, 2602, 2603) of flexible cloth material and one part (2604) of a rigid material.

**15.** A method of providing a shaft arrangement of a light guiding system, comprising the steps of:

providing a plurality of parts (601, 602, 603, 604; 1601, 1602; 2601, 2602, 2603, 2604), of which at least two parts comprising a piece of cloth of flexible cloth material,
optionally adapting the parts of said plurality to a desired shape, and
positioning side edges of adjacent part at or near each other to provide a mounted condition of the shaft arrangement.

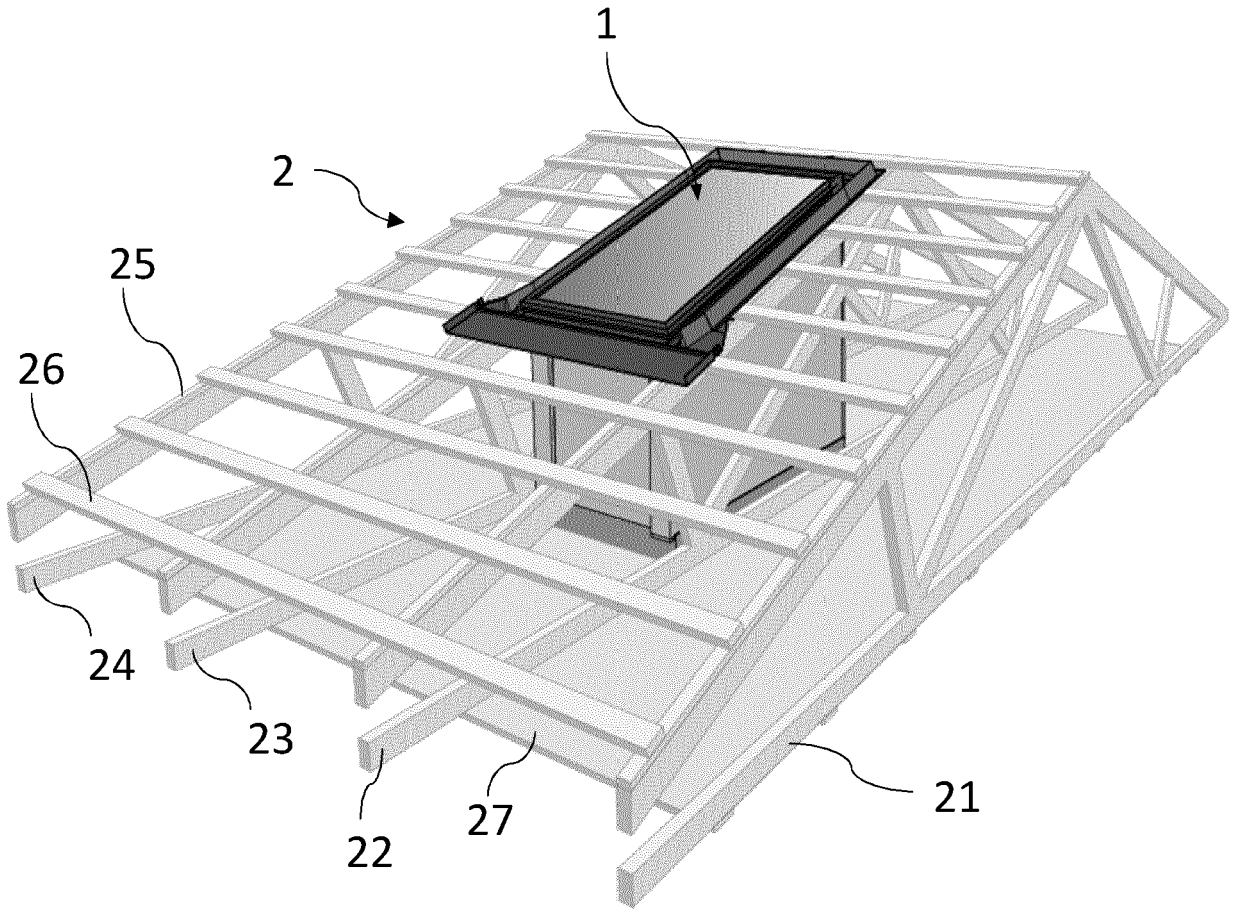



Fig. 1

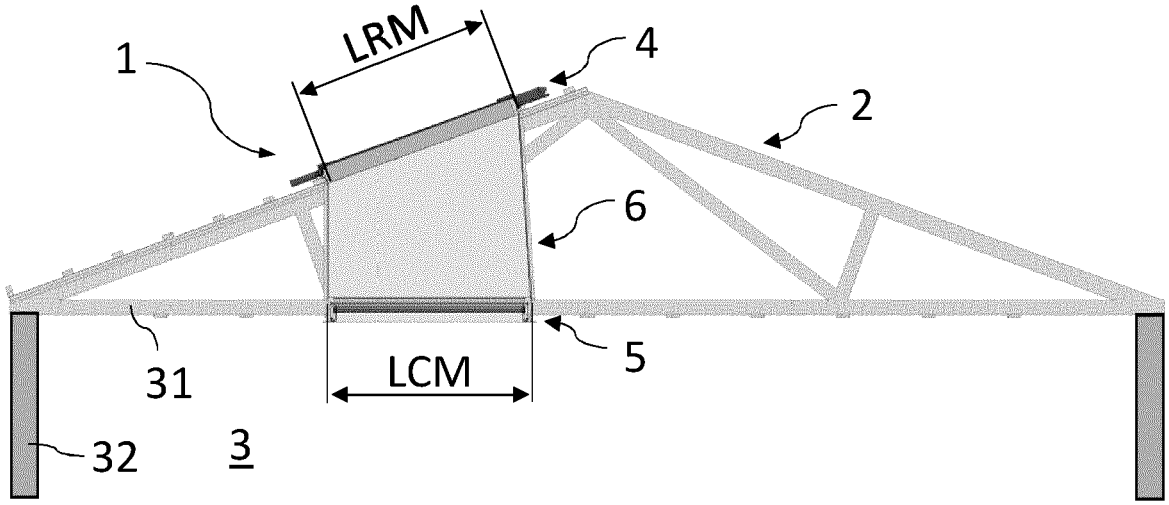
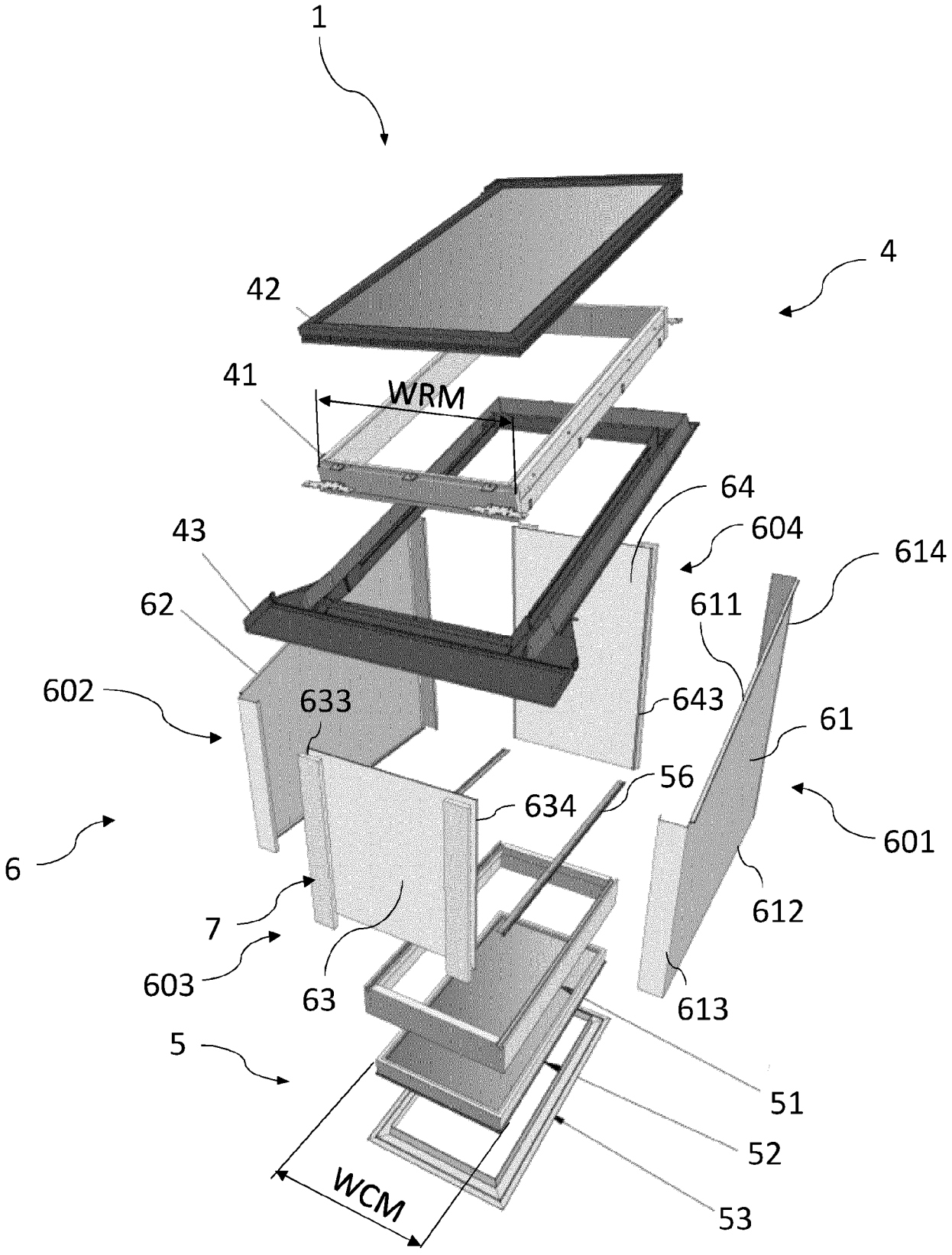



Fig. 2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604
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62
611
602
633
643
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56
634
601
6
7
612
603
63
613
5
51
52
WCM
53

Fig. 3

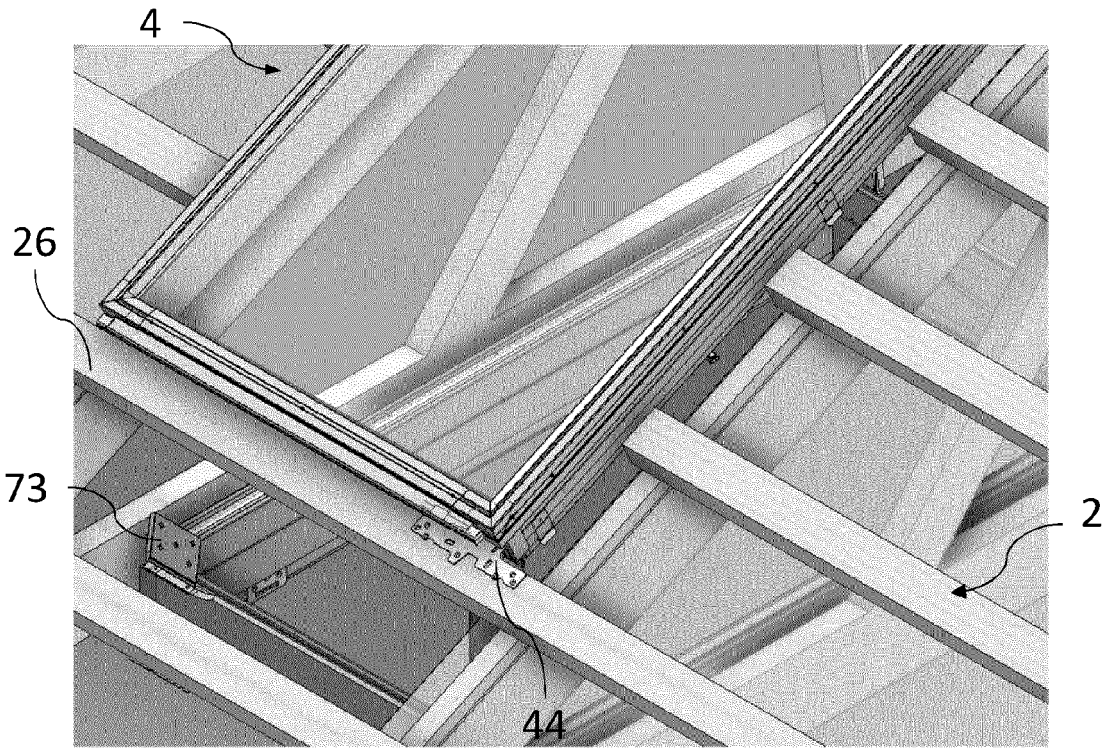


Fig. 4

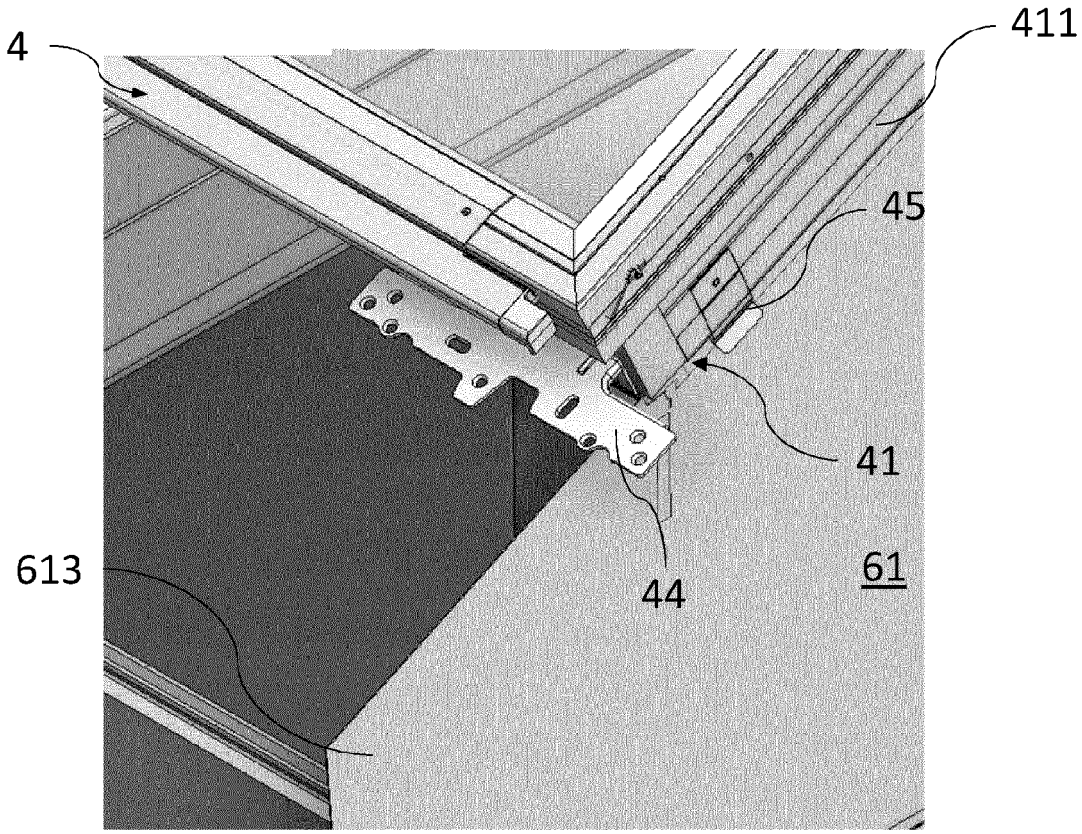


Fig. 5

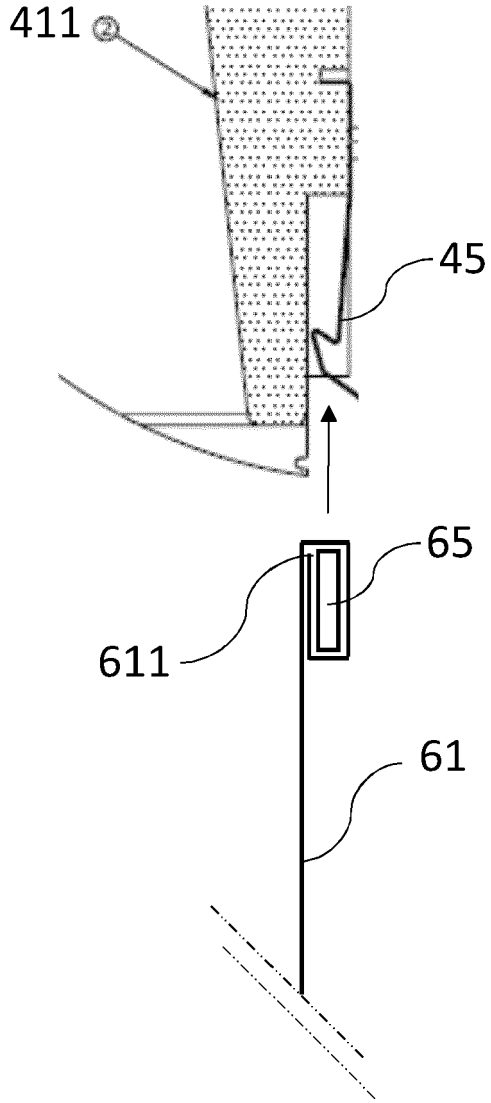


Fig. 6

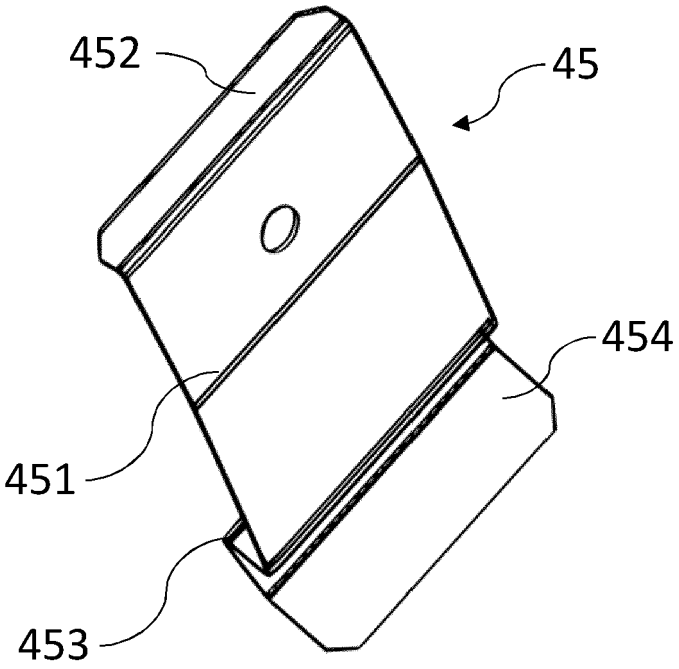


Fig. 7

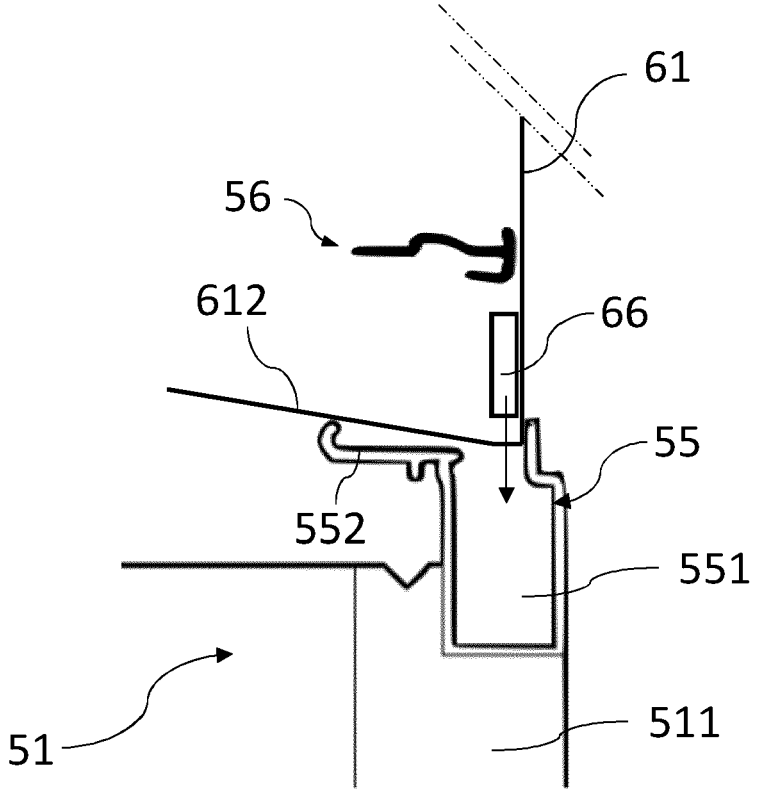


Fig. 8

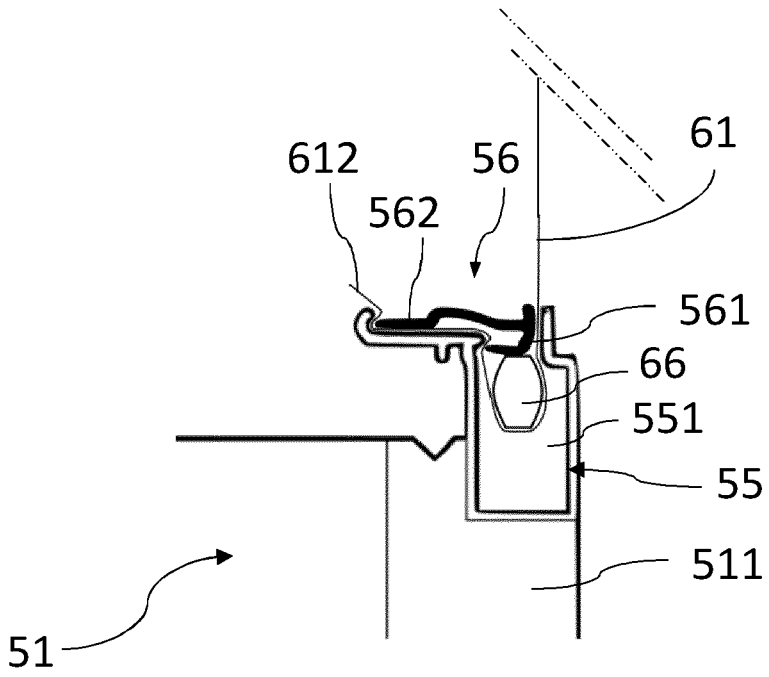


Fig. 9

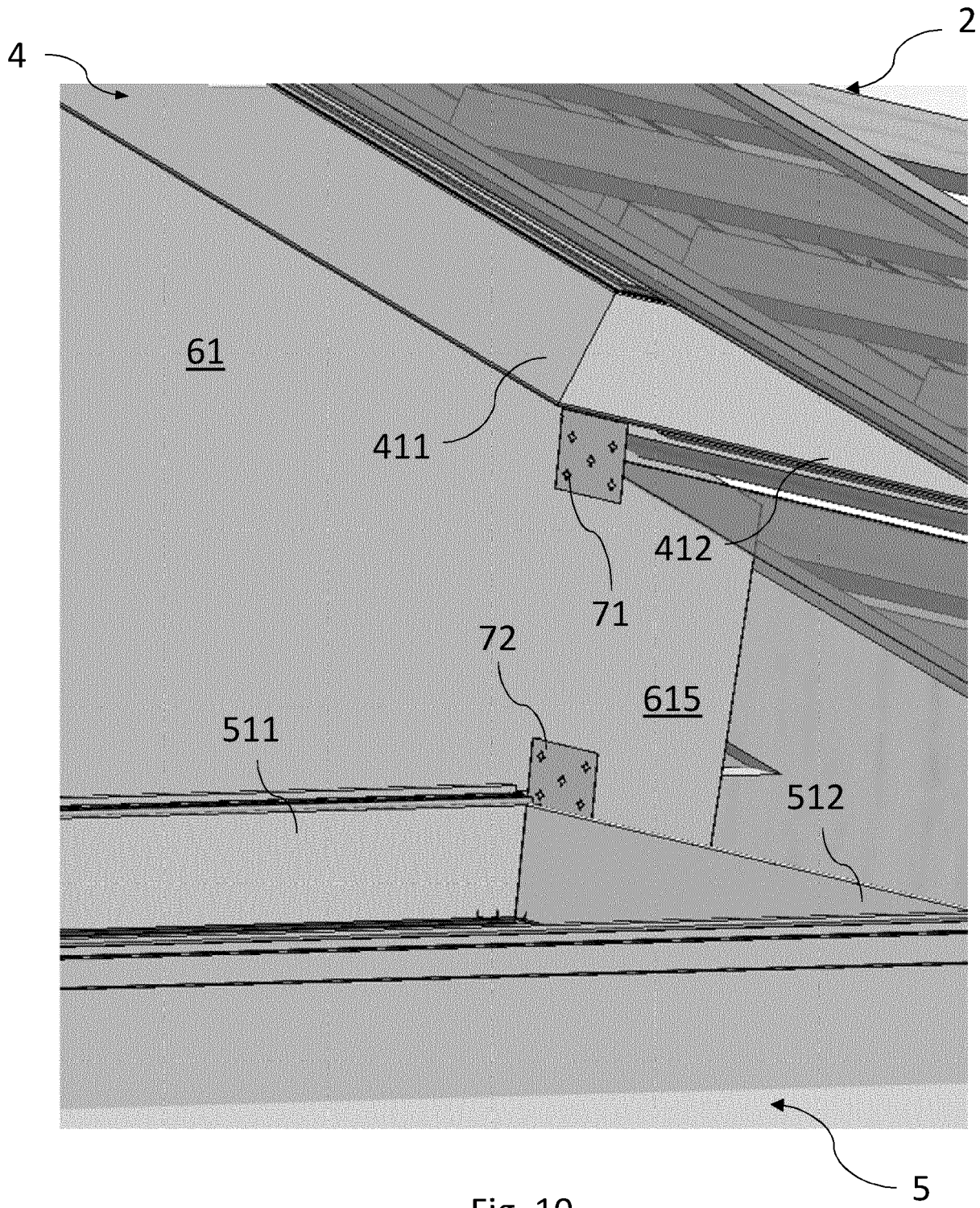


Fig. 10

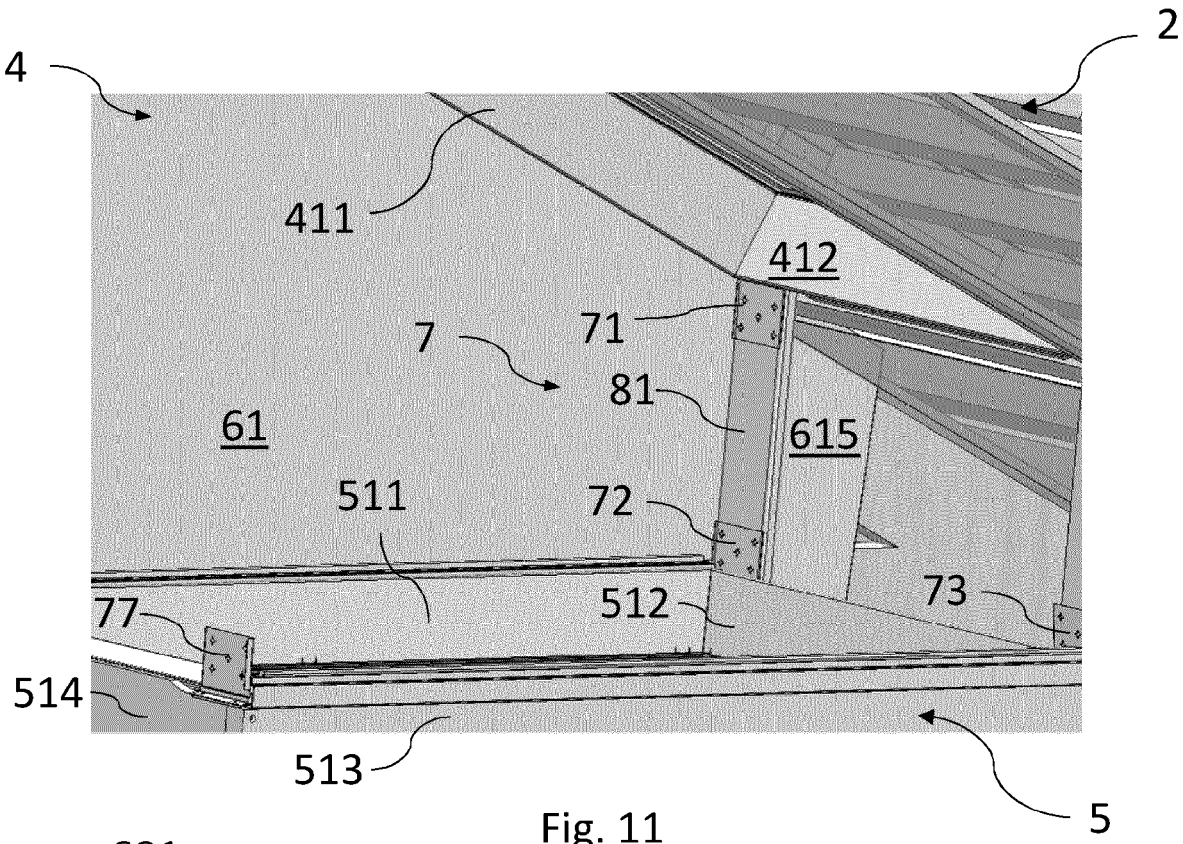


Fig. 11

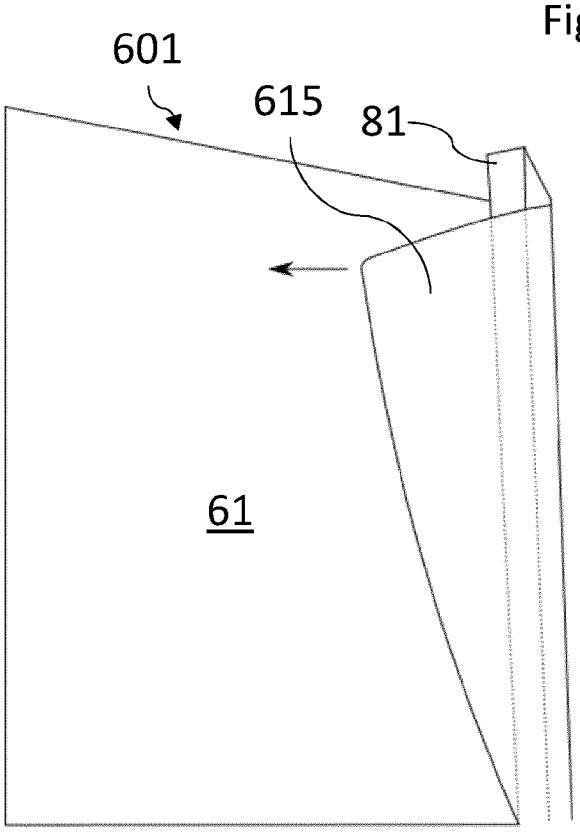


Fig. 12a

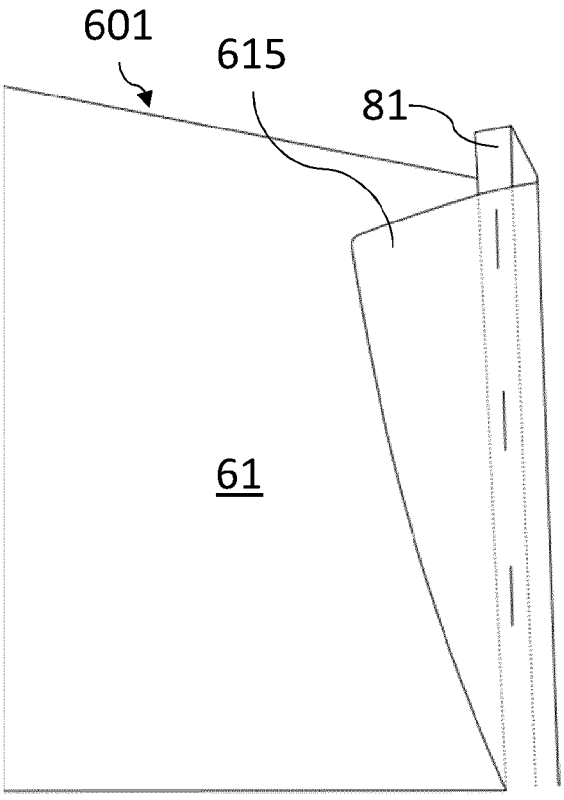


Fig. 12b

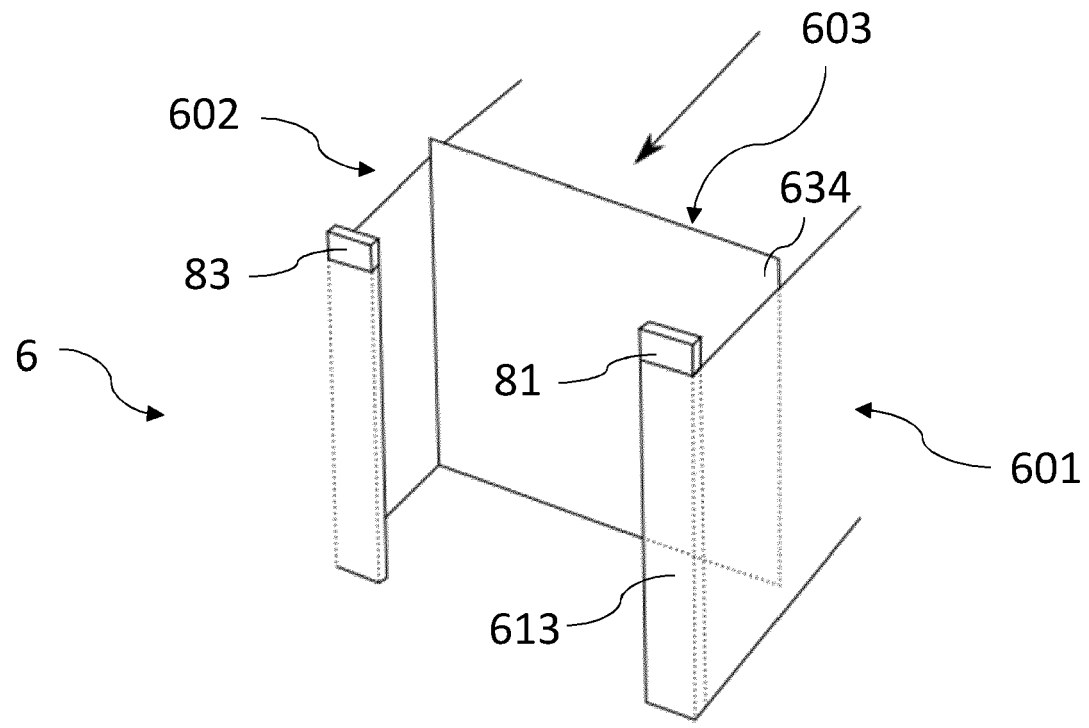


Fig. 13a

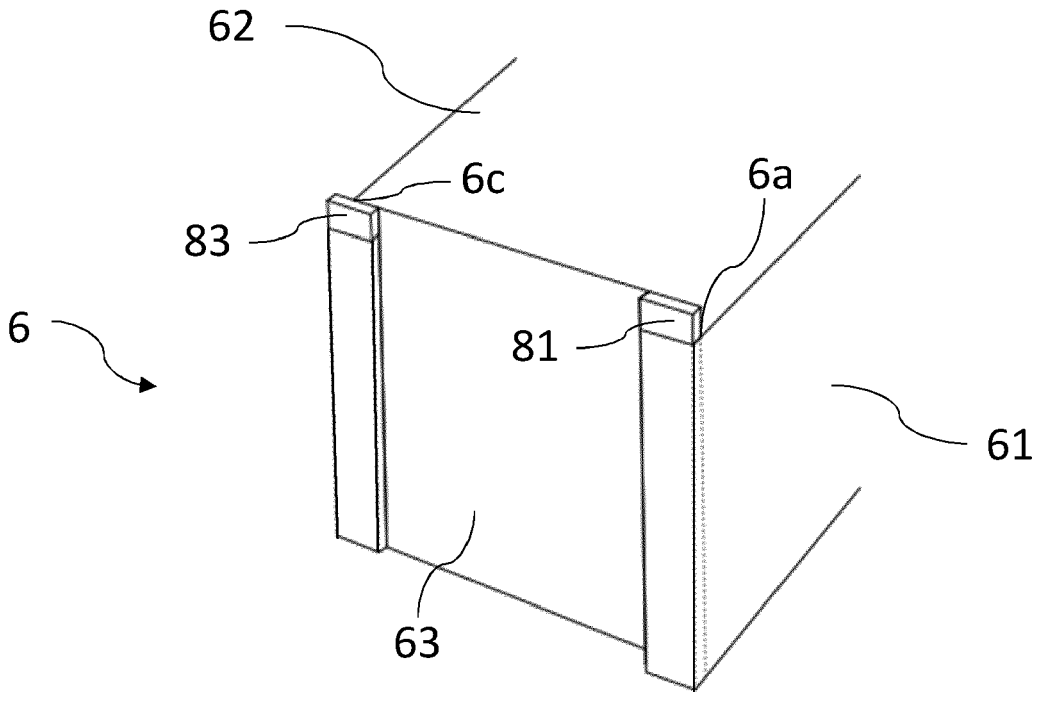


Fig. 13b

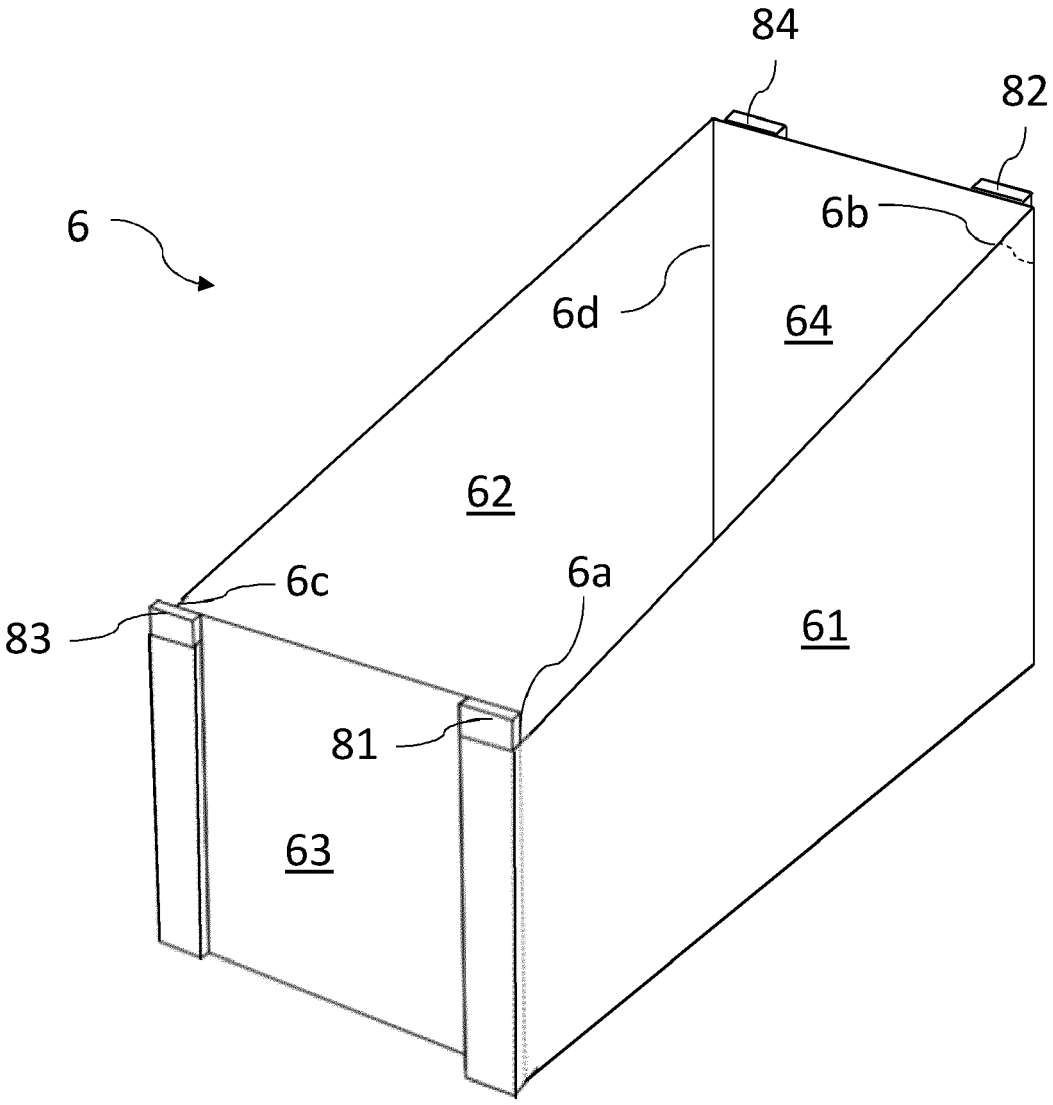


Fig. 13c

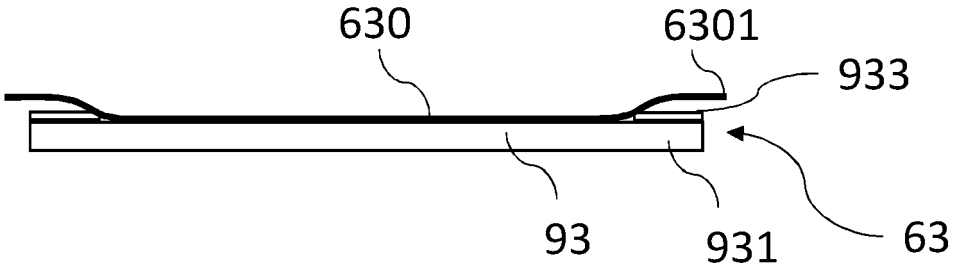


Fig. 14

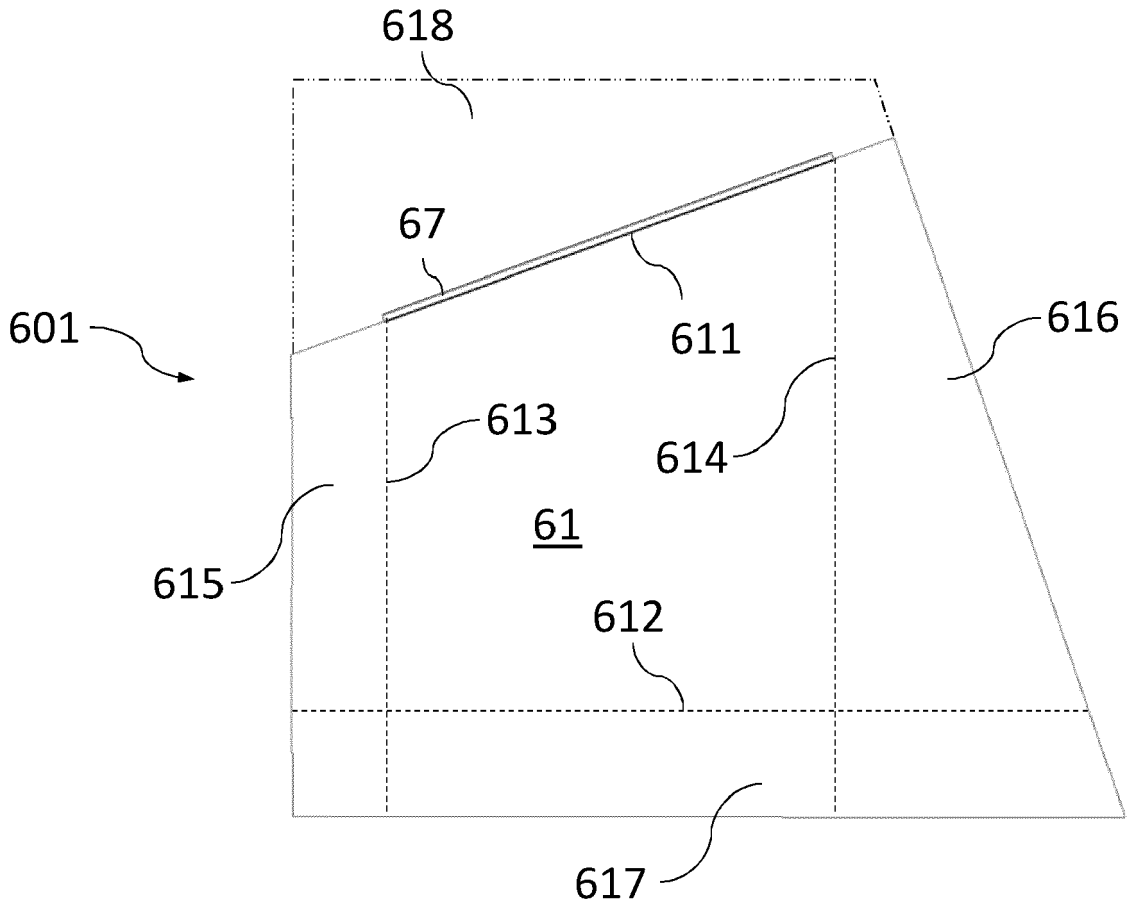


Fig. 15

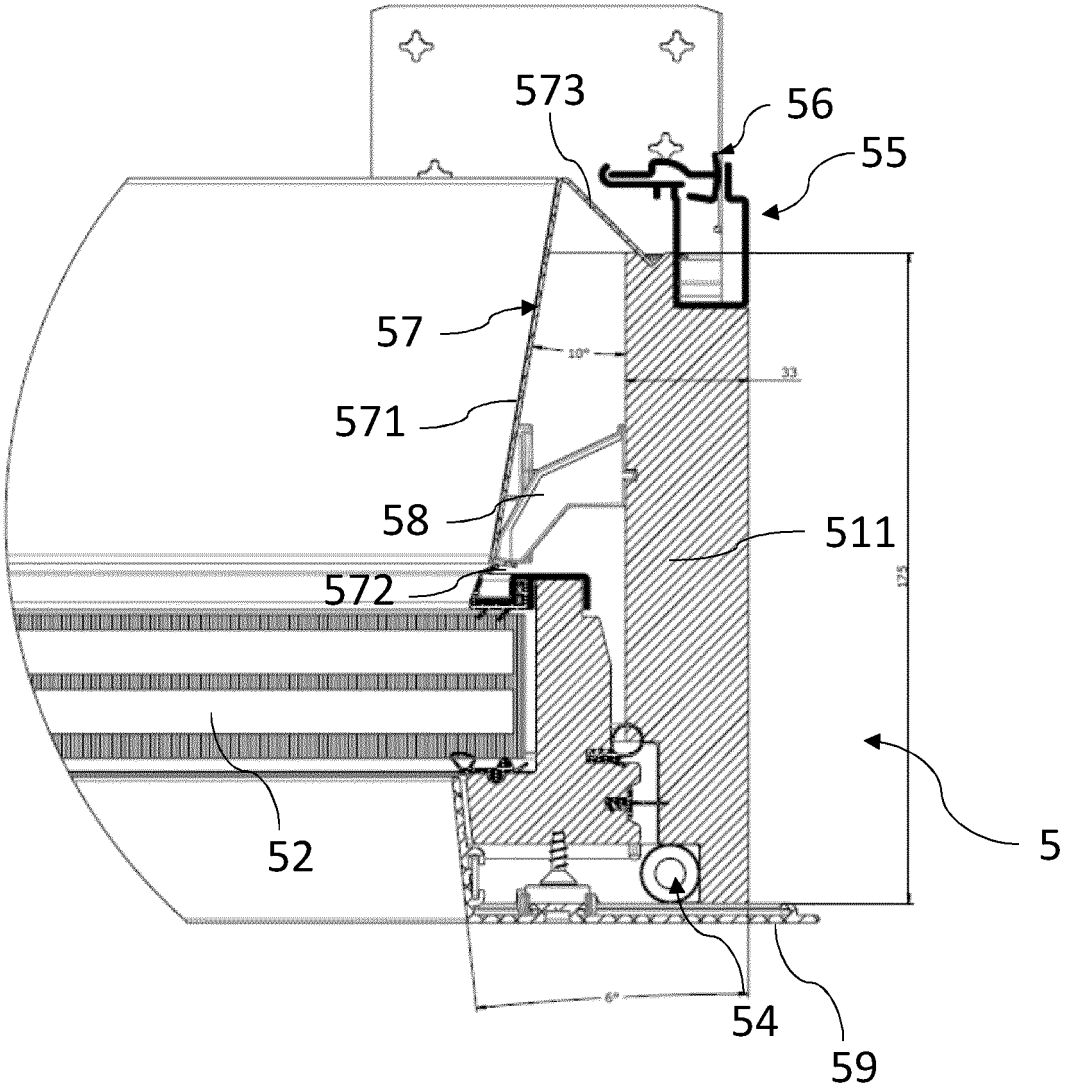


Fig. 16

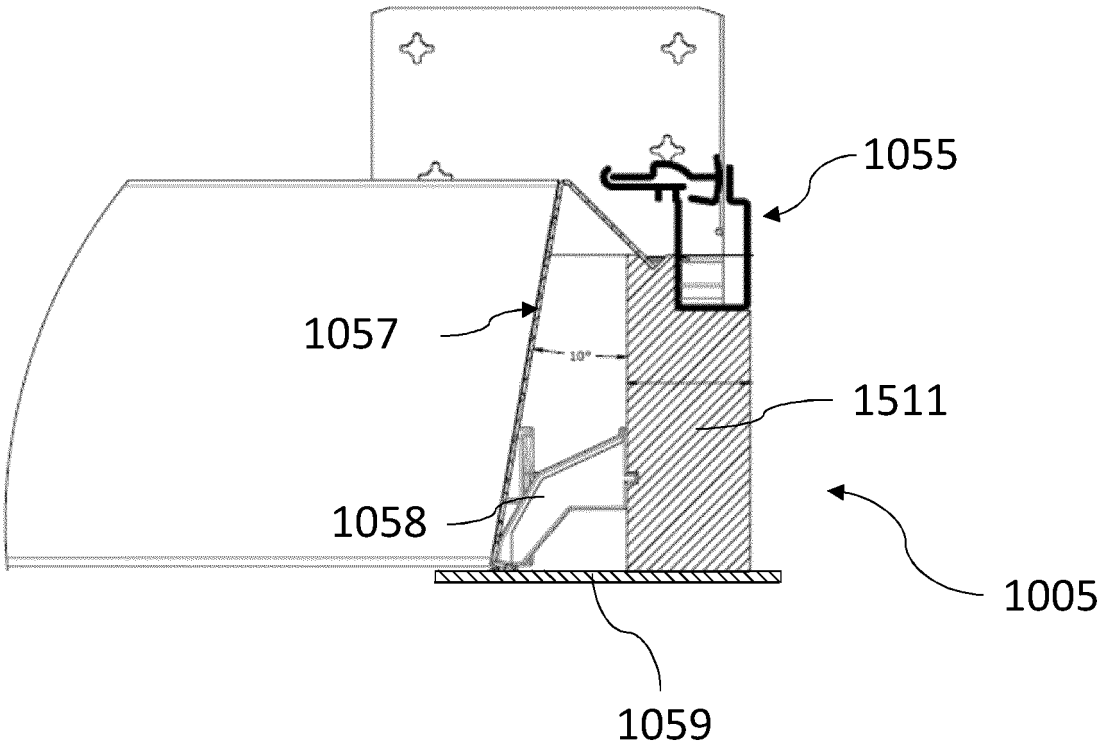


Fig. 17

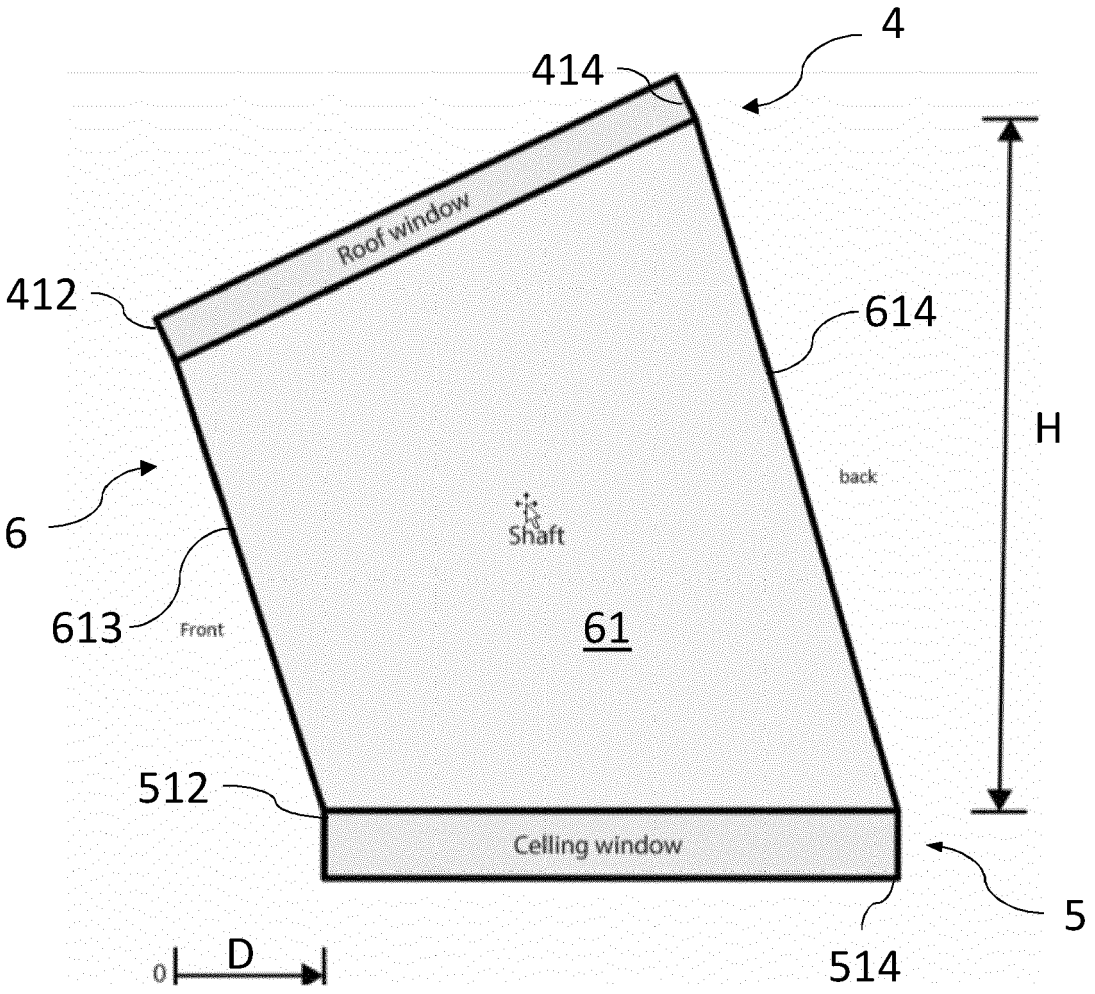
4
414
Roof window
412
614
H
back
6
Shaft
613
Front
61
512
Celling window
5
0
D
514

Fig. 18

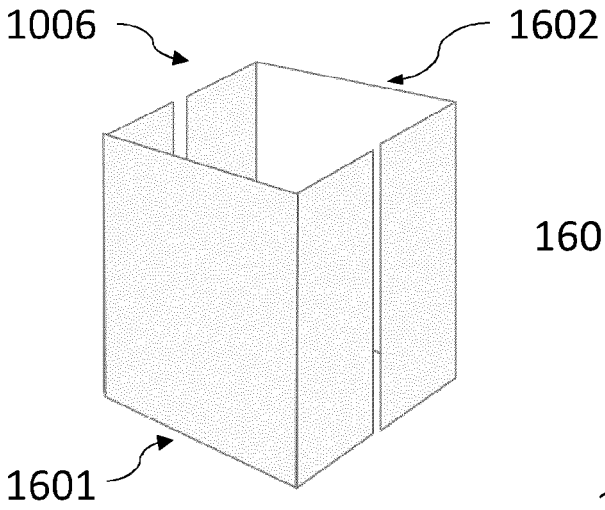


Fig. 19a

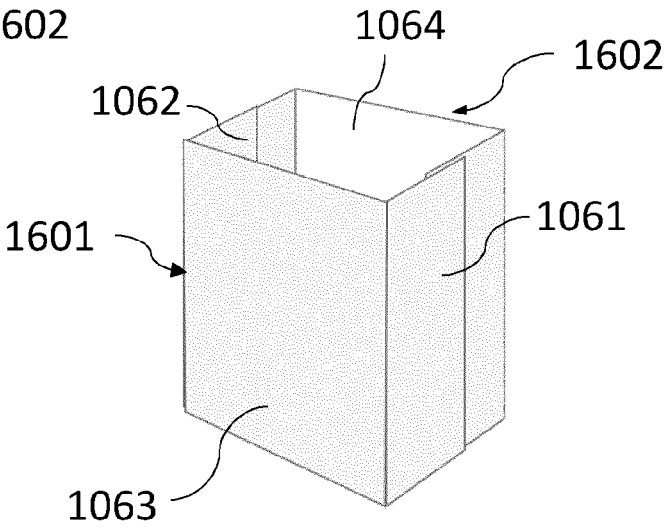


Fig. 19b

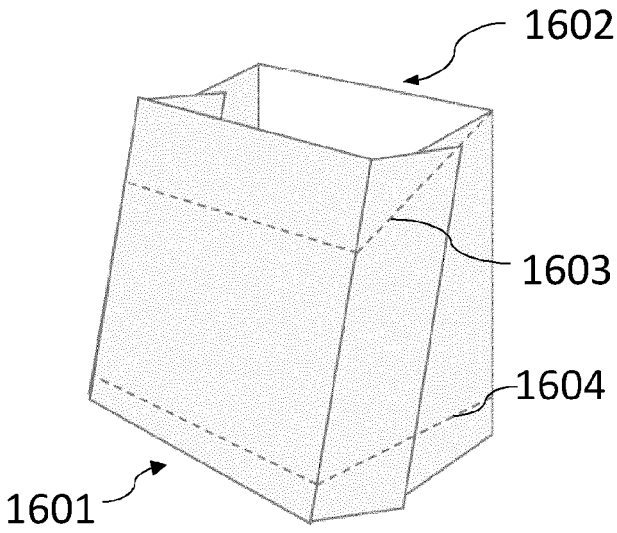


Fig. 19c

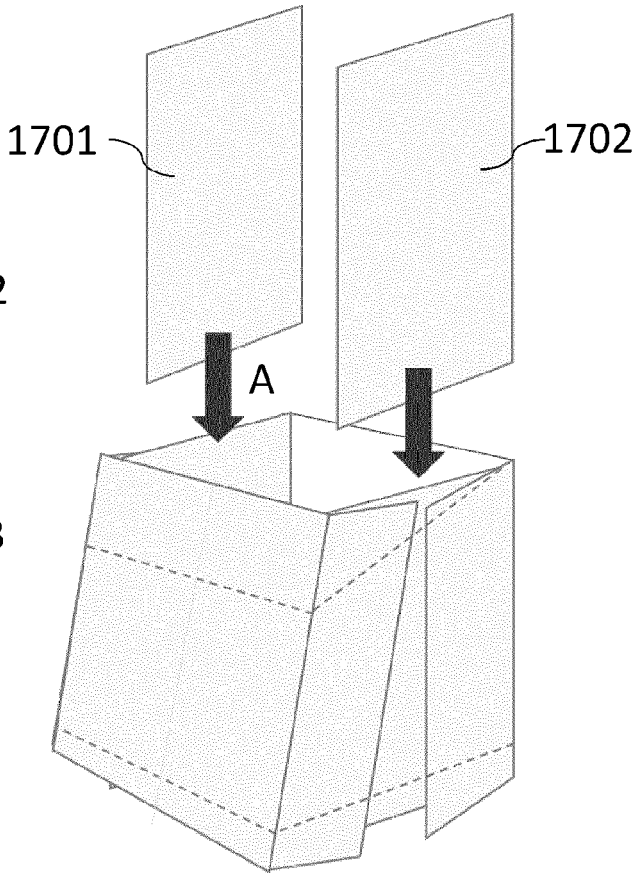


Fig. 19d

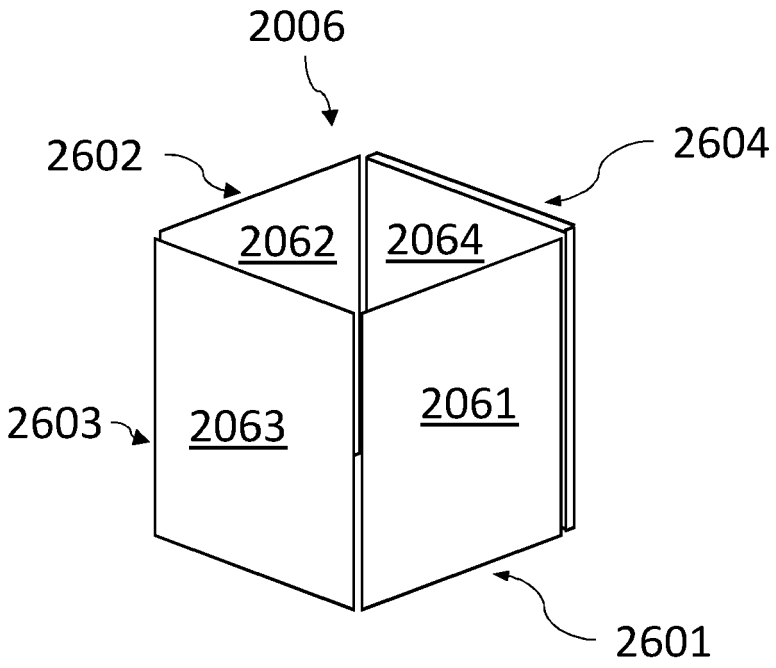


Fig. 20

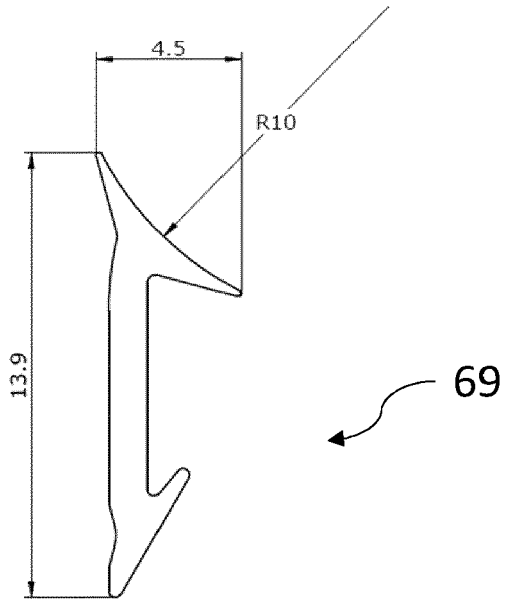


Fig. 21

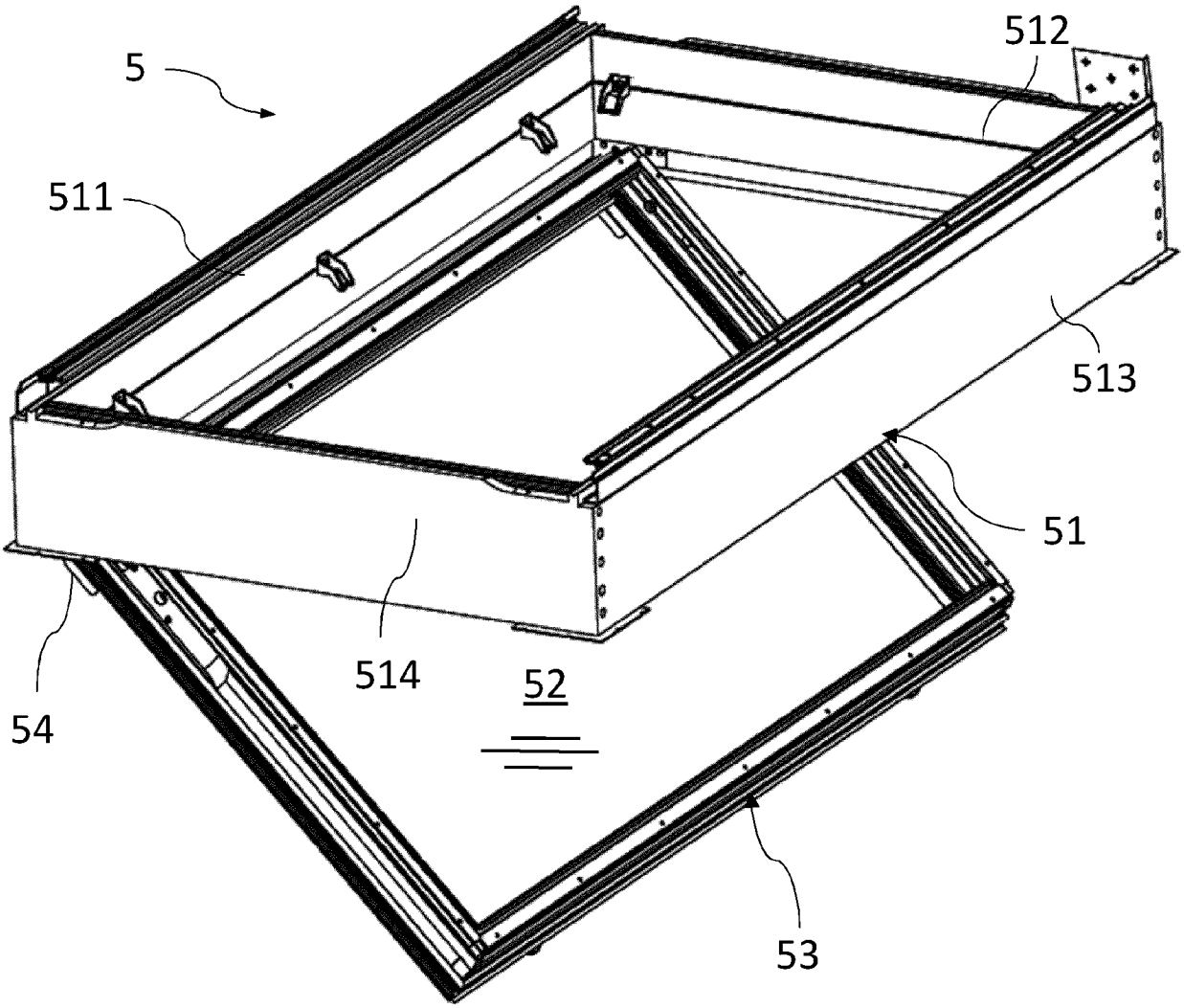


Fig. 22

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# EUROPEAN SEARCH REPORT

Application Number
EP 20 19 4843

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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| X | US 4 833 838 A (VAN DAME JAMES [US])<br>30 May 1989 (1989-05-30)<br>* column 6, lines 10-39; figure 5 * | 1-8,10,<br>12,13 | |
| A | US 2003/126811 A1 (VAN DAME JAMES TYLER [US]) 10 July 2003 (2003-07-10)<br>* paragraph [0036]; figure 8 * | 14 | |
| A | US 5 544 455 A (DEBLOCK DAVID A [US])<br>13 August 1996 (1996-08-13)<br>* column 3, lines 61-64; figure 2 *<br>* column 4, lines 8-12 * | 12 | |
| A | JP 2012 160288 A (TAKIRON CO; DAIKEN CO LTD) 23 August 2012 (2012-08-23)<br>* figure 5 * | 6 | |
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| A,D | US 5 613 333 A (WITZIG JR MICHAEL J [US])<br>25 March 1997 (1997-03-25)<br>* figure 5 * | 1-15 | F24F |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 22 January 2021 | Leroux, Corentine |

CATEGORY OF CITED DOCUMENTS

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

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