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(54) **ROOF LIGHT SYSTEM COMPRISING OPTIONAL ELEMENTS AND INTERCHANGEABLE PARTS**

DACHFENSTERSYSTEM MIT OPTIONALEN ELEMENTEN UND AUSTAUSCHBAREN TEILEN

SYSTEME D'ECLAIRAGE POUR TOIT COMPRENANT DES ELEMENTS OPTIONNELS ET DES PARTIES AMOVIBLES

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Description

[0001] The present invention relates to a roof light system comprising a roof unit, a light conduit and a diffuser unit, said light conduit extending between a first end positioned at the roof unit and a second end positioned at the diffuser unit. EP 0 313 461 discloses such a roof light system according to the preamble of claim 1.

[0002] Traditionally, roof units such as roof windows, skylights and other more or less light transmissible roof penetrating structures provide natural lighting to a space situated immediately below or only a short unobstructed distance from the part of the roof, in which the roof unit is installed. For illuminating other spaces such as rooms situated further inwards and/or downwards with respect to the roof of the building, artificial lighting has been the dominating source of light.

[0003] For many reasons, natural lighting may be desirable in a room. In order to provide lighting or supplement artificial lighting of an inner room, roof window assemblies of the kind mentioned in the introduction have been suggested and are well known in the art. In such an assembly, a light conduit is led through the roof structure between the roof unit installed in the roof and a diffuser unit installed in the ceiling of an inner room. Light from the ambience is channelled through the light conduit into the inner room. The light conduit may e.g. be formed as a length of flexible hose, possibly reinforced by wire hoops, or rigid sections connected with each other to form the desired path of the light conduit between the roof unit and the diffuser unit. In order to ensure that as much natural lighting as possible is channelled from the outside to the inner room, the internal side of the light conduit is usually provided with a light reflective lining or coating, or the entire material of the light conduit is made from a light reflective material.

[0004] Such a roof light system is traditionally delivered as a set of ready-to-use elements comprising the roof unit, the light conduit and the diffuser unit. Due to the different installation conditions, the light conduit is delivered in a variety of different lengths or even made to custom. In case the roof light system is intended for use in connection with rooms, for which ventilation is necessary or even required, such as bathrooms, a ventilation device is usually included in the set. To the manufacturer, this entails that several models must be produced and kept in stock. To the consumer, this might entail that he or she is forced to invest in a system, which contains elements not required or wanted in relation to his or her particular wish.

[0005] It is an object of the present invention to provide a roof light system of the kind mentioned in the introduction, which makes it possible to facilitate manufacture and installation.

[0006] This and further objects are met by the provision of a roof light system comprising a roof unit, a light conduit and a diffuser unit, said light conduit extending between a first end positioned at the roof unit and a second end positioned at the diffuser unit, characterized in comprising a base module including the roof unit, the light conduit and the diffuser unit, that the roof unit comprises a frame defining an inner circumference and having a circular aperture and a sash carrying a glazing, said frame and sash having a rectangular shape, said light conduit having a circular shape, and said first end of the light conduit being detachably connected with the frame at said circular aperture, the area between the inner circumference of the frame and the circular aperture constituting a transition area substantially in parallel with the glazing, the roof light system furthermore comprising optional elements adapted to be connected with the base module, and interchangeable elements to replace elements of at least the roof unit and the light conduit of the base module.

[0007] With the base module, a functional roof light system is achieved. In case it is desired to supplement or modify the base module, this may be accomplished by means of the optional elements or by interchanging one or more elements of the base module with other elements. The replacement or addition of elements is facilitated by the fact that the light conduit is detachably connected with the roof unit at the area of transition between the light conduit and the roof unit. For instance, the light conduit may be made to custom, a ventilation device may be delivered separately, or the roof light system may be transformed into a more traditional, openable roof window. The differences in shape between the frame and the light admitting aperture entails that light directed to the transition area, i.e. outside the aperture, is not channelled into the light conduit. However, the apparently contradictory requirements of the desire for a rectangular frame and sash to fit in with e.g. other, traditional roof window in a roof on one hand, and the desire for a light-conduit of a circular cross-sectional shape on the other are fulfilled, even without the use of a separate adaptor in the form of an elaborate transition member which necessarily renders the system more expensive and cumbersome to install.

[0008] In an embodiment, the shape of the frame and sash is square.

[0009] In a development of this embodiment, which makes the system particularly simple to install, a ring is provided for connection with a rim surrounding said aperture, said ring being provided with pins for engagement with lugs on the rim.

[0010] In order to improve the retention of the light conduit on the ring, the ring may be provided with a circumferential flange, the light conduit being connected with the ring by means of a draw-band positioned above said flange.

[0011] The optional elements may comprise a ventilation device including a ventilation tube extending between a first end and a second end, said first end being connected with the roof unit at said transition area. This embodiment is particularly advantageous in those fields of application, in which ventilation of the inner room is desirable or even required, as is e.g. the case in a bath-

room.

[0012] In an advantageous development of this embodiment, the ventilation tube is separate from the light conduit, said second end of the ventilation tube being connected with the diffuser unit. By the provision of a separate ventilation tube, which is nevertheless connected with the diffuser unit as well as the roof unit, any problems connected with arrangements making use of the light conduit itself as ventilation passage are completely avoided. At the same time, the provision of an additional opening in the roof is made redundant. It is furthermore possible to install the ventilation device independently of the roof light system. Such a ventilation device is thus particularly favourable for retailing as a supplement to the base module.

[0013] The ventilation tube may be connected with the roof unit by means of a manifold member. The function of the manifold member is to allow passage from the ventilation tube to the roof unit and further out to the surroundings.

[0014] The manifold member may be an integral part of the roof unit or separate therefrom. The use of a separate manifold member facilitates installation and makes it possible to after-mount the ventilation tube on an already installed roof unit not beforehand provided with a ventilation device. In an embodiment, the manifold member is a separate member connected with the frame. In an advantageous further development of this embodiment, the manifold member is substantially U-shaped and surrounds the light conduit partly.

[0015] Preferably, the second end of said ventilation tube as well is connected with the diffuser unit by means of a manifold member.

[0016] In order to facilitate the installation procedure even further, a development of this preferred embodiment is characterized in that the manifold member is releasably connected with the roof unit or diffuser unit by means of engagement means on the manifold member cooperating with apertures in the roof unit or the diffuser unit. Preferably, these apertures are provided as knock-out plates surrounded by detachment indication lines. Supplemental connection means, such as screw or snap engagement means, may be provided.

[0017] The manifold member may comprise a series of openings surrounded by upstanding walls. In this manner, water collected in the manifold member as a result of entered precipitation or condensation from humid air is prevented from flowing into the ventilation tube.

[0018] In order to obtain a higher degree of flexibility with respect to the ventilated areas, the ventilation device may comprise, in addition to said ventilation tube, at least one branch tube extending between a first end and a second end. The second end of the at least one branch tube may be positioned at a distance from the diffuser unit. In order to support the natural draft in the ventilation device, means for mechanical ventilation may be provided.

[0019] In case it is desired to modify the base module into a more traditional, openable roof window without light conduit, it is advantageous that the optional elements of the roof light system includes means for providing a hinge connection between the sash and the frame.

[0020] Detachment indication lines may be provided at the inner circumference of the frame in order to provide an aperture within the frame.

[0021] In such an openable window, the frame may be provided with at least one knock-out plate adapted to allow passage of an extending device.

[0022] Due to its position in a roof the roof unit may be utilized for the application of optional elements in the form of solar cells. Such solar cells may be positioned on any part of the roof unit, however, advantageously on the frame.

[0023] In case it is desired to make the entrance to the light conduit inconspicuous, further optional elements in the form of a reflective and/or coloured film or coating may be provided on the frame and/or the glazing.

[0024] Further advantages will be appreciated from the following detailed description.

[0025] In the following the invention will be described in further detail with reference to preferred embodiments and to the schematic drawings.

Fig. 1 shows a perspective view of a roof light system in a first embodiment of the present invention;
Fig. 2 shows, on a larger scale, a perspective and partial view of the roof light system of Fig. 1;
Fig. 3 is a view corresponding to Fig. 2 of the first embodiment of the roof light system shown from the side intended to face inwards into a building;
Fig. 4 is a view corresponding to Fig. 3 of a second embodiment of the roof light system;
Fig. 5 shows a perspective view of a detail of the roof light system shown in Fig. 3;
Fig. 6 shows a sectional view of the detail shown in Fig. 5;
Figs. 7 and 8 show perspective views of a detail of the embodiment of the roof light system shown in Figs. 1-3;
Fig. 9 shows a perspective view of the roof light system shown in Fig. 3 during installation;
Fig. 10 is a partial perspective view of a detail of the roof light system;
Fig. 11 is a view corresponding to Fig. 10 of an alternative embodiment of the roof light system according to the present invention;
Fig. 12 shows a perspective view of a detail of the roof light system according to the invention; and
Fig. 13 is an exploded perspective view of the detail of Fig. 12.

[0026] Referring to the drawings, the roof light system comprises a roof unit 10, a light conduit 70 and a diffuser unit 80. These three components form a base module.

[0027] The roof unit 10 is intended to be installed in the roof of a building and includes a light-admitting ap-

erture 11 formed in a frame 12, cf. Fig. 10. Light is admitted into the aperture 11 through a sash 13 carrying a glazing 14, cf. in particular Figs. 2 and 6. The glazing 14 may be formed in any suitable manner and from any suitable translucent material, e.g. glass or a plastic material. Roof unit 10 furthermore comprises a flashing arrangement intended to provide a substantially weather-tight transition to the surrounding roofing (not shown). In the embodiment shown, the frame 12 is formed integrally with substantially sheet-shaped portion 15 surrounding the frame 12 and is, in the mounted position, placed beneath the roofing. In order to direct precipitation on to a skirt portion 17 placed on top of the roofing, rails 16 are provided on either side of the frame 12. Furthermore, a sealing strip 18 is connected with the sheet-shaped portion 15 and the skirt portion 17 to prevent water from entering the underlying roof structure. The flashing arrangement may also be provided separately from the frame and sash, or be dispensed with altogether, if the installation conditions allow so.

[0028] Opposite the aperture 11 in the frame 12 of roof unit 10, one end of the light conduit 70 is connected with the frame 12 in a manner which will be described in detail further on. The light conduit 70 has a first cross-section and a first length which corresponds to or exceeds the distance between the roof unit 10 and the diffuser unit 80. The other end of the light conduit 70 is connected with the diffuser unit 80, likewise to be described in detail further on. The diffuser unit 80 is intended to be installed in the ceiling of an inner room in the building, and light conduit 70 thus extends through at least the roof structure of the building. In the embodiment shown, light conduit 70 is formed as a length of flexible hose reinforced by wire hoops 71. However, the light conduit may be formed by rigid sections connected with each other to form the desired path of the light conduit between the roof unit and the diffuser unit. In order to ensure that as much natural lighting as possible is channelled from the outside to the inner room, the internal side of the light conduit is usually provided with a light reflective lining or coating, or the entire material of the light conduit is made from a light reflective material.

[0029] As mentioned in the above, the roof light system is provided as a base module comprising roof unit, light conduit, diffuser. In the embodiments described with reference to Figs. 1 to 9, a ventilation device is provided as a supplement. In the embodiment shown in Figs. 10 and 11, the roof light system may be modified into a traditional openable window. Furthermore, other parts of the base module may be exchanged or supplemented. For instance, the light conduit may be customized for e.g. very long or complicated routing through the roof structure.

[0030] In a first and second embodiment, a ventilation device is provided for allowing moist air to escape from the inner room and fresh air from the outside to enter the room. The ventilation device is supplied either together with the base module, or is retailed as a separate optional kit of elements, and comprises a ventilation tube 60, which may be formed from any suitable, preferably flexible, material and may have any cross-sectional shape. There may be more than one ventilation tube. The ventilation tube 60 has a second cross-section and a second length extending between a first end 60a and a second end 60b. As is the case with the light conduit 70, the second length corresponds to or exceeds the distance between the roof unit 10 and the diffuser unit 80. In the first end 60a the ventilation tube 60 is connected with the roof unit 10 and in the second end 60b with the diffuser unit 80.

[0031] As the ventilation tube 60 is separate from the light conduit 70 and the cross-section of the ventilation tube 60 is detached from, i.e. does not overlap at any point, the cross-section of the light conduit 70, the ventilation device may be installed independently of the other parts of the roof light system. It is furthermore noted that the respective cross-sections may vary over the length of the light conduit and the ventilation tube, respectively. The cross-sections may, as indicated in the drawings, be entirely different. The respective lengths and courses of the light conduit 70 and the ventilation tube 60 may vary as well, e.g. to adapt to installation conditions.

[0032] In Fig. 4, a second embodiment is shown. In addition to the ventilation tube 60, the ventilation device comprises a first branch tube 160 extending between a first end 160a and a second end 160b and a second branch tube 260 extending between a first end 260a and a second end 260b. In the embodiment shown, the first end 260a is positioned between the first end 60a and the second end 60b of the ventilation tube 60, i.e. the second branch tube 260 is branched off from the ventilation tube 60a. It is of course conceivable to let the second branch tube 260 branch off from the first branch tube 160, or to position the branch-off site arbitrarily along the ventilation tube 60 or the first branch tube 160. In the embodiment shown, the branch-off is situated virtually at the first end 60a of the ventilation tube 60. An obvious manner of obtaining this configuration is to cut the ventilation tube 60 and the branch tubes 160 and 260, connect part of the circumferences and let the three tubes merge into the mouth piece 61.

[0033] In order to support the natural draught in the ventilation tube 60, means for providing mechanical ventilation may be present in the ventilation device. Such means are known per se and may e.g. include an electrically operated fan. The fan or fans may be positioned arbitrarily in the ventilation device, e.g. in the roof unit or at the mouth piece 62, 162 and/or 262. It may be advantageous to position a fan at the intended branch-off site or sites on the ventilation tube 60. In this case, the fan may be provided with two or more inlet ends, possibly covered by knock-out plates, and one outlet end facing the first end 60a of the ventilation tube 60.

[0034] Details regarding the connection between the light conduit 70 and the ventilation tube 60, and the roof unit 10 will be described with particular reference to Figs. 5 to 9.

[0035] The respective shape and size of the frame 12 and the sash 13 may be arbitrary and is traditionally chosen to match possible other roof penetrating structures, such as skylights and roof windows, installed in the roof. In the embodiments shown in the drawings, the frame 12 and sash 13 have a substantially square shape, but other shapes, such as a rectangular shape other than square, are conceivable as well. As a consequence of the square shape of the frame 12 and sash 13 in combination with the circular cross-section of the light conduit 70 in the preferred embodiment, an area L2a exists between the aperture 11 and an inner circumference of the frame 12, the inner circumference extending substantially along lines 24, cf. Fig. 10, the function of which will be described in further detail in the following. This area 12a provides for a transition between the rectangular frame 12 and the circular light conduit in parallel with the glazing 14. The area 12a may be utilized for positioning solar cells, preferably connected to battery means, to provide energy for e.g. a screening arrangement in the form of a dimmer situated in the roof light system, or possibly even for controlling or operating a drive motor of an electrically operated fan. Such solar cells may of course also be positioned on other places of the roof unit. For instance, the glazing may be covered by solar cells, in particular in the section corresponding to the area 12a of the frame, e.g. on the inner side of the glazing. The area 12a may have a coloured and/or reflective film or coating in order to obtain a uniform appearance of the roof unit. Such film or coating may also be provided on the glazing 14.

[0036] One particularly advantageous manner of installing the roof light system according to the present invention comprises the following steps:

[0037] The roof unit 10 is mounted in an aperture in the roof prepared to that purpose. Attachment of the roof unit may be performed in any suitable manners known per se from skylights, roof windows and other roof penetrating structures, comprising e.g. the use of mounting brackets secured to the underlying roof structure in the form of rafters and laths, or sheathing. Roofing is placed on top of the sheet-shaped portion 15 of the flashing arrangement up to a suitable distance from the frame 12 and sash 13 of the roof unit, and the skirt portion 17 is made to abut against the upper face of the roofing below the frame 12 and sash 13.

[0038] Referring now to Figs. 5 and 6, a ring 30 is provided for connection with a rim 19 surrounding the aperture 11 in the frame 12. In the vicinity of one edge of the ring 30, a plurality of pins 31 are distributed over the circumference of the ring for engagement with lugs 20 on the rim 19. By positioning the pins 31 in front of a keyhole-shaped track 21 in each lug 20 and then rotating the ring 30 slightly, a safe engagement between the ring 30 and the frame 12 is obtained. Subsequently, the light conduit 70 is attached to the ring 30 by first guiding one end of light conduit 70 past a circumferential flange 32 at the other edge of the ring 30, and then secure the light conduit 70 to the ring 30 and thus in turn to the frame 12 by means of a draw-band (not shown) positioned above the flange 32. It is noted that the ring may be made integral with the frame, or dispensed with altogether, the connection thus being carried out in any suitable manner. The light conduit thus extends substantially perpendicularly to and almost up to the glazing 14 near the roof unit 10. This provides for an optimum influx of light. A small spacing between the light conduit, or in this case the ring, is left up to the glazing in order to avoid condensation.

[0039] When the light conduit 70 has thus been connected with the roof unit 10, a manifold member 40 shown in detail in Figs. 75 and 8 is connected with the roof unit 10. The manifold member 40 is mainly U-shaped and at the ends of legs 41, engagement means in the form of protruding flaps 42 are provided. These flaps 42 are inserted into corresponding apertures in the frame 12. In the embodiment shown, these openings are provided by detaching two knock-out plates 22 at the bottom of the frame 12, cf. Fig. 10, from the remaining portion of the frame 12 by an appropriate tool. The position shown in Fig. 9 has now been attained. Manifold member 40 is then swung around flaps 42 at the end of legs 41 until the bottom of the U-shape is brought into abutment with the under side of the upper part of the frame 12. Appropriate fastening means, such as screws, are then inserted through upstanding reception elements 45 and further into the frame 12, cf. Fig. 8. The manifold member 40 may be connected with the frame in other ways than that described in the above, including screw fastening, fastening by adhesion, interlocking elements, snap connection etc.

[0040] The manifold member 40 could have one of a variety of designs. One possibility is to form the manifold member integral with the frame 12. In its simplest form, the manifold member is constituted by a socket piece connected with the roof unit. The socket piece may e.g. be provided with knock-out plates which are detached when the ventilation device is to be installed. The manifold member may also provide for connection of more than one mouth piece, e.g. one mouth piece for each of the ventilation tube and the branch tube or tubes. Mouth pieces having one opening in the end facing the manifold member and two or more openings in the opposite end are also conceivable, i.e. one opening for each of the ventilation tube and the branch tube or tubes. The openings not in use may be covered by knock-out plates.

[0041] The ventilation tube 60 is then connected with the manifold member 40 by means of its mouth piece 61. This connection is not shown in detail but may be carried out in any suitable manner, e.g. by snap engagement or screws. The position shown in Fig. 3 is now attained.

[0042] Ventilation of the inner room is performed by means of the following features in the manifold member 40 and the roof unit 10: At the bottom of the U-shape of manifold member 40, a series of arc-shaped openings 43 surrounded by walls 44c is provided. Air flowing to or from the ventilation tube 60 is allowed to pass through these openings 43. The manifold member 40 is in fluid

communication with the outside by means of a plurality of apertures in the frame 12. As is the case with the flap receiving apertures, such apertures may be obtained by detaching knock-out plates 23 in the frame 12 from the remaining part of the frame, cf. Figs. 6 and 10. In the installed condition of the roof light system, the sash 13 and the frame 12 form a kind of labyrinth seal, which allows air to escape from and enter into the ventilation tube, but which at the same time makes it difficult for precipitation to enter into the manifold and possibly the ventilation tube. In case precipitation nevertheless enters the manifold member 40, or in case condensation is formed, a controlled drainage is provided, as water collected in the trough defined by outer walls 44a and 44c and upstanding walls 44b surrounding openings 43 may flow out of the frame 12 through the apertures receiving flaps 42. Upstanding wall sections 44b prevent flow of water into the ventilation tube 60. Upstanding wall sections 46 form a labyrinth seal in order to secure that precipitation that might have entered the manifold member 40 through these apertures does not flow in the opposite direction.

[0043] In case it is desirable to modify the roof light system into a traditional openable window, the following steps are carried out, with reference in particular to Figs. 10 and 11.

[0044] Light conduit 70 is removed substantially in reverse manner in relation to the installation operation as described in the above.

[0045] Sash 13 is removed from the frame 12. In the state of delivery of the roof light system, the sash 13 is advantageously connected with the frame 12 by means of a hinge connection at the top of the sash L3 and frame 12. When the roof light system is in use, the sash 13 is most often secured to the frame by means of screws or similar fastening means to prevent the sash 13 from being opened inadvertently. Hinge connection may, however, be provided separately.

[0046] The area 12a surrounding the aperture 11 in the frame 12 is detached from the remaining part of the frame 12. The detachment is facilitated by detachment indication lines 24. Detachment indication lines 24 may be provided by means of visual indication only, or as weakening lines.

[0047] An aperture at the bottom of the frame 12 is obtained by means of a knock-out plate 25, the function of which is apparent from Fig. 11, viz. to accommodate the passage of an extending device or a stay 26.

[0048] Sash 13 is re-connected with the frame 12, possibly after the application of a hinge connection, and the extending device 26 is attached to the sash 13 and co-operating fixture means to the frame 12. Such extending devices, fixtures and other kinds of operating devices, e.g. an electrically operated chain, are known *per se* and are not the subject of detailed description. It is of course conceivable to let the interchangeable elements of the invention comprise elements suitable for substitution of parts of or the entire sash. For instance, it is possible to exchange the sash 13 of the base module with any other kind of sash, e.g. a sash having a different glazing with respect to colour, translucency or shape. For instance, the glazing may be substantially dome-shaped.

[0049] The diffuser unit 80 depends from the light conduit of the roof light system described above, and transmits light received from the light conduit into the interior of the building room. The diffuser unit may take many different forms and is as such not a central part of the present invention. In the following an embodiment of the diffuser unit corresponding to the embodiment of Fig. 3 will be described.

[0050] The diffuser unit includes a ceiling ring, a dual diffuser, a trim ring, a ceiling ring gasket, and a diffuser gasket.

[0051] With reference to Figs. 12 and 13, diffuser unit 80 is depicted. Ceiling ring 82 includes a plurality of flanges 84 configured for receipt of the light conduit from the roof light system. As will be appreciated, flanges 84 are configured for mating attachment with the distal end of the light conduit, whether the light conduit is constructed of a flexible tube or of a solid member. The light conduit may be attached to the flanges 84 by screws, banding attachment, or the like.

[0052] It will be observed in Fig. 13 that gasket 99 is also provided. Gasket 99 is disposed for receipt above flange 83 of ceiling ring 82, to provide a seal between flange 83 and gypsum, sheetrock, or like ceiling material upon installation of the diffuser unit in a building.

[0053] Ceiling ring 82 also includes a plurality of adjustable mounting cams 86. Mounting cams 86 are activated by screws 88, the heads of which are accessible from beneath ceiling ring 82. By turning screws 88, mounting cams 86 are drawn downward, with the gypsum boards, sheetrock, or like material by which the interior room ceiling is constructed disposed between mounting cams 86 and flange 83, thereby attaching ceiling ring 82 to the ceiling.

[0054] Each screw 88 also includes at its head a mounting tab (not shown in detail). Mounting tabs are configured to swing about the head of screws 88 to allow for receipt and attachment of the diffuser unit 92.

[0055] As depicted in Fig. 13, diffuser unit 80 includes flange 83 about the exterior. Flange 83 is configured for co-planar disposition against the interior ceiling of a building. As noted in Fig. 13, flange 83 also includes a plurality of apertures 94. Apertures 94 are configured for receipt of the ventilation tube 60 of the roof light system, if the roof light system is supplemented with a ventilation device as in the embodiment of Figs. 1 to 8. The apertures 94 are advantageously provided by detaching knock-out plates, as has been described in further detail with respect to other parts of the roof light system. In case no ventilation device is desired, these knock-out plates are left in place. In case a ventilation device is desired, mouth piece 62, which constitutes a manifold member having at least one opening to form a fluid communication with the ventilation tube 60, is connected with the diffuser unit

80 in any suitable manner. It will be appreciated that, by engagement of such a ventilation tube with apertures 94 upon ceiling ring 82, only a single penetration of an interior building ceiling would be necessary for installation of both a roof light system as well as a roof ventilation system.

[0056] Diffuser unit 80 also includes diffuser pan 96 and diffuser 92. Diffuser pan 96 is configured to slide within the interior opening defined within ceiling ring 82. Likewise, diffuser 92 is configured for fitting within the aperture defined within ceiling ring 82. Diffuser pan 96 receives diffuser 92 so as to allow a space of air between diffuser 92 and the pane 97 of diffuser pan 96. So disposed, the combination of diffuser pan 96 and diffuser 92 creates a thermal barrier to the transmission of heat to or from the roof light system. Once diffuser pan 96 and diffuser pan 92 are installed within the aperture defined through the center of ceiling ring 82, mounting tabs 90 are swung into position to hold diffuser 92, and thus also diffuser pan 96, within ceiling ring 82, blocking their removal. Disposed above diffuser pan 96 is gasket 98, providing a seal of the roof light system against the intrusion of humidity, dust, and insects to the interior of the roof light system.

[0057] Finally provided is trim ring 100, adapted for a snap fit engagement with ceiling ring 82. Trim ring 100 provides a finished outward surface for diffuser unit 80 upon installation of diffuser unit 80 into a ceiling.

[0058] So configured, installation of diffuser unit 80 into a building may proceed as follows. Upon installation of a roof unit in accordance with the present invention, an aperture may be cut through a ceiling of a building of appropriate size for receipt of diffuser unit 80. With gasket 99 in place about ceiling ring 82 above flange 83, ceiling ring 82 and gasket 99 may be inserted through such hole. So inserted, screws 88 are then turned so as to engage mounting cams 86, so as to capture between mounting cams 86 and flange 83 the ceiling gypsum board, sheetrock, or the like, thereby attaching ceiling ring 82 into the ceiling. The light conduit may then be attached to flanges 84. In the embodiment shown in Figs. 12 and 13, the ventilation tube 60 is attached to apertures 94 by means of mouth piece 62 constituting a manifold member as described in the above. Gasket 98 may then be installed within the aperture defined within ceiling ring 82. With gasket 98 in place, diffuser pan 96 and diffuser 92 may be installed within the aperture of ceiling ring 82, with mounting tabs then turned to hold diffuser 92 within ceiling ring 82 against gravity. The trim ring 100 may then be installed over the exposed flange 83 of ceiling ring 82, snap fitted into place.

[0059] The invention should not be regarded as being limited to the embodiments shown and described in the above. Various modifications and combinations may be carried out without departing from the scope of the appended claims.

Claims

1. Roof light system comprising a base module including a roof unit (10), a light conduit (70) and a diffuser unit (80), said light conduit extending between a first end positioned at the roof unit and a second end positioned at the diffuser unit, **characterized in that**, the roof unit (10) comprises a frame (12) defining an inner circumference and having a circular aperture (11) and a sash (13) carrying a glazing (14), said frame and sash having a rectangular shape, said light conduit (70) having a circular shape, and said first end of the light conduit being detachably connected with the frame (12) at said circular aperture (11), the area between the inner circumference of the frame (12) and the circular aperture (11) constituting a transition area (12a) substantially in parallel with the glazing, the roof light system furthermore comprising optional elements adapted to be connected with the base module, and interchangeable elements to replace elements of at least the roof unit and the light conduit of the base module.

2. A roof light system according to claim 1, wherein the shape of the frame (12) and the sash (13) is square.

3. A roof light system according to claim 2, wherein a ring (30) is provided for connection with a rim (19) surrounding said aperture (11), said ring being provided with pins (31) for engagement with lugs (20) on the rim.

4. A roof light system according to claim 3, wherein said ring (30) is provided with a circumferential flange (32), said light conduit being connected with the ring by means of a draw-band positioned above said flange.

5. Roof light system according to any one of the preceding claims, wherein said optional elements comprise a ventilation device including a ventilation tube (60) extending between a first end (60a) and a second end (60b), said first end being connected with the roof unit at said transition area (12a).

6. Roof light system according to claim 5, wherein said ventilation tube (60) is separate from the light conduit (70), said second end (60b) of the ventilation tube being connected with the diffuser unit (80).

7. A roof light system according to any one of claims 5 or 6, wherein the ventilation tube (60) is connected with the roof unit by means of a manifold member (40).

8. A roof light system according to claim 7, wherein the manifold member (40) is a separate member connected with the frame (12).

9. A roof light system according to claim 8, wherein the manifold member (40) is substantially U-shaped and surrounds the light conduit (70) partially.

10. A roof light system according to any one of claims 7 to 9, wherein the second end of said ventilation tube (60) is connected with the diffuser unit (80) by means of a manifold member (62).

11. A roof light system according to any one of claims 7 to 10, wherein the manifold member (40,62) is releasably connected with the roof unit or diffuser unit (10,80) by means of engagement means (42) on the manifold member cooperating with apertures (22,94) in the roof unit or diffuser unit, said apertures being preferably provided as knock-out plates (22) surrounded by detachment indication lines, and supplemental connection means (45) being preferably provided.

12. A roof light system according to any one of claims 7 to 11, wherein said manifold member (40) comprises a series of openings (43) surrounded by upstanding walls (44b) .

13. A roof light system according to any one of claims 5 to 12, wherein the ventilation device in addition to said ventilation tube (60) comprises at least one branch tube (160,260) extending between a first end (160a,260a) and a second end (160b,260b).

14. A roof light system according to claim 13, wherein the second end (160b,260b) of the at least one branch tube (160,260) is positioned at a distance from the diffuser unit (80) .

15. A roof light system according to any one of claims 5 to 14, wherein means for mechanical ventilation is provided.

16. A roof light system according to claim 1, wherein said optional elements of the roof light system includes means for providing a hinge connection between the sash (L3) and the frame (12).

17. A roof light system according to claim 16, wherein detachment indication lines (24) are provided at the inner circumference of the frame (12).

18. A roof light system according to claim 17, wherein said frame (12) is provided with at least one knock-out plate (25) adapted to allow passage of an extending device (26).

19. A roof light system according to any one of the preceding claims, wherein said optional elements include a plurality of solar cells provided on the roof unit.

20. A roof light system according to any one of the preceding claims, wherein the roof unit (10) comprises a frame (12) and a sash (13) carrying a glazing (14), and wherein said optional elements include a reflective and/or coloured film or coating provided on the frame and/or on the glazing.

Patentansprüche

1. Beleuchtungssystem für ein Dach mit einem Basismodul, das eine Dacheinheit (10), einen Lichtkanal (70) und eine Diffusoreinheit (80) umfasst, wobei sich der Lichtkanal zwischen einem ersten Ende, das an der Dacheinheit angeordnet ist, und einem zweiten Ende erstreckt, das an der Diffusoreinheit angeordnet ist, **dadurch gekennzeichnet, dass** die Dacheinheit (10) einen Rahmen (12) aufweist, der einen inneren Umfang bildet und eine kreisförmige Öffnung (11) sowie einen Fensterrahmen (13) aufweist, der eine Scheibe (14) hält, wobei der Rahmen und der Fensterrahmen eine rechteckige Form haben, wobei der Lichtkanal (70) eine kreisförmige Form hat und wobei das erste Ende des Lichtkanals lösbar mit dem Rahmen (12) an der kreisförmigen Öffnung (11) verbunden ist, wobei der Bereich zwischen dem inneren Umfang des Rahmens (12) und der kreisförmigen Öffnung (11) einen Übergangsbereich (12a) bildet, der im Wesentlichen parallel mit der Scheibe verläuft, wobei das Beleuchtungssystem für ein Dach ferner optionale Elemente aufweist, die angepasst sind, mit dem Basismodul verbunden zu werden, und austauschbare Elemente, um Elemente aus wenigstens der Dacheinheit und dem Lichtkanal des Basismoduls zu ersetzen.

2. Beleuchtungssystem für ein Dach nach Anspruch 1, wobei die Form des Rahmen (12) und des Fensterrahmens (13) quadratisch ist.

3. Beleuchtungssystem für ein Dach nach Anspruch 2, wobei ein Ring (30) für eine Verbindung mit einem Rand (19), der die Öffnung (11) umgibt, vorgesehen ist, wobei der Ring mit Stiften (31) zum Eingriff mit Vorsprüngen (20) an dem Rand versehen ist.

4. Beleuchtungssystem für ein Dach nach Anspruch 3, wobei der Ring mit einem Umfangsflansch (32) versehen ist, wobei der Lichtkanal mit dem Ring mittels eines Spannbandes verbunden ist, das über dem Flansch angeordnet ist.

5. Beleuchtungssystem für ein Dach nach einem der vorhergehenden Ansprüche, wobei die optionalen Elemente eine Belüftungsvorrichtung mit einem Belüftungsrohr (60) umfassen, das sich zwischen einem ersten Ende (60a) und einem zweiten Ende (60b) erstreckt, wobei das erste Ende mit der Dach-

einheit in dem Übergangsbereich (12a) verbunden ist.

6. Beleuchtungssystem für ein Dach nach Anspruch 5, wobei das Belüftungsrohr (60) von dem Lichtkanal (70) getrennt ist, wobei das zweite Ende (60b) des Belüftungsrohres mit der Diffusoreinheit (80) verbunden ist.

7. Beleuchtungssystem für ein Dach nach einem der Ansprüche 5 oder 6, wobei das Belüftungsrohr (60) mit der Dacheinheit mittels eines Stutzenelements (40) verbunden ist.

8. Beleuchtungssystem für ein Dach nach Anspruch 7, wobei das Stutzenelement (40) ein getrenntes Element ist, das mit dem Rahmen (12) verbunden ist.

9. Beleuchtungssystem für ein Dach nach Anspruch 8, wobei das Stutzenelement (40) im wesentlichen U-förmig ist und den Lichtkanal (70) teilweise umgibt.

10. Beleuchtungssystem für ein Dach nach einem der Ansprüche 7 bis 9, wobei das zweite Ende des Belüftungsrohres (60) mit der Diffusoreinheit (80) mittels eines Stutzenelements (62) verbunden ist.

11. Beleuchtungssystem für ein Dach nach einem der Ansprüche 7 bis 10, wobei das Stutzenelement (40, 62) lösbar mit der Dacheinheit oder der Diffusoreinheit (10, 80) mittels Eingriffselementen (42) an dem Stutzenelement verbunden ist, die mit Öffnungen (22, 94) in der Dacheinheit oder der Diffusoreinheit zusammenwirken, wobei die Öffnungen vorzugsweise als Ausstoß-Platten (22) vorgesehen sind, die von Anzeigelinien zum Lösen umgeben sind, und wobei vorzugsweise zusätzliche Verbindungselemente (45) vorgesehen sind.

12. Beleuchtungssystem für ein Dach nach einem der Ansprüche 7 bis 11, wobei das Stutzenelement (40) eine Reihe von Öffnungen (43) aufweist, die von vorstehenden Wänden (44b) umgeben sind.

13. Beleuchtungssystem für ein Dach nach einem der Ansprüche 5 bis 12, wobei die Belüftungsvorrichtung zusätzlich zu dem Belüftungsrohr (60) wenigstens ein Verzweigungsrohr (160, 260) aufweist, das sich zwischen einem ersten Ende (160a, 260a) und einem zweiten Ende (160b, 260b) erstreckt.

14. Beleuchtungssystem für ein Dach nach Anspruch 13, wobei das zweite Ende (160b, 260b) des wenigstens einen Verzweigungsrohres (160, 260) in einem Abstand von der Diffusoreinheit (80) angeordnet ist.

15. Beleuchtungssystem für ein Dach nach einem der Ansprüche 5 bis 14, wobei Mittel für eine mechanische Lüftung vorgesehen sind.

16. Beleuchtungssystem für ein Dach nach Anspruch 1, wobei die optionalen Elemente des Beleuchtungssystems für ein Dach Mittel zum Vorsehen einer Gelenkverbindung zwischen dem Fensterrahmen (13) und dem Rahmen (12) umfassen.

17. Beleuchtungssystem für ein Dach nach Anspruch 16, wobei Anzeigelinien (24) zum Lösen an dem inneren Umfang des Rahmens (12) vorgesehen sind.

18. Beleuchtungssystem für ein Dach nach Anspruch 17, wobei der Rahmen (12) mit wenigstens einer Ausstoß-Platte (25) versehen ist, die einen Durchgang einer vorstehenden Einrichtung (26) erlaubt.

19. Beleuchtungssystem für ein Dach nach einem der vorhergehenden Ansprüche, wobei die optionalen Elemente eine Vielzahl von Solarzellen umfassen, die an der Dacheinheit vorgesehen sind.

20. Beleuchtungssystem für ein Dach nach einem der vorhergehenden Ansprüche, wobei die Dacheinheit (10) einen Rahmen (12) und einen Fensterrahmen (13) umfasst, der eine Scheibe (14) hält, und wobei die optionalen Elemente eine reflektierende und/oder getönte Schicht oder Beschichtung umfassen, die an dem Rahmen und/oder der Scheibe vorgesehen sind.

Revendications

1. Système d'éclairage destiné à un toit comprenant un module de base comportant une unité de toit (10), un conduit d'éclairage (70) et une unité de diffusion (80), ledit conduit d'éclairage s'étendant entre une première extrémité positionnée au niveau de l'unité de toit et une seconde extrémité positionnée au niveau de l'unité de diffusion, **caractérisé en ce que** l'unité de toit (10) comprend un bâti (12) définissant une circonférence intérieure et comportant une ouverture circulaire (11) et un châssis (13) supportant un vitrage (14), ledit bâti et ledit châssis présentant une configuration rectangulaire, ledit conduit d'éclairage (70) présentant une forme circulaire et ladite première extrémité du conduit d'éclairage pouvant être rattachée de façon amovible au bâti (12) au niveau de ladite ouverture circulaire (11), la surface comprise entre la circonférence intérieure du bâti (12) et l'ouverture circulaire (11) constituant une surface de transition (12a) essentiellement parallèle au vitrage, le système d'éclairage pour toit comportant, en outre, des éléments optionnels adaptés pour être raccordés avec le module de base, et des éléments interchangeables pour remplacer des élé-

ments au moins de l'unité de toit et du conduit d'éclairage du module de base.

2. Système d'éclairage destiné à un toit selon la revendication 1, dans lequel la forme du bâti (12) et du châssis (13) est carrée.

3. Système d'éclairage destiné à un toit selon la revendication 2, dans lequel une bague (30) est fournie en vue d'un raccordement avec une nervure (19) entourant ladite ouverture (11), ladite bague étant prévue avec des broches (31) destinées à s'engager avec des pattes (20) formées sur la nervure.

4. Système d'éclairage destiné à un toit selon la revendication 3, dans lequel ladite bague (30) est prévue avec un rebord sur sa circonférence (32), ledit conduit d'éclairage étant raccordé à la bague au moyen d'une bande de serrage placée au-dessus dudit rebord.

5. Système d'éclairage destiné à un toit selon l'une quelconque des revendications précédentes, dans lequel lesdits éléments optionnels comprennent un dispositif de ventilation incluant un tube de ventilation (60) s'étendant entre une première extrémité (60a) et une seconde extrémité (60b), ladite première extrémité étant raccordée à l'unité de toit au niveau de ladite surface de transition (12a).

6. Système d'éclairage destiné à un toit selon la revendication 5, dans lequel ledit tube de ventilation (60) est séparé du conduit d'éclairage (70), ladite seconde extrémité (60b) du tube de ventilation étant raccordée à l'unité de diffusion (80).

7. Système d'éclairage destiné à un toit selon l'une quelconque des revendications 5 ou 6, dans lequel le tube de ventilation (60) est raccordé à l'unité de toit au moyen d'un élément collecteur (40).

8. Système d'éclairage destiné à un toit selon la revendication 7, dans lequel l'élément collecteur (40) est un élément séparé raccordé au bâti (12).

9. Système d'éclairage destiné à un toit selon la revendication 8, dans lequel l'élément collecteur (40) est essentiellement configuré en U et entoure partiellement le conduit d'éclairage (70).

10. Système d'éclairage destiné à un toit selon l'une quelconque des revendications 7 à 9, dans lequel la seconde extrémité dudit tube de ventilation (60) est raccordée à l'unité de diffusion (80) au moyen d'un élément collecteur (62).

11. Système d'éclairage destiné à un toit selon l'une quelconque des revendications 7 à 10, dans lequel l'élément collecteur (40, 62) est raccordé de façon amovible à l'unité de toit ou à l'unité de diffusion (10, 80) par l'intermédiaire de moyens d'engagement (42) sur l'élément collecteur coopérant avec des ouvertures (22, 94) formées dans l'unité de toit ou l'unité de diffusion, lesdites ouvertures étant, de préférence, prévues sous forme de plaques orientables (22) entourées de lignes d'indication de détachement, et des moyens de raccordement supplémentaires (45) étant fournis, de préférence.

12. Système d'éclairage destiné à un toit selon l'une quelconque des revendications 7 à 11, dans lequel ledit élément collecteur (40) comprend une série d'ouvertures (43) entourées de parois droites (44b).

13. Système d'éclairage destiné à un toit selon l'une quelconque des revendications 5 à 12, dans lequel le dispositif de ventilation en plus dudit tube de ventilation (60) comprend au moins un tube à branches (160, 260) s'étendant entre une première extrémité (160a, 260a) et une seconde extrémité (160b, 260b).

14. Système d'éclairage destiné à un toit selon la revendication 13, dans lequel la seconde extrémité (160b, 260b) d'au moins un tube à branches (160, 260) est positionnée à une certaine distance de l'unité de diffusion (80).

15. Système d'éclairage destiné à un toit selon l'une quelconque des revendications 5 à 14, dans lequel des moyens destinés à une ventilation mécanique sont fournis.

16. Système d'éclairage destiné à un toit selon la revendication 1, dans lequel lesdits éléments optionnels du système d'éclairage destiné à un toit comportent des moyens pour fournir une connexion articulée entre le châssis (13) et le bâti (12).

17. Système d'éclairage destiné à un toit selon la revendication 16, dans lequel des lignes d'indication de détachement (24) sont prévues au niveau de la circonférence intérieure du bâti (12).

18. Système d'éclairage destiné à un toit selon la revendication 17, dans lequel ledit bâti (12) est prévu avec au moins une plaque orientable (25) adaptée pour permettre le passage d'un dispositif d'extension (26).

19. Système d'éclairage destiné à un toit selon l'une quelconque des revendications précédentes, dans lequel lesdits éléments optionnels comportent une pluralité de cellules solaires prévues sur l'unité de toit.

20. Système d'éclairage destiné à un toit selon l'une

quelconque des revendications précédentes, dans lequel l'unité de toit (10) comprend un bâti (12) et un châssis (13) supportant un vitrage (14), et dans lequel lesdits éléments optionnels comprennent un film ou un revêtement réflecteur et/ou coloré prévu sur le bâti et/ou sur le vitrage.

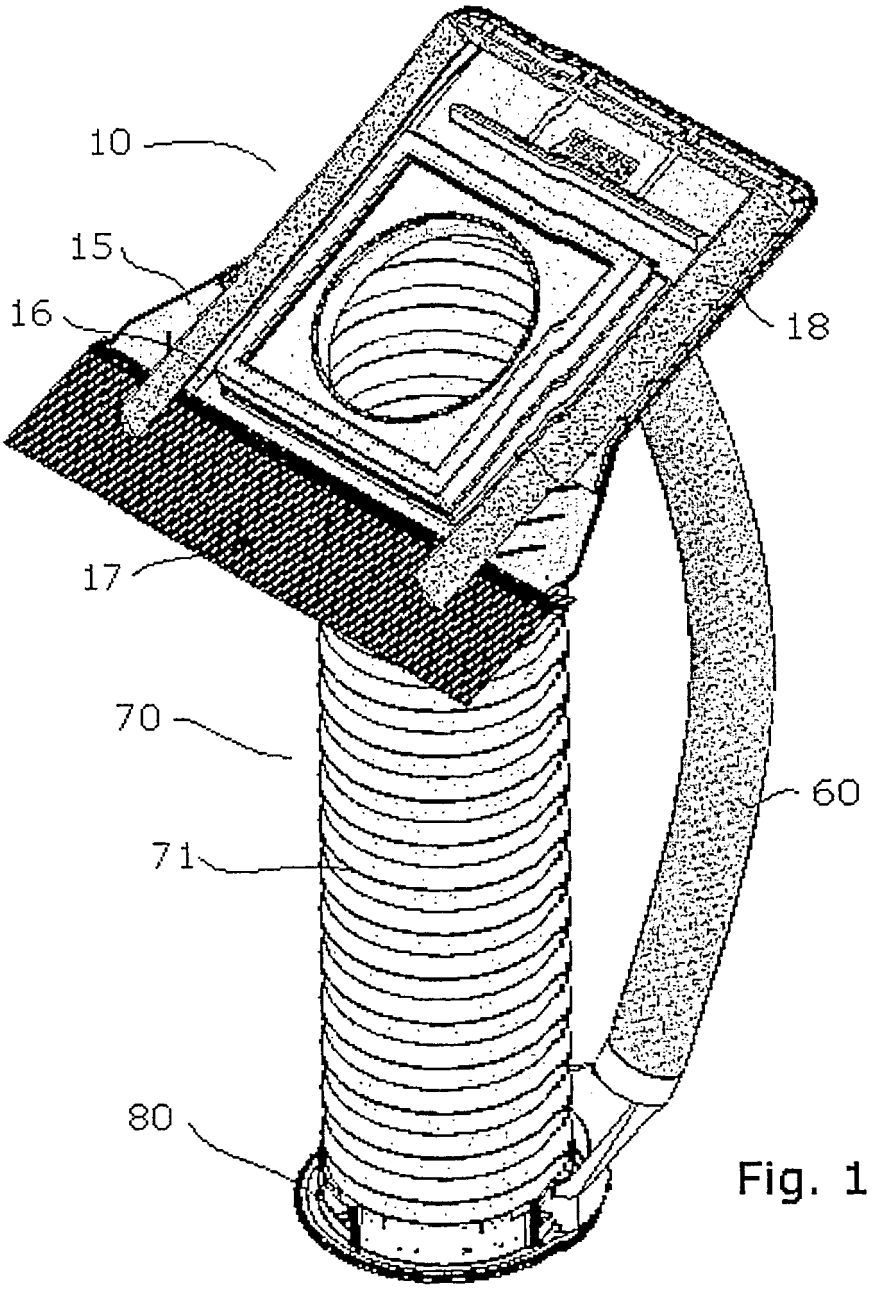

Fig. 1

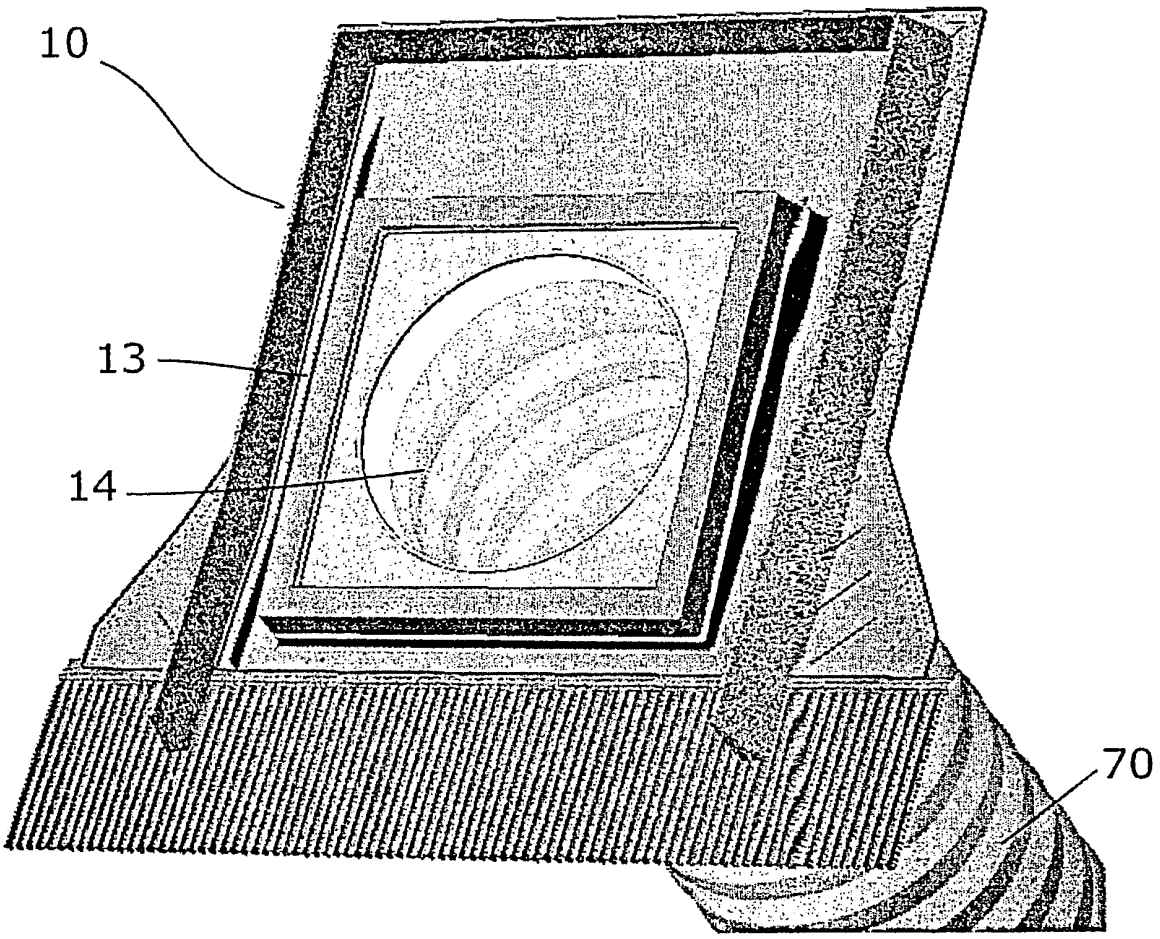

Fig. 2

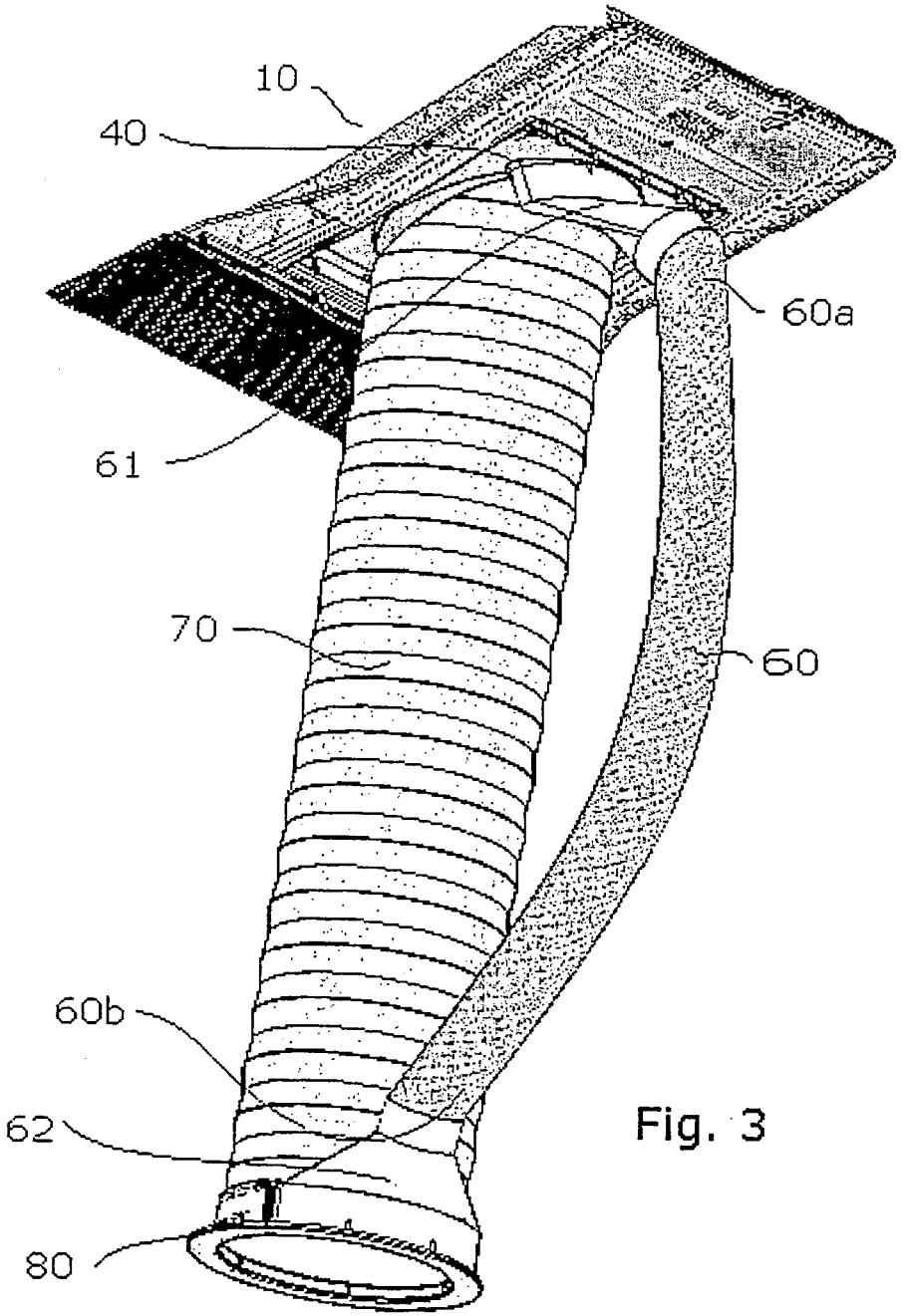

Fig. 3

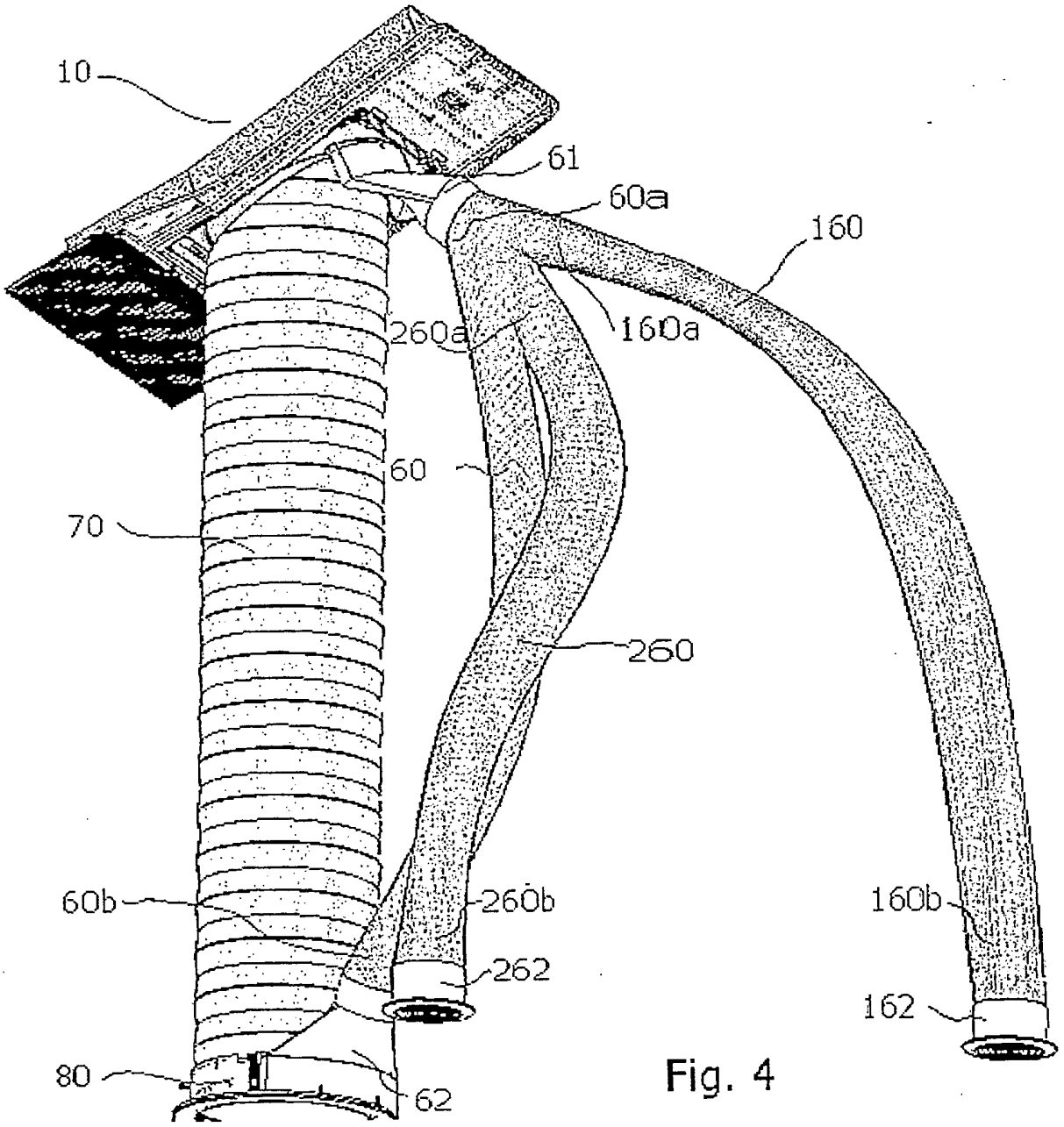

Fig. 4

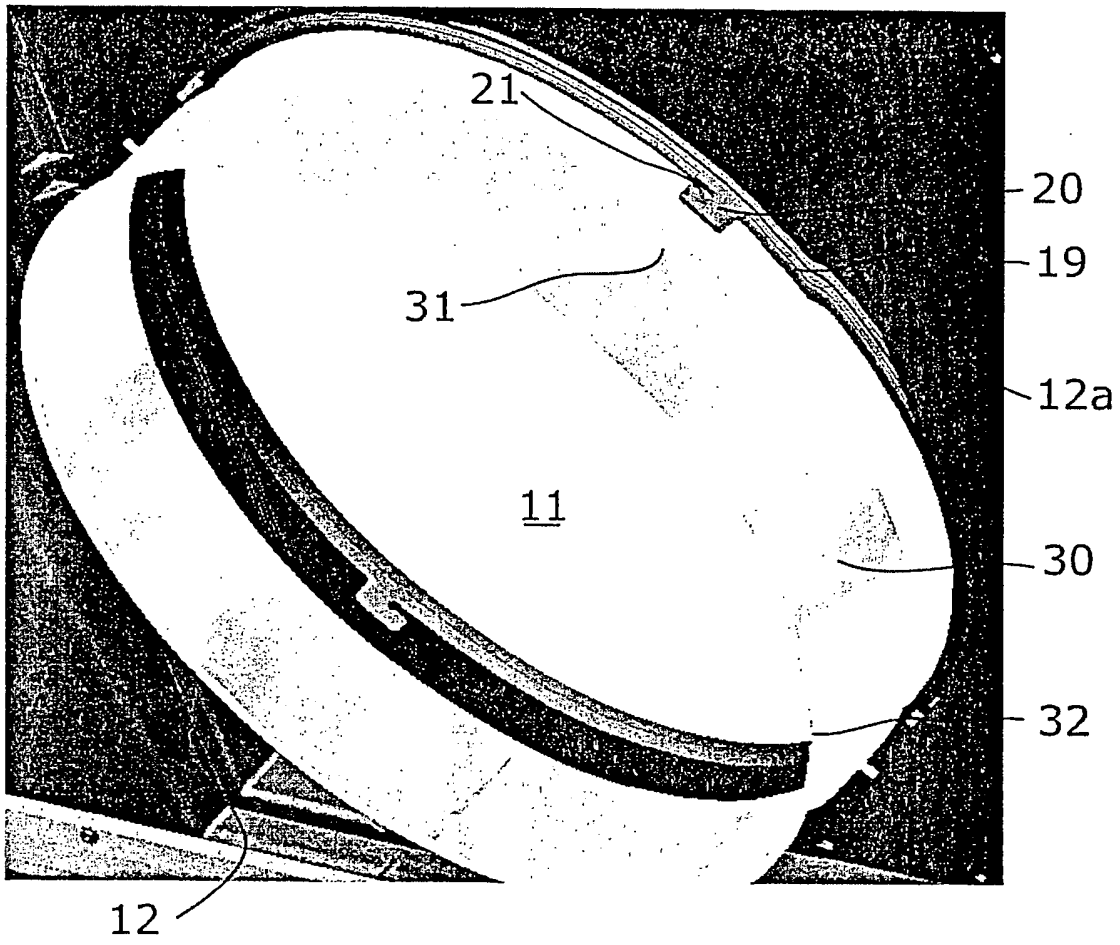

Fig. 5

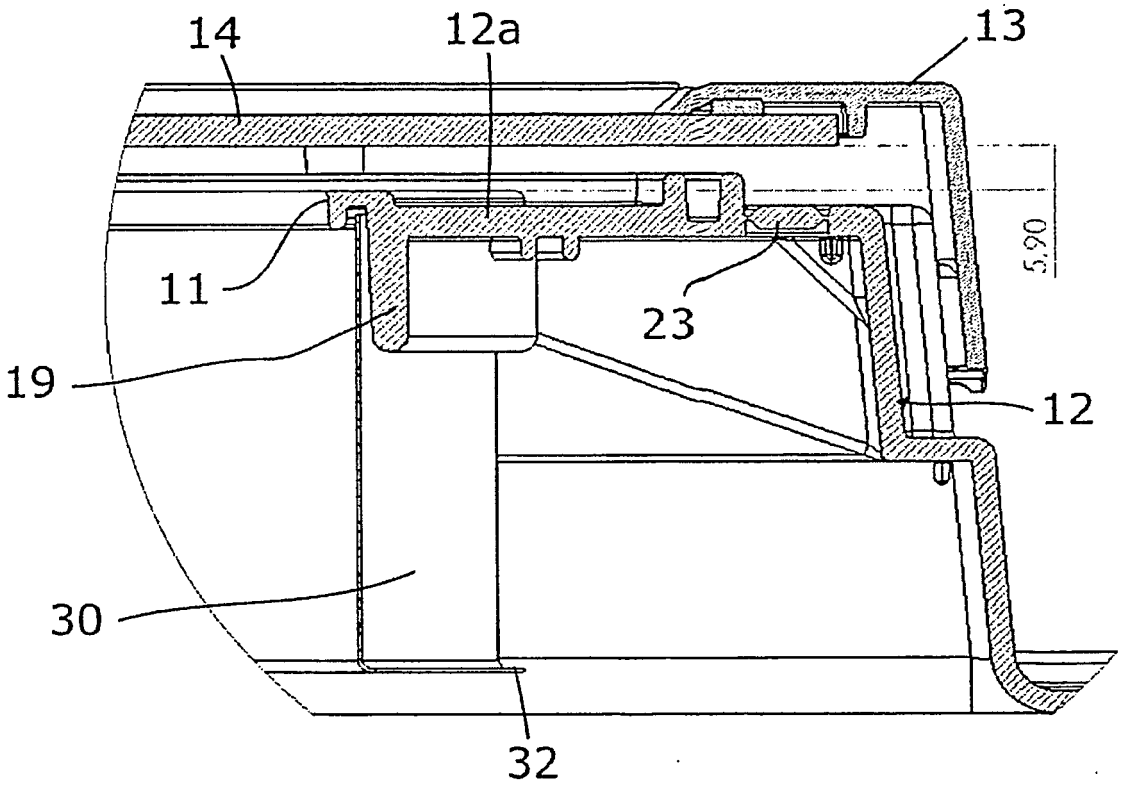

Fig. 6

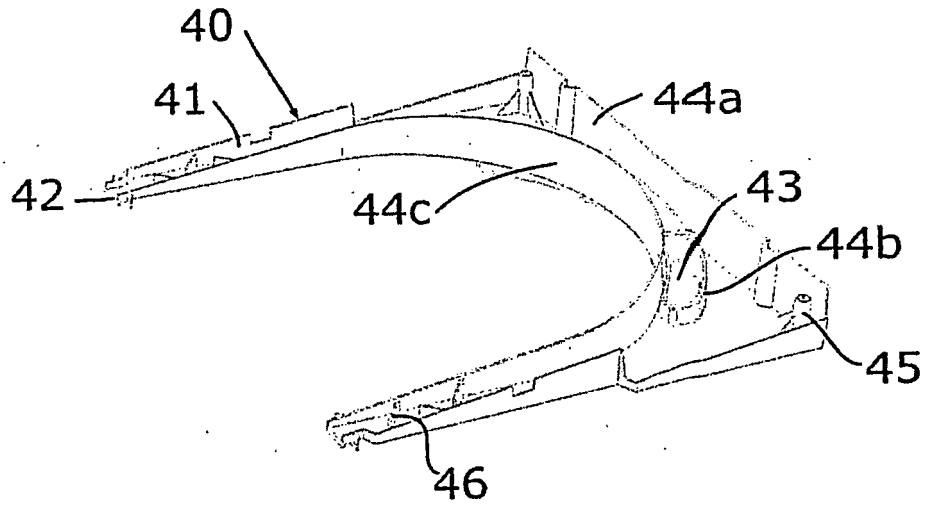

Fig. 7

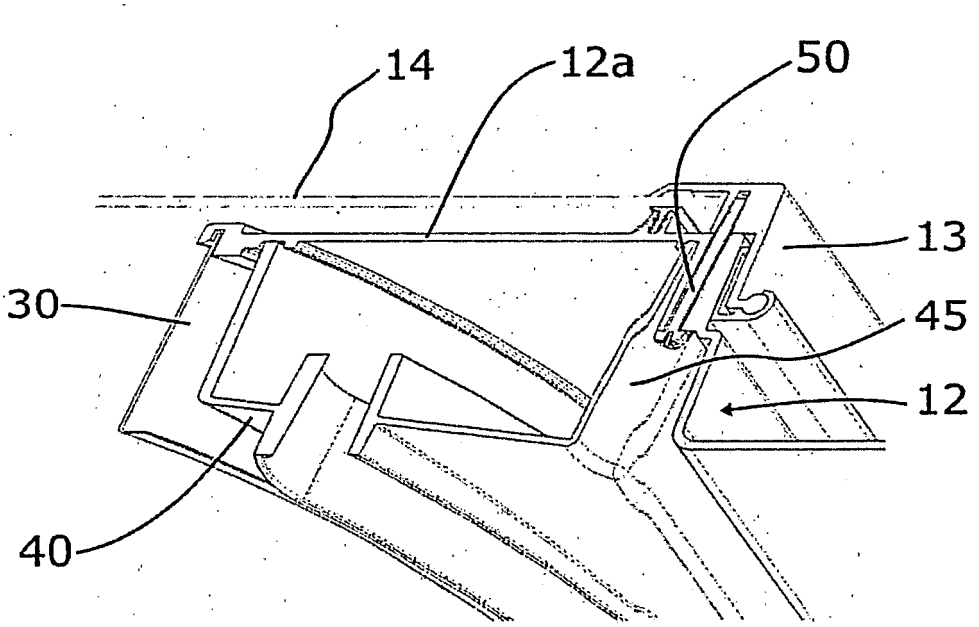

Fig. 8

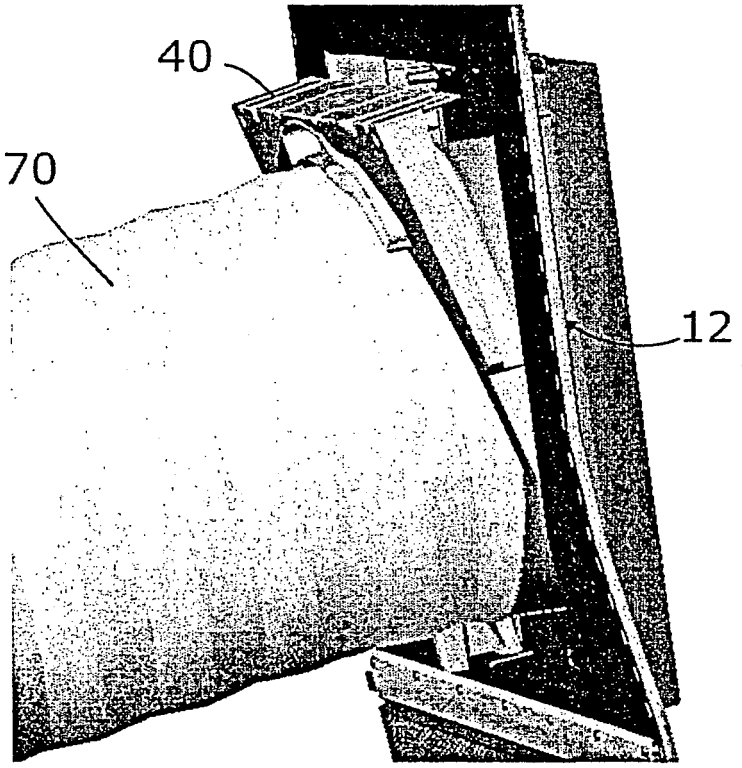

Fig. 9

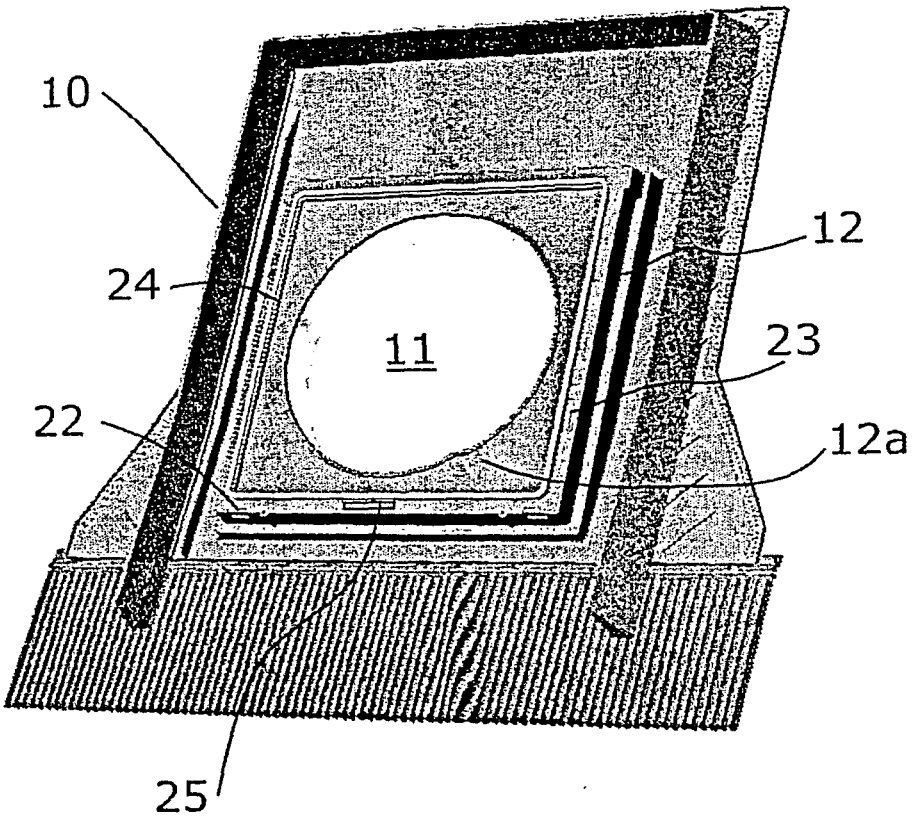

Fig. 10

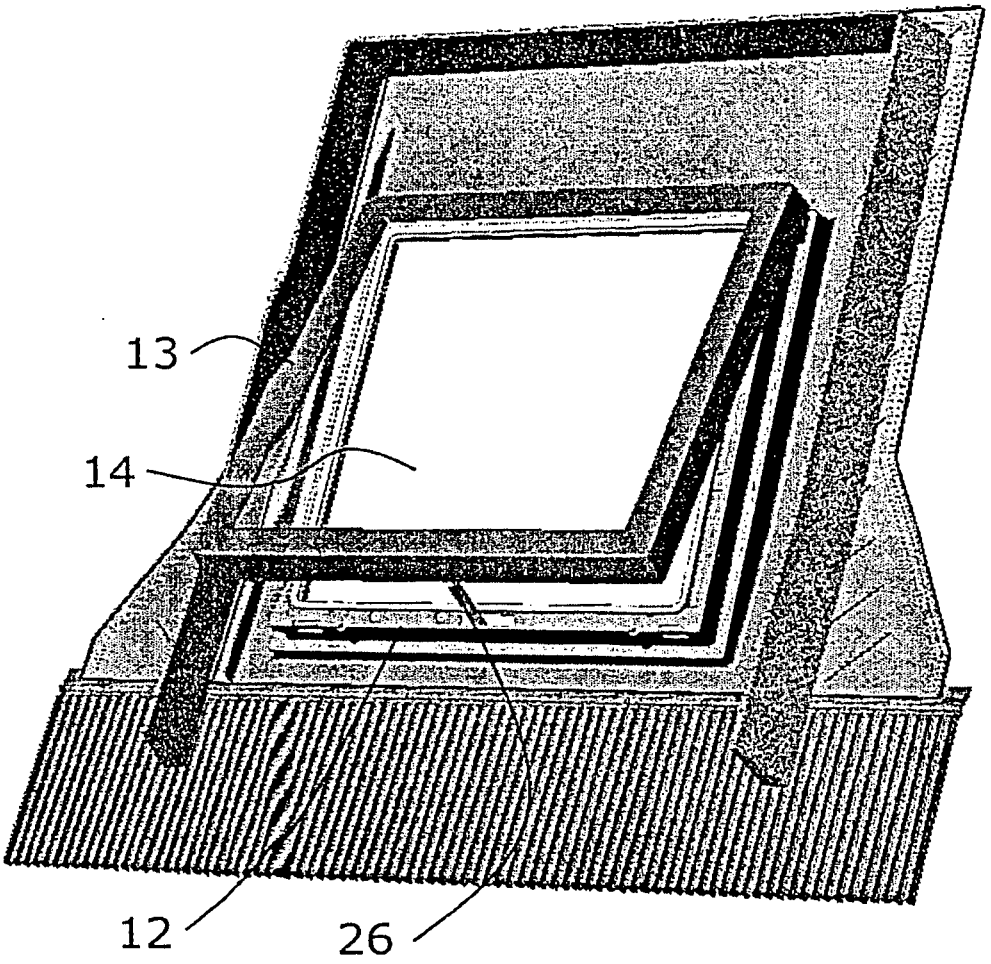

Fig. 11

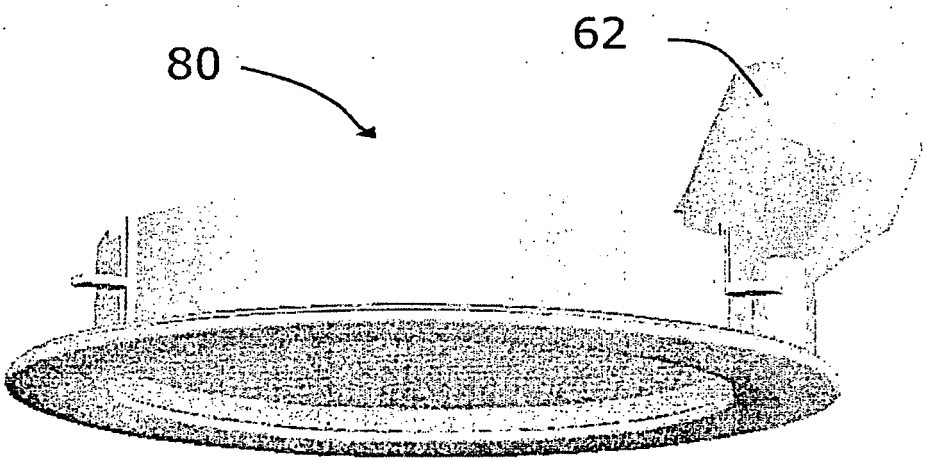

Fig. 12

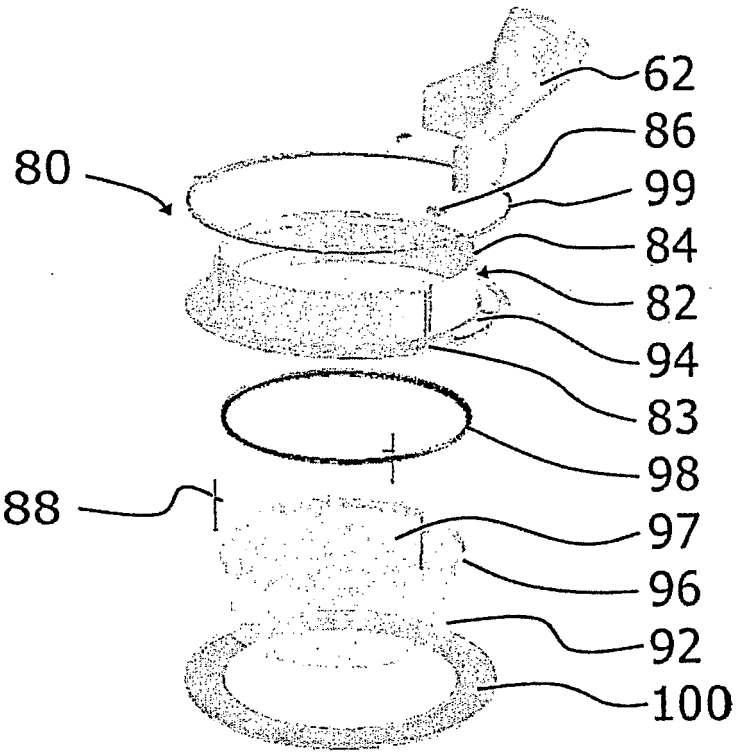

Fig. 13

REFERENCES CITED IN THE DESCRIPTION

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