

(19)



(11)

EP 3 162 977 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.05.2017 Bulletin 2017/18

(51) Int Cl.:
E04D 13/035 (2006.01) E05D 15/40 (2006.01)
E05F 15/100 (2015.01) E04D 13/03 (2006.01)

(21) Application number: **16196247.7**

(22) Date of filing: **28.10.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(71) Applicant: **FAKRO PP Sp. z o.o. 33-300 Nowy Sacz (PL)**

(72) Inventor: **Dziurzy ski, Tomasz 33-300 Nowy S cz (PL)**

(30) Priority: **28.10.2015 PL 41457815**

(54) ROOF SKYLIGHT WITH RAISING LEAF, IN PARTICULAR WITH SMOKE REMOVAL FUNCTION

(57) The present invention is a roof skylight, consisting of a frame 1 and a leaf 2, raised orthogonally relative to the frame 1, where the frame and leaf have four sides forming a closed rectangular shape, preferably with equal sides, generally made from plastic profiles, and the movement of the leaf 2 is guided and stabilized by four scissor mechanisms 3, one for each side of the frame

and the leaf, operating in a plane orthogonal to the plane of the frame 1 and in parallel to the side by which they are fixed; moreover, the leaf is raised by four driving actuators 4, installed symmetrically, preferably in parallel planes, in an angular position relative to the direction in which the leaf is raised, two for opposite sides of the frame 1 and corresponding sides of the leaf 2.

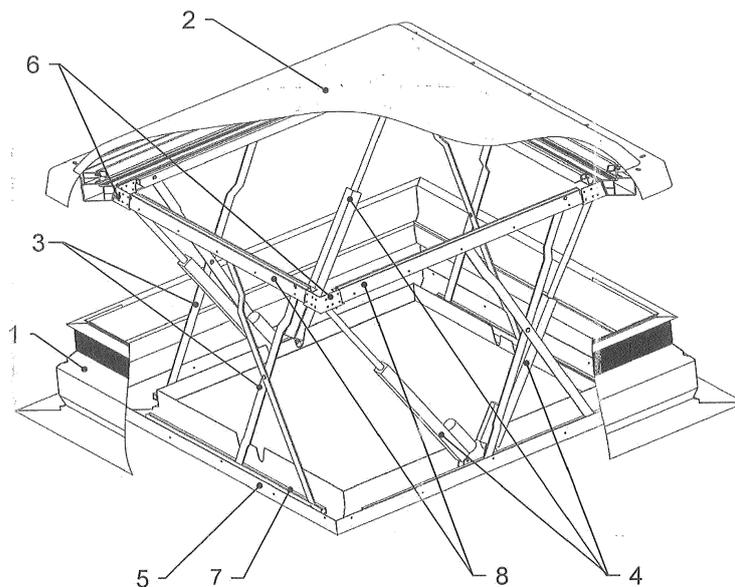


Fig. 1

EP 3 162 977 A1

Description

[0001] The present invention relates a roof skylight used to transmit outside natural light into building interiors, which, apart from its interior illumination function, additionally is characterized in a smoke removal function and may serve as ventilation or exhaust.

[0002] The smoke removal function of the skylight is required in many industrial and public buildings and is characterized by largest possible opening or displacement of the leaf from the frame in order to facilitate the flow of the smoke to the outside of the building. The leaf is generally held in two positions: closed and open. Generally, skylights intended for use in flat roofs, i.e. horizontal or low pitch roofs, comprising a frame and a moveable relative to the frame, leaf. A convex dome or a flat glazing, e.g. insulated glass unit, may form the outer layer of the leaf. In a skylight with a raising leaf, which constitutes the present invention, the movement of the leaf takes place through linear raising of the leaf generally orthogonally to the plane of the frame, which in case of a horizontal roof simultaneously constitutes vertical movement. In a typical configuration the frame and the leaf have four sides and the orthogonal movement of the leaf is achieved via guiding mechanisms and drives which hold the leaf and the frame in varied distances relative to each other in a generally parallel position, i.e. with no change in mutual angular position.

[0003] A skylight with a lightweight design is known from patent EP0979333 B1; it consists of a frame installed in the roof structure and a leaf orthogonally moveable relative to the frame. The frame and the leaf have four sides and the orthogonal movement of the leaf is achieved via a single leaf raising mechanism located in the middle of the span of the skylight. This solution may be used for lightweight designs of the leaf, with no high forces projected to act in the plane of the leaf. When the leaf is in the open position and the wind is strong there is a risk that it may be damaged, particularly if the force acts orthogonally to the plane in which the scissor mechanism operates. Moreover, there is no possibility to hide or camouflage mechanical elements, which reduces aesthetic value of the solution.

[0004] A skylight consisting of a frame and a leaf moveable orthogonally relative to the frame is known from patent EP2385184 B1, where the frame and the leaf have 4 sides and the orthogonal movement of the leaf is achieved via guiding means which hold the leaf and the frame in a generally parallel position relative to each other. Two rigid chain drives are placed symmetrically relative to the centre of the skylight and the movement of the leaf is guided and stabilized by scissor mechanisms on each of the four sides of the skylight. Both the scissor mechanisms and the chain drives are embedded in the voids in the plastic frame. This solution ensures that the design is aesthetically pleasing, but, due to the necessity of adapting the design of the skylight for installing mechanisms and drives, it requires additional structural ele-

ments and fixings as well as removal machining of the frame and leaf elements of the skylight in order to create mounting sockets. A skylight with a raising leaf of such a design is a solution where standard profiles, utilized e.g. for typical non-opening skylights, can be used only to a limited extent. It would be desirable to propose such a design for a skylight with a raising leaf where manufacturing and installation costs could be reduced through utilizing as many standard elements, used in other skylight types and other components for joinery and window frames, as possible.

[0005] The purpose of the proposed solution is to introduce a roof skylight arranged for opening the leaf, generally orthogonally to the plane of installation of the frame, to a sufficient height, and use of said skylight with as a skylight with smoke removal function, wherein the leaf raising mechanism should be embedded as close to the frame and leaf elements as possible. The leaf rising mechanism should also enable its use in standard profiles for frame and leaf elements utilized in other skylight designs. Installation of the raising mechanism does not require any special preparation and machining of the frame and leaf elements.

[0006] The skylight in a typical configuration has a generally rectangular or square shape and comprises a frame embedded in the roof structure and a moveable leaf embedded in said frame. The movement of the leaf, preferably orthogonal relative to the plane of the frame, is achieved via at least two guiding mechanisms preferably placed symmetrically in skylight, and at least one drive, holding the leaf and the frame together in selected positions relative to each other, generally parallel, i.e. with no change in mutual angular position. The guiding mechanism generally utilizes a known solution known as a flat scissor mechanism, which, if the linear movement of the leaf is forced, uses two levers of equal length, connected to each other through articulated joints in their kinematic centres. Each lever is characterized by a rotary connection on one end and a rotary sliding connection on the other end. In order to enable the movement raising the leaf over the frame, each of these elements must have one rotary connection and one rotary sliding connection. Both dependencies result in a mechanism in which the rotary sliding connections of both levers with the leaf and the frame occur opposite each other. If the torque of the leaf relative to the frame occurs in a limited fashion, the levers of the scissor mechanism transfer mainly the load in the plane of its operation. The aforementioned torque, and additionally lateral forces, occur mainly in designs where the direction in which the driving actuator operates is not parallel to the direction in which the leaf moves and in cases where the skylight is installed on a non-horizontal surface, e.g. a roof with a slight pitch. Arranging the driving actuator in this manner is intentional and advantageous, since it reduces its height in the direction in which the leaf raises in the closed position and allows for lower profiles to be used, thereby reducing the height of the skylight. At the same time, the design of the

driving actuator should ensure sufficient protrusion in order to enable the leaf to be raised in such a way as to ensure proper smoke removal function of the skylight, i. e. have the most advantageous (the highest) possible air outflow coefficient. Moreover, taking into account transport, storage and installation, the skylight should be characterized by a compact design.

[0007] The torque of the leaf relative to the frame also causes additional forces which act orthogonally to the plane of the scissor mechanism. In order to minimise the lateral forces, a set of three or four scissor mechanisms is preferably utilized, of which at least one is in a plane non-parallel to the others, preferably orthogonal. The most stable system consists of such a number of scissor mechanisms as to form a pseudo-closed chain when viewed from the top. In case of a skylight with a rectangular profile this means using four scissor mechanisms, one on each side. Such configuration of scissor mechanisms enables asymmetrically applied raising force, i.e. characterized by non-zero net torque in the plane parallel to the plane of the skylight, to be utilized. The minimum number of actuators is one; however, this causes a considerable unbalance of forces and torques, which has to be countered by lever connections with handles in the frame and the leaf. Long-term operation of the skylight in this configuration causes the elements to wear more quickly, backlash and instability, especially in the raised position of the leaf. Operating practice shows that the optimal solution, considering the cost and functionality, consists of two actuators, placed as symmetrically as possible, and three or four scissor mechanisms, preferably placed on each side of the skylight.

[0008] In order to reduce the torque of the leaf relative to the frame while it is being raised, the drive set used should be characterized by zero net torque and minimal forces acting in the plane parallel to the plane of the skylight. This may be achieved through a system of at least three actuators arranged diagonally, forming a spatial balanced system of forces, in which the direction in which the actuators operate is not parallel to the direction in which the leaf is raised. Alternatively, a system of at least three actuators, operating in the direction in which the leaf is raised, may be utilized, provided one of their ends is embedded in a non-rotary manner in the frame or in the leaf. It is important to choose the location, embedding and direction in which the actuators operate in such a way that, regardless of the direction of the load, the degree of freedom of the leaf is limited to only linear movement orthogonally to the plane of the skylight.

[0009] The system in such configurations could generally function without scissor mechanisms, but due to relatively high cost of the actuators this is rarely utilized. Moreover, a much cheaper and more functional solution is to use actuators as drives and scissor mechanisms as systems for stabilizing and limiting the degree of freedom of the leaf. The leaf can generally be held relative to the frame in a closed position or in an open position. In the closed position the leaf is embedded in the frame and

the scissor mechanisms and driving actuators are not under load. In the open position, if horizontal component forces occur generating torque of the leaf relative to the frame, the entire load related to the leaf is transferred via the driving actuators and scissor mechanisms.

[0010] The essence of the solution as per the proposed invention is a set of elements generally comprising a bottom bracket fixed to the frame element and a top bracket fixed to the leaf element or to the supporting frame of the dome, serving as supporting elements for the rotary and rotary sliding embedding of both levers of the scissor mechanism and additionally rotary embedding of the actuator if it is projected for installation. There are generally two types of sets of elements fixed to each side of the skylight in the proposed solution: active with a driving actuator and a scissor mechanism and passive without a driving actuator. The scissor mechanism and elements of the installation kit are preferably made from a material with a high mechanical strength, primarily flexural strength, e.g. steel or composite materials, and furthermore should be characterized by resistance to changing weather conditions. The bottom bracket is fixed to the inner edge of the frame element and should have a sufficiently large contact area with the surface of the frame element and an appropriate amount of fasteners, so that the transferred load does not damage the frame element, which is typically made from plastic or, more rarely, wooden profiles. Furthermore, the bottom bracket may, on the inner side of the frame, adjoin the surface of the roof structure if the hole in the roof is preferably smaller than the inner outline of the frame. Similarly, the top bracket is fixed to the inner side of the leaf or the supporting frame of the skylight. The essence of the solution is placing the set of elements, i.e. the scissor mechanism, driving actuator, bottom bracket and top bracket, on the inner side of the frame and leaf elements.

[0011] The above description pertains to a single selected set, comprising installation kit, scissor mechanism and driving actuator, intended for one of the sides of the skylight. The number of sets used for a skylight should take into account the conditions relating to the structural stability given above, stemming from, among others, the mass of the leaf being raised and additional load, e.g. snow, as well as projected effect of air movement outside of the building. In order to maintain high aesthetic value, mechanical elements are preferably hidden by covers fixed to the bottom bracket on the inner side. Apart from the aforementioned function, the covers are characterized by ease of installation and removal, thereby providing convenient and easy access to mechanical elements of the skylight, e.g. in case repair or maintenance is necessary. Masking plates or lining, whose upper edge is preferably adjusted to the shape and position of the glazing of the leaf or the dome in the closed position of the skylight, may be utilized as covers. If in a given skylight design the covers would protrude too much over the frame, causing e.g. increased resistance for air outflow, they may be divided into a part fixed to the frame and a

part fixed to the leaf, or covering the mechanisms near the leaf may be forgone. In the closed position the leaf is preferably embedded in the brim of the frame, and between the masking covers and the surface of the glazing of the skylight there is a preferably small gap, which takes manufacturing and installation imperfections, as well as thermal expansion, into account.

[0012] The proposed solution as per the invention requires no special design and preparatory machining of the frame and leaf elements and may be utilized both for new skylights, using current technology, as well as for skylights which are already in operation, whose functionality may be extended to openable skylights or skylights with smoke removal function. The advantage of such a solution is a considerable reduction in cost of manufacturing skylights.

[0013] The roof skylight in the **proposed embodiment**, consisting of four sides arranged in a rectangular system, preferably square, in a configuration with four scissor mechanisms, one for each side of the skylight, and four driving actuators, two symmetrically for opposite sides of the skylight, is graphically presented in the drawings:

Fig. 1 - The skylight in the open position - axonometric projection with removed fragments.

Fig. 2a - The skylight in the open position - cross section through the middle, with a background view of a side with two driving actuators.

Fig. 2b - The skylight in the open position - cross section through the middle, with a background view of a side without driving actuators.

Fig. 3 - An example set of mechanical elements of the skylight, generally comprising: scissor mechanism, two symmetrically placed driving actuators, installation kit, articulated brackets and guides - axonometric projection.

Fig. 4 - The skylight in the closed position - cross section through the middle, with a background view of a side with two driving actuators.

A skylight as per the invention comprising a frame 1 and a leaf 2, raised orthogonally relative to the frame 1. The frame 1 and the leaf 2 have four sides forming a closed rectangular shape, preferably with equal sides, generally made from plastic profiles. The movement of the leaf 2 is guided and stabilized by four scissor mechanisms 3, one for each side of the frame and the leaf, operating in a plane orthogonal to the plane of the frame 1 and in parallel to the side by which they are fixed. The movement of the leaf is achieved via four driving actuators 4, installed symmetrically, preferably in parallel planes, in an angular position relative to the direction in which the leaf is raised, two for opposite sides of the frame 1 and corresponding sides of the leaf 2. Such arrangement of the driving actuators 4, if the skylight is placed horizontally (vertical movement of the leaf 2), guarantees reduction in net lateral forces stemming from the load caused by

the mass of the leaf 2 when the skylight is placed horizontally. The loads stemming from e.g. wind, snow or the fact that the skylight is inclined due to being installed on a slightly pitched roof are transferred mainly by a set of four scissor mechanisms 3.

The scissor mechanism 3, as well as driving actuators 4, if present, are, consistently on each side of the skylight, connected with the frame 1 through a bottom bracket 5 fixed to the element of the frame 1. The bottom bracket 5 is generally a channel section with an inner arm 51, an arm 52 adjoining the inner surface 11 of the frame 1 and a connector 53, whose surface is generally parallel to the plane of the frame 1. The shape of the profile and the inclination of the adjoining arm 52 imitates the shape and inclination of the inner surface 11 of the frame 1, to which the bottom bracket 5 is fixed. The bottom bracket 5 constitutes a closed gutter preferably on the entire perimeter of the frame 1, on its inner side. A bottom guide 7 for rotary sliding connection of the lever 31 of the scissor mechanism 3 and articulated brackets 55 for rotary connection of the linear actuator 4, if one is installed on the selected side of the skylight, are embedded on and fixed to the connector 53 of the bottom bracket 5, using typical joining means.

One lever 31' of the scissor mechanism 3 has a rotary-sliding connection with the bottom guide 7 achieved via an articulated slider 32'. The rotary connection of second lever 31" of the scissor mechanism 3 with the bottom guide 7 is achieved via an articulated slider 32" with sliding blocked by a bolt 33 crossing coaxial holes in the bottom guide 7 and the second lever 31". The levers 31', 31" of the scissor mechanism 3 are preferably made from steel flat bars.

[0014] The top brackets 6 are the elements which connect the driving actuators 4 with the leaf. They are generally embedded in the corners between the elements 21 of the leaf 2 and generally fixed to both leaf elements 21 via retaining arms 61 using typical joining means, e. g. screws. An articulated bracket 62 for rotary connection of the driving actuator 4 is mounted on one of the retaining arms 61. The articulated bracket 62 is mounted using the same joining means by which the retaining arm is fixed to the frame 2 elements 21, utilizing coaxial mounting holes.

[0015] The top guide 8 is generally a longitudinal profile, with a retaining arm 81 and a guiding profile 82 for fixing the top guide 8 to the frame 2 element 21 using typical joining means. The top guide 8 has an identical function as the bottom guide 7 and preferably the same elements are used for rotary-sliding and rotary connections of the lever 31', 31" of the scissor mechanism 3, i. e. an articulated slider 32' for rotary sliding connection and an articulated slider 32" blocked by a bolt 33 for rotary connection.

[0016] Mainly for aesthetic purposes, the skylight has masking plates 9, generally on the entire perimeter, fixed to the inner arm 51 of the bottom bracket 5. The height of the masking plates 9 in the direction of the leaf 2 is

chosen in such a way as to effectively hide mechanical elements from view and at the same time not create additional factor of increased resistance for air outflow. For this reason, the height of the masking plates 9 is reduced and masking strips 10, preferably plastic, fixed to the leaf 2, fulfil the masking function in the space not covered by the masking plates 9. When the leaf 2 is in the closed position, the masking plates 9 and the masking strips 10 are next to each other or there is a small tuck between them, thus they completely cover the view of mechanical parts from within the skylight. The mutual height of the masking plates 9 and the masking strips 10 should take manufacturing and installation imperfections and varied thermal expansion of the skylight elements into account, so that they do not interfere with the ability to close the skylight tightly.

[0017] In order to increase the versatility of the proposed skylight, the control system for the driving actuators 4 provides at least three predefined positions of the height to which the leaf 2 is raised. The closed position of the leaf 2 is the first of them. Ventilation position is the second: the leaf 2 is raised to a small height so as to enable the flow of air, but at the same time prevent access by unauthorized persons from the outside. The alarm position, the smoke removal position, is the third; here, the leaf 2 is raised to maximum height.

[0018] The skylight as per proposed invention is characterized by displacement of the elements of the frame 1 and leaf 2 from the exhaust outlet, which results in improved thermal performance.

Claims

1. A roof skylight, comprising

- a frame (1) embedded in a roof structure, in particular a flat roof, and
- a moveable leaf (2) embeded in said frame (1), where the leaf (2) is arranged to be raised orthogonally relative to the frame (1) and held in selected distance from the frame (1), generally in a position parallel to the frame,
- the frame (1) and the leaf (2) have at least three, preferably four, sides forming a closed shape,
- at least two scissor mechanisms (3) which are arranged to move the leaf (2) relative to the frame (1), where said scissor mechanisms (3) are placed individually on the sides of the skylight, for which individually the plane of operation is generally parallel to the adjacent side of the skylight,
- and said scissor mechanisms (3) are in mechanical rotary or rotary-sliding connections with the frame (1) and the leaf (2),
- at least one driving actuator (4) arranged to move the leaf, where said driving actuator being

with a rotary connection with the frame and the leaf,

characterized in that the skylight comprises a bottom bracket (5) in which the scissor mechanism (3) and/or the driving actuator (4) is installed and said bottom bracket (5) is fixedly embedded on the inner side of the frame (1), and the skylight comprises at least one top bracket (6) fixedly embeded on the inner side of the leaf (2), for providing a movable connection of the leaf (2) relative to the frame (1).

2. A roof skylight according to claim 1, **characterized in that** the bottom bracket (5) is generally a channel section with an inner arm (51), an adjoining arm (52) to the frame (1) and a connector (53), where the connector (53) surface is generally parallel to the plane of the frame (1).

3. A roof skylight according to claim 2, **characterized in that** the adjoining arm (52) is a profile with shape and inclination which matches shape and inclination of the inner surface (11) of the frame (1), to which the bottom bracket (5) is fixed.

4. A roof skylight according to claim 1-2, **characterized in that** the bottom bracket (5) constitutes a closed gutter generally on the entire perimeter of the frame (1).

5. A roof skylight according to claim 1 **characterised in that** a bottom guide (7) in the bottom bracket (5) is located and a top guide (8) in the top bracket (6) is located.

6. A roof skylight according to claim 1-5, **characterized in that** a bottom guide (7) and a articulated brackets (55) are fixed to the connector (53) of the bottom bracket (5).

7. A roof skylight according to claim 1 **characterized in that** the scissor machanism comprising one lever (31') and second lever (31'') connected to each other through articulated joints in their kinematic centres.

8. A roof skylight according to claim 5 or 7 **characterized in that** the one lever (31') is in rotary-sliding connection and the second lever (31'') is in rotary connection with said bottom guide (7).

9. A roof skylight according to claim 6 **characterized in that** the driving actuator (4) is in rotary connection with the articulated bracket (55).

10. A roof skylight according to claims 5 or 7 **characterized in that** one lever (31') is in rotary-sliding connection and the second lever (31'') is in rotary connection with said top guide (8).

- 11. A roof skylight according to claims 5 or 10 **characterized in that** the top guide (8) is longitudinal profile and comprises a guiding profile (82) and a retaining arm (81) for fixing the top guide (8) to the leaf (2) element (21). 5

- 12. A roof skylight according to claims 1 **characterized in that** the top brackets (6) are embedded in the corners between the leaf elements (21) and are fixed to one or both adjacent leaf elements (21) via retaining arms (61) by joining means. 10

- 13. A roof skylight as per claim 12, **characterized in that** the retaining arm (61) of the top bracket (6) constitutes a base and has means for fixing the articulated bracket (62) arranged for the rotary connection the lever (31 ") of the scissor mechanism (3) with said articulated barcket (62). 15

- 14. A roof skylight according to claims 1-13, **characterized in that** the rotary-sliding connection of the scissor mechanism (3) with the top guide (8) and bottom guide (7) is achieved via an articulated slider (32'), and the rotary connection of the scissor mechanism (3) with the top guide (8) and bottom guide (7) is achieved via an articulated slider (32") with blocked sliding function by bolt 33 arranged for crossing coaxial holes in the bottom guide (7) and the lever (31). 20
25

- 15. A roof skylight according to claims 1-14 **characterized in that** the inner arm (51) of the bottom bracket constitutes a base and comprises means for embedding masking plates (9), preferably on the entire perimeter of the frame (1), with a height in the direction of the leaf (2) not exceeding the distance to the glazing of the leaf (2) in the closed position. 30
35

40

45

50

55

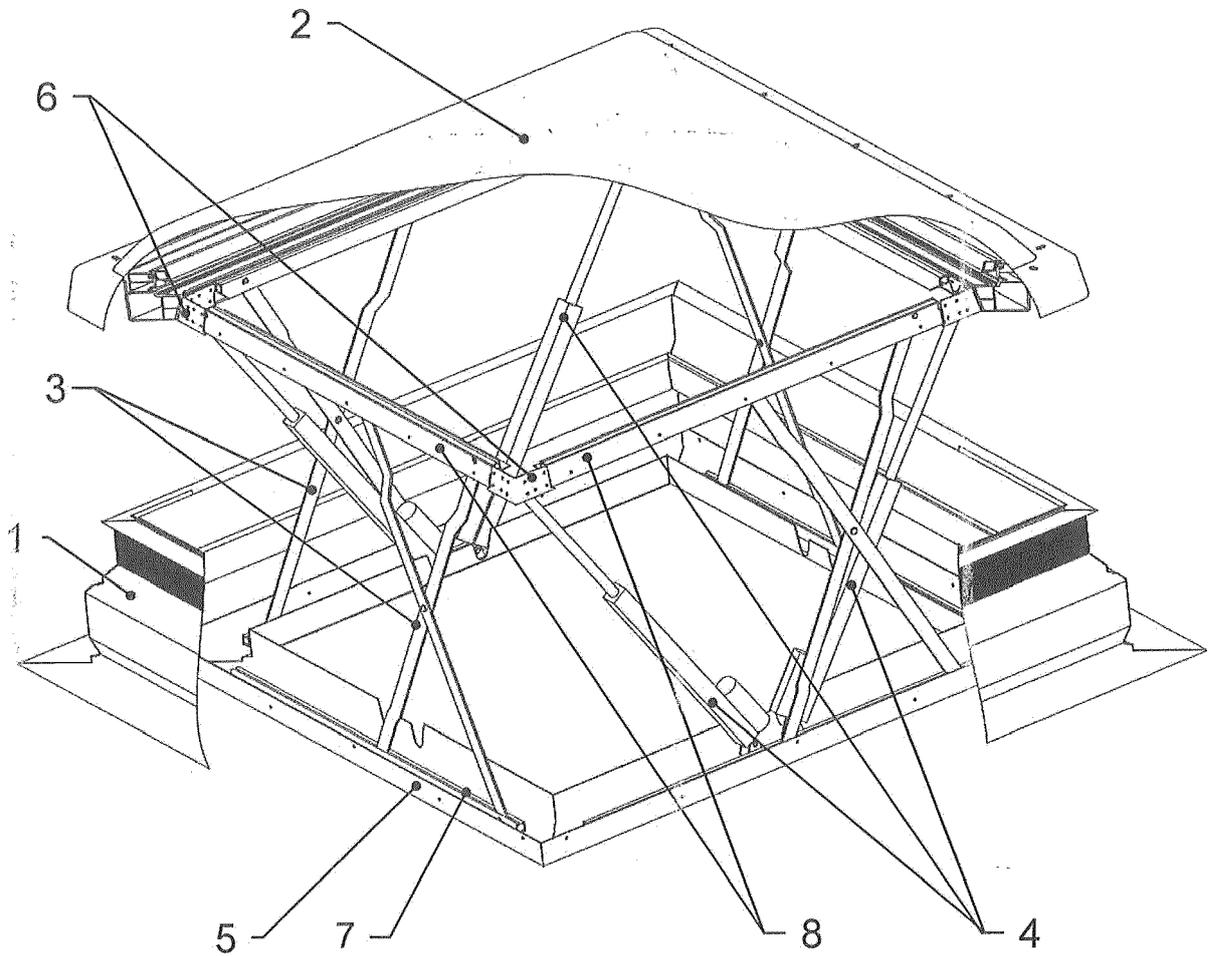


Fig. 1

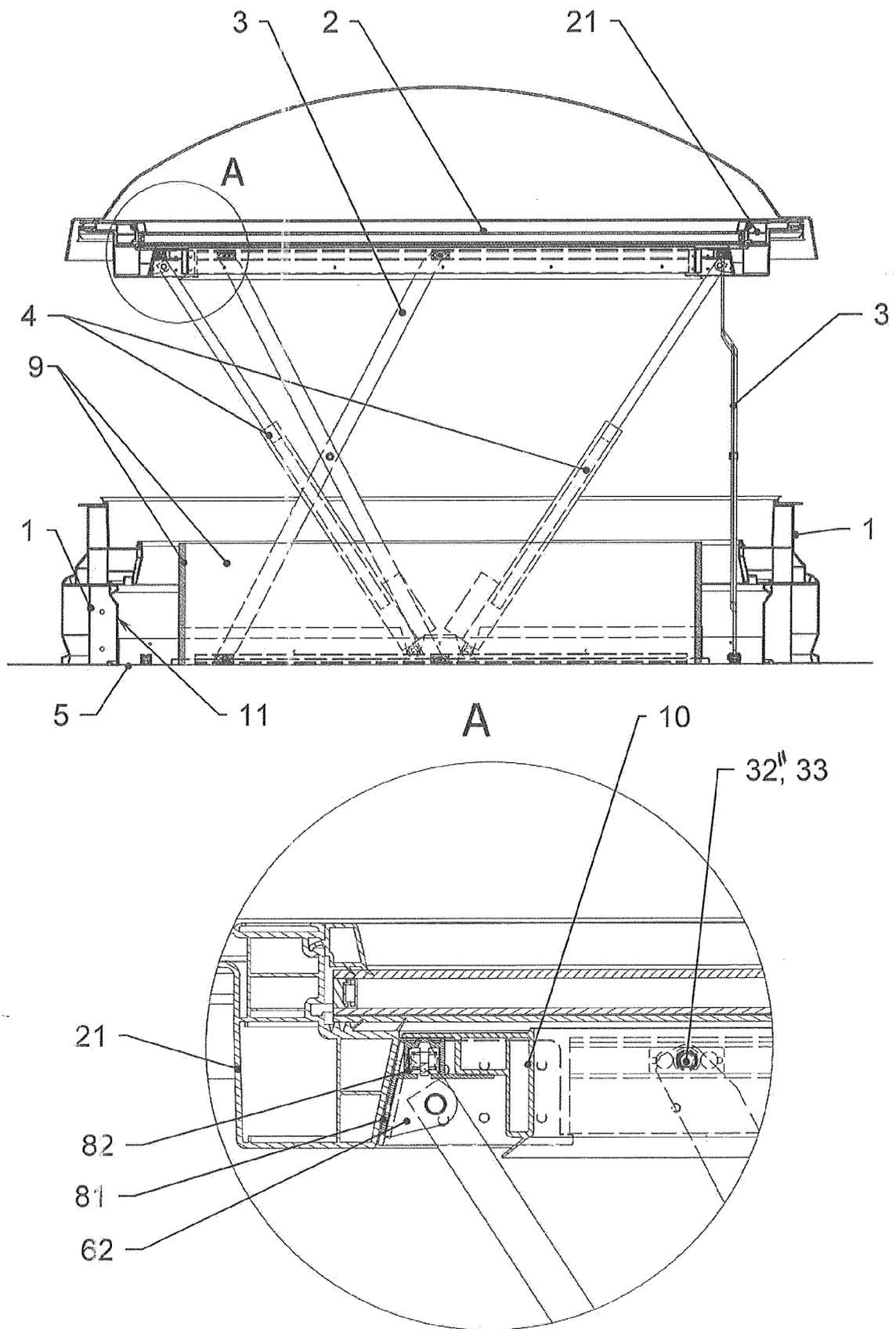


Fig. 2a

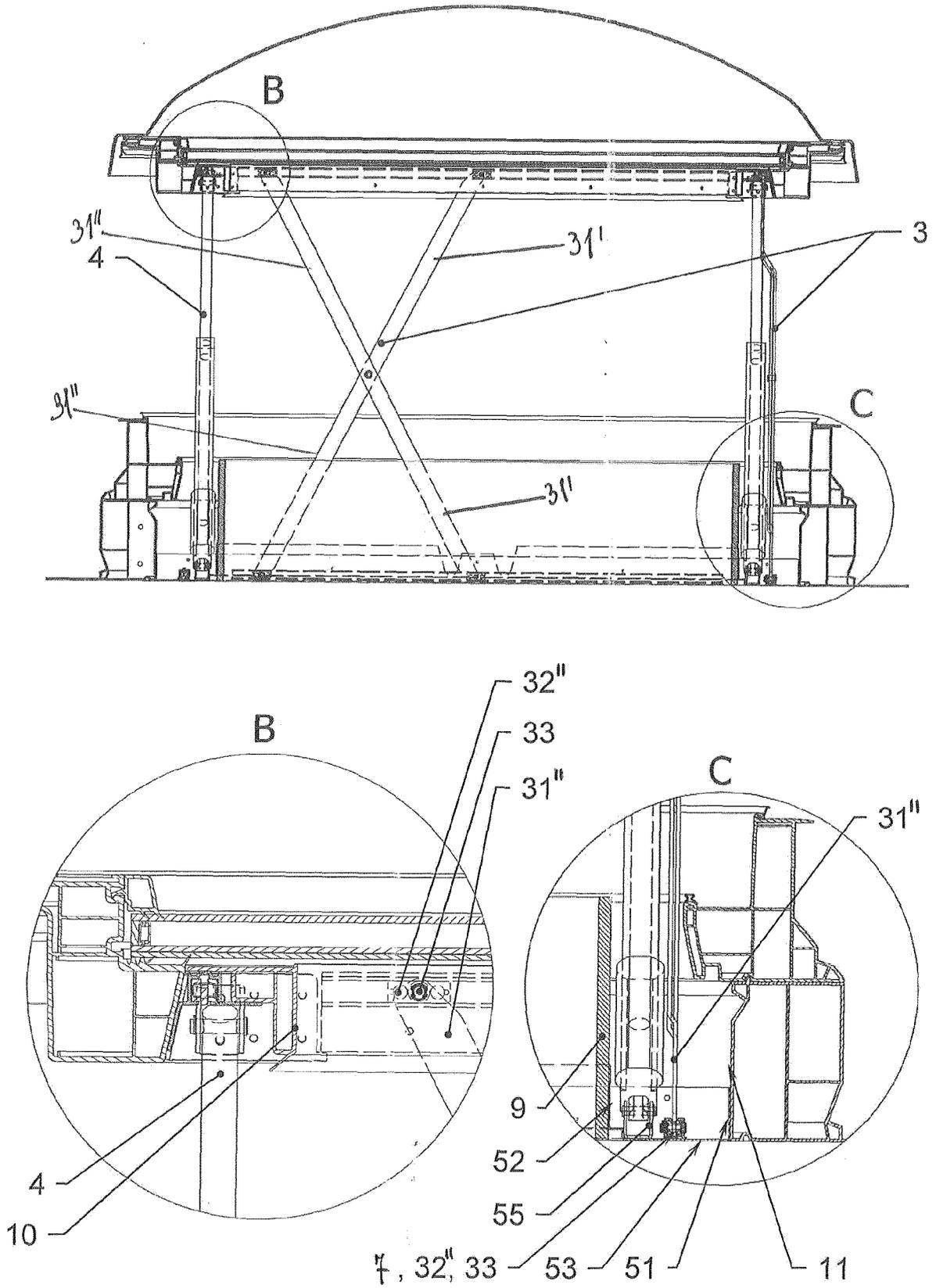


Fig. 2b

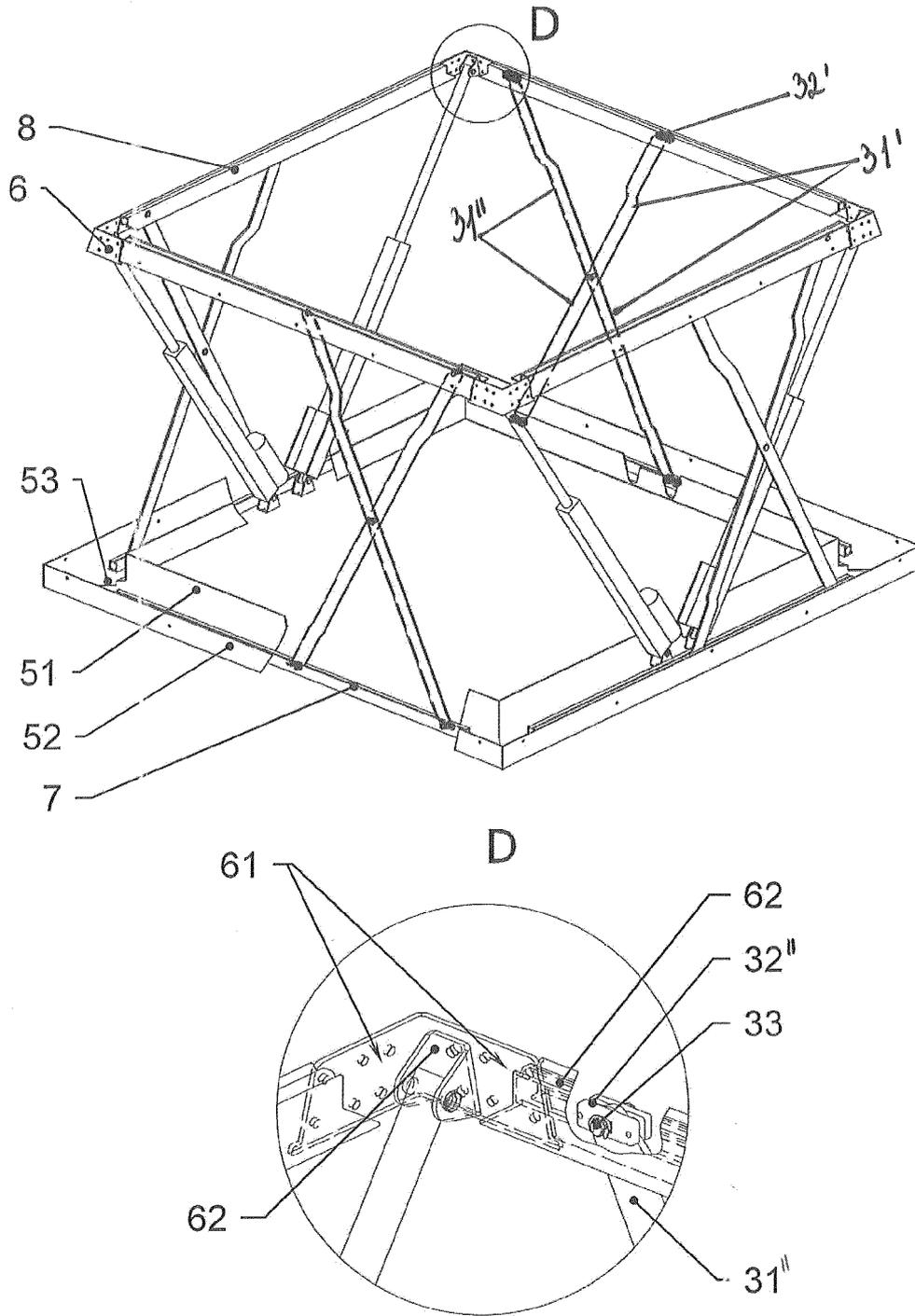


Fig. 3

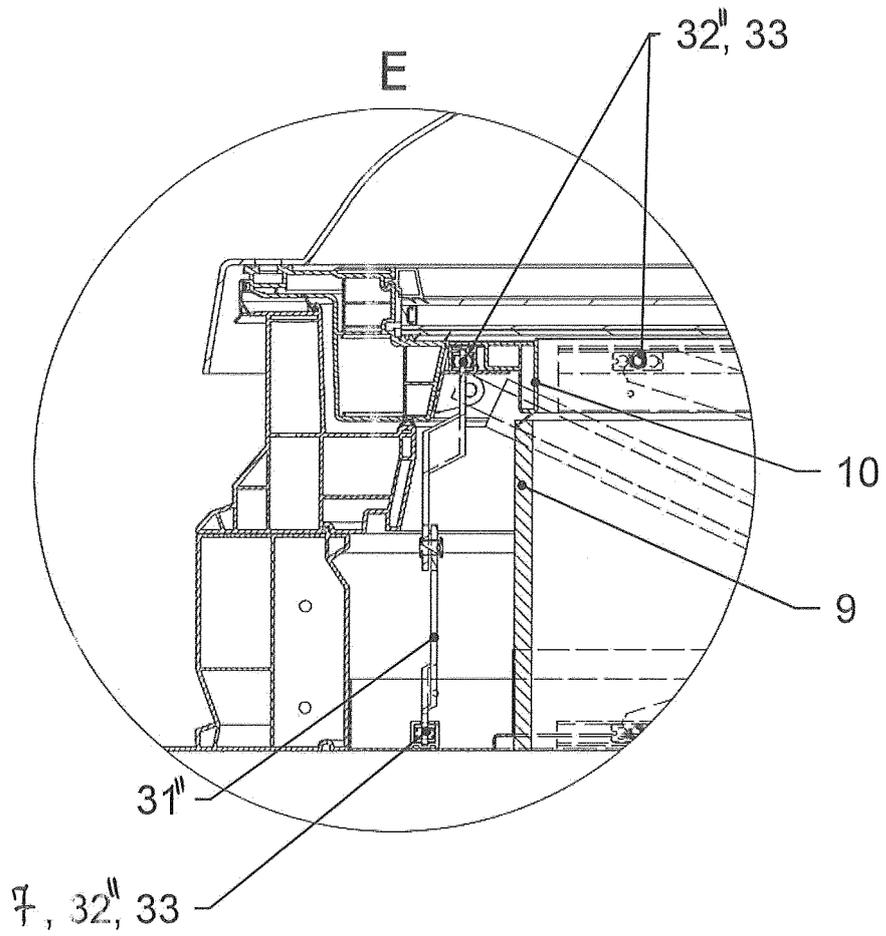
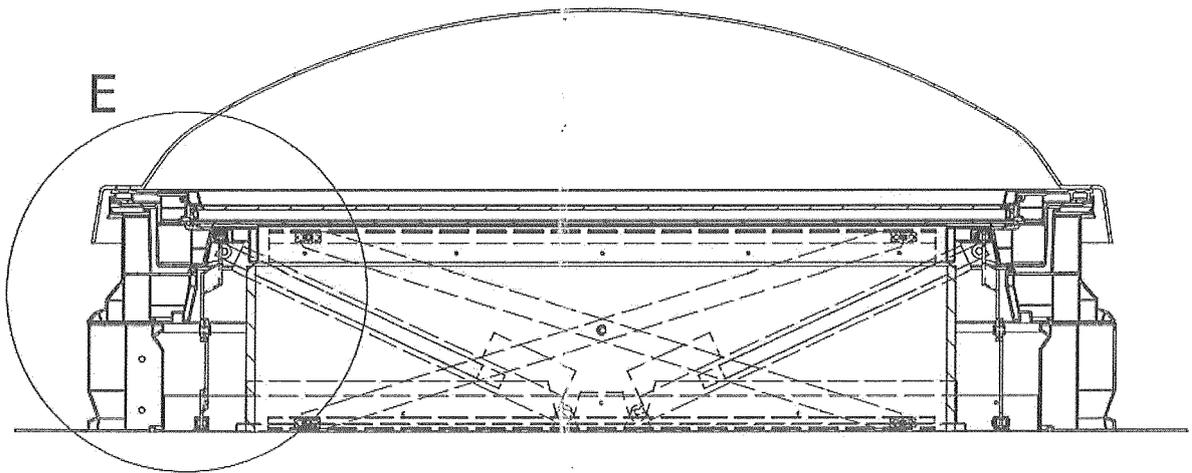


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 16 19 6247

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2000 017793 A (ENDO TAKAFUMI) 18 January 2000 (2000-01-18)	1-3,7	INV. E04D13/035 E05D15/40 E05F15/00 E04D13/03
A	* figures 1,2,4 *	4-6,8-15	
A	----- EP 0 801 183 A1 (CRONIER APPLIC [FR]) 15 October 1997 (1997-10-15)	1-15	
A	----- WO 2009/076950 A1 (VKR HOLDING AS [DK]; JENSEN BENT KIRK [DK]) 25 June 2009 (2009-06-25)	1-15	
A	----- JP S60 223559 A (CHUO HATSUJO KK) 8 November 1985 (1985-11-08)	1-15	
	----- * figure 2 *		
			TECHNICAL FIELDS SEARCHED (IPC)
			E04D E05D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		1 March 2017	Tryfonas, N
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone		T : theory or principle underlying the invention	
Y : particularly relevant if combined with another document of the same category		E : earlier patent document, but published on, or after the filing date	
A : technological background		D : document cited in the application	
O : non-written disclosure		L : document cited for other reasons	
P : intermediate document		& : member of the same patent family, corresponding document	

EPO FORM 1503 03.02 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 16 19 6247

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

01-03-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000017793 A	18-01-2000	NONE	
EP 0801183 A1	15-10-1997	DE 69702877 D1 EP 0801183 A1 FR 2747413 A1	28-09-2000 15-10-1997 17-10-1997
WO 2009076950 A1	25-06-2009	CN 101827991 A EP 2231977 A1 WO 2009076950 A1	08-09-2010 29-09-2010 25-06-2009
JP S60223559 A	08-11-1985	JP H0229142 B2 JP S60223559 A	28-06-1990 08-11-1985

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0979333 B1 [0003]
- EP 2385184 B1 [0004]