



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
20.04.2022 Bulletin 2022/16

(51) International Patent Classification (IPC):
E04D 13/035 ^(2006.01)

(21) Application number: **21020511.8**

(52) Cooperative Patent Classification (CPC):
E04D 13/0358

(22) Date of filing: **12.10.2021**

(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:
KH MA MD TN

(71) Applicant: **Ceske vysoke uceni technicke v Praze
160 00 Praha 6 - Dejvice (CZ)**

(72) Inventor: **Tywoniak, Jan
257 22 Cercany (CZ)**

(30) Priority: **14.10.2020 CZ 20200562**

(54) **A ROOF WINDOW HAVING A CASEMENT OPENABLE TO THE EXTERIOR TO A POSITION
PARALLEL TO THE PLANE OF THE ROOF**

(57) A roof window having a casement (3) openable to the exterior to a position parallel to the plane of the roof comprising a fixed frame (2) constituted by frame profiles (7) delineating an opening in the fixed frame (2), and an openable casement (3). The openable casement (3) comprises an openable frame (4) of the openable casement (3) constituted by casement profiles (8). In the closed position of the window each of the casement profiles (8) adjoins the respective opposite frame profile (7). The roof window also comprises two opening mechanisms (6), each of which comprises a parallelogram. The

opening mechanisms (6) are mounted on two mutually parallel sides of the window for an openable connection of the casement profile (8) and its corresponding opposite frame profile (7). Each casement profile (8) on its side facing away from the opening in the fixed frame (2) comprises a protrusion. In the closed position of the window, the protrusion covers at least a part of the outer side wall (7.4) of the frame profile (7) to which the casement profile (8) adjoins, and this along at least half the length of the respective opposite frame profile (7).

SECTION C-C

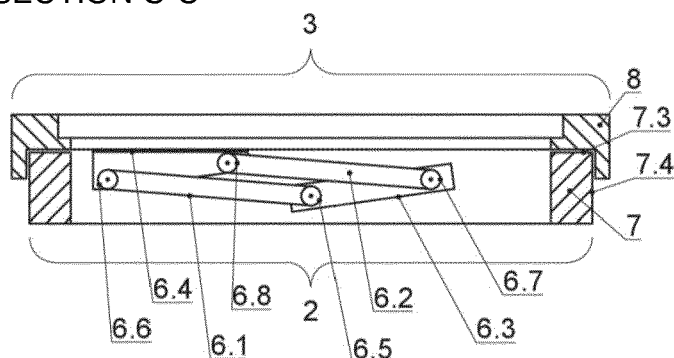


Fig. 2c

Description

Technical Field

[0001] The invention relates to a roof window with a casement openable to the side to a position over the to the roof plane and parallel to the roof plane, with minimized heat transfer and the possibility of effective shading from the exterior side.

Background Art

[0002] Roof windows are one of the weakest elements of the building envelope in terms of heat transfer. Despite their relatively small portion in the building envelope surface, the heat loss caused by them constitutes a significant item in the total heat loss of the building. While the windows in the walls are achieving thermal transmittance below $0.8 \text{ W}/(\text{m}^2 \cdot \text{K})$, for roof windows and skylights these values are generally significantly higher. While for windows in the walls it is possible to reduce the additional heat flux due to the connection to the surrounding constructions down to negligible values, for roof windows for geometric reasons (lining shape, smaller elements with longer circumference length) this is a significant item.

[0003] Due to the small dimensions of conventional roof windows, the window frame is a very important item in the heat transfer through the window. This affects both the overall thermal transmittance and the surface temperature on the frame and edges of the glazing. Therefore, to significantly improve the roof windows, in addition to the installation of a higher-quality glazing unit, it is necessary to significantly improve the frame. Insufficient temperature on the surface of the frames can, under unfavorable circumstances, lead to surface condensation of water vapor with unacceptable accompanying phenomena of mold growth, which is both a hygienic and aesthetic problem.

[0004] The usual way of opening roof windows is to rotate the casement about a horizontal axis located above the center of the window so that the lower part of the casement moves towards the exterior and the upper part moves to the interior. The metal assembly of the window casement hinge necessarily impairs the thermal insulation integrity, thus leading to greater heat loss. The seal between the fixed frame and the casement is disadvantageously subject to shear stress. The profiles of the fixed frame and the casement frame must be shaped differently in the part below the hinge and in the part above the hinge. Due to the above-mentioned movement of the casement, it is not possible to use exterior lamella shading systems (blinds) as with vertical windows.

[0005] In tilting windows, where the casement rotates around the horizontal axis at the upper edge of the window, the problem remains to ensure the possibility of cleaning the window on the exterior side when accessed from the room, unless a complicated combination hinge is used which enables to rotate the glazed part of the

casement towards the interior for cleaning. In this case, the shape of the casement frame and of the metal parts of the hinges significantly impair the thermal insulation properties of the frame.

[0006] Roof windows opening by sliding the casement to a position outside the window opening are used to a very small extent. A solution is known in which the casement is slid to one side guided on pull-out rails or using other guide elements (e.g. CN101080019003A, CN207700554U, FR2335666A1, CH633852A5, US4064649A). Such casement movement without lifting does not allow a roof casement design where its outer contour would extend on all sides over the outer contour of the fixed window frame when viewed from the exterior. In addition, pull-out rails or other metal guide elements reduce the possibility of ensuring integrity of thermal insulation on the junction of the fixed frame and the casement.

[0007] Moving the casement to one side also means that seals between the fixed frame and the casement are disadvantageously stressed on shear, and that it is not possible to overcome locally raised elements on the roof, such as lightning conductors, solar panel over roofing, shaped ventilation roof tile. Guide rails can also mean aesthetic limitations if they are designed so that they are visible on the roof outside the roof window.

[0008] EP2843149A1 describes a solution using a parallelogram principle for the opening mechanism, so that the casement is lifted from its position in a closed state by a semicircular movement and is positioned on the side of the window opening in the fully open state. The window casement in the closed state is mounted with its exterior surface in the plane of the exterior surface of the roof, i.e. it fits into the window opening formed by the fixed frame fitted in a recess below. The elements of the opening mechanism are positioned between the inner side of the frame and the outer side of the casement. Rainwater ingress is prevented by simply overlapping the glass on the outside over the gap between the casement and the fixed frame, because the casement frame does not overlap over the fixed frame when viewed from the exterior. In this solution, it is not possible to use conventional glazing units with multiple glass panes. In this solution, complete integrity of the thermal insulation function between the frame and the casement cannot be ensured. This solution cannot be used for roofs with a small pitch, because it would not be possible to ensure that rainwater from rain or melting snow does not penetrate the gap between the casement and the fixed frame. This solution is not applicable for roofs with profiled tiled roofing.

Summary of the Invention

[0009] The above-mentioned drawbacks are eliminated by the roof window according to the present invention with the arrangement, shapes, profile materials and opening mechanism described below.

[0010] A roof window having a casement that opens

to the exterior to a position parallel to the roof plane comprises a fixed frame constituted by frame profiles, and an openable casement. The frame profiles delineate an opening in the fixed frame. The openable casement comprises an openable frame constituted by casement profiles, whereas each of the casement profiles in the closed position of the window abuts against the respective opposite frame profile. At least two sides of the window, each of which is constituted by a casement profile and its respective opposite frame profile, are parallel to each other. The roof window also comprises two opening mechanisms, each of which comprises a parallelogram, with these opening mechanisms being mounted on two mutually parallel sides of the roof window and configured for an openable connection of the casement profile and its respective opposite frame profile on these mutually parallel sides of the roof window. The principle of the invention is that each casement profile on its side facing away from the opening in the fixed frame comprises a protrusion, the said protrusion being configured in the closed position of the window to cover at least part of the outer side wall of the opposite frame profile against which the casement profile abuts, and this along at least half the length of the respective opposite frame profile.

[0011] In a preferred embodiment, the opening mechanism comprises a first rod which is provided at one end with a frame joint of the first rod which is rotatably attached to the frame profile. At the other end the opening mechanism is provided with a casement joint of the first rod which is rotatably attached to that casement profile which corresponds to said frame profile and abuts against it in the closed position. At the same time, in this advantageous embodiment, the opening mechanism also comprises a second rod which is provided at one end with a frame joint of the second rod which is rotatably attached to the frame profile and at the other end is provided with a casement joint of the second rod which is rotatably attached to the casement profile which corresponds to the frame profile and abuts against it in the closed position.

[0012] In one preferred embodiment, the roof window also comprises frame fittings and casement fittings. In this embodiment, in the closed position of the window, each casement profile to which the rods are rotatably attached is configured with an overlap over its respective frame profile, against which it abuts in the closed position. This overlap is positioned above a part of the opening in the fixed frame, and on this overlap the casement fittings are firmly affixed from below for attaching the casement joint of the first rod and for attaching the casement joint of the second rod. Below the casement fittings, the frame fittings are firmly attached to the frame profile for attaching the frame joint of the first rod and for attaching the frame joint of the second rod.

[0013] It is advantageous if at least 50 % of the volume of each of the frame profiles consists of a first rigid thermal insulation material with a thermal conductivity coefficient of 0.05 W/(m.K) maximum and if at least 50% of the vol-

ume of each of the casement profiles consists of a second rigid thermal insulation material with a thermal conductivity coefficient of 0.05 W/(m.K) maximum.

[0014] In an advantageous embodiment, at least one of the opening mechanisms is provided with a motor drive for opening and closing the window.

[0015] This motor drive is with an advantage provided with a remote control of the motor drive, controlled by the user or an upstream control system.

[0016] The main advantages of the window designed in this manner are the reduction of heat transfer in the area of the window frames due to the unperturbed thermal insulation function and the easier provision of long-term tightness against the ingress of rainwater. Another advantage is the possibility of simplifying the production of the window profiles due to the fact that each profile can be the same along its entire length, as well as the possibility of using exterior shading systems with controlled light passage mounted on the window casement. The design solution described above allows easy cleaning of the exterior surfaces of the roof window.

Brief Description of Drawings

[0017] The figures depict some advantageous roof window arrangements with the casement opening to the side parallel to the roof plane, including significant details.

[0018] In all figures the designation ext. means exterior, designation int. means interior.

[0019] In Figure 1a, on a window installed in a pitched roof relative to the window as such, are indicated section planes B-B and A-A used in Figures 1b, 1c, 1d and 1e. The window in Figure 1a is depicted only schematically, without distinguishing between the edges of the casement and the edges of the fixed frame. Figure 1b schematically depicts the installation of the roof window on a pitched roof in section B-B. Figures 1c, 1d, 1e then depict in detail the geometric relationship between the frame profile and the casement profile, whereas each of Figures 1c, 1d, 1e depicts one of the possible advantageous embodiments. The advantageous embodiments differ in the different shaping of the frame and casement profiles. For the sake of clarity, the opening mechanism is not shown in these figures, it will be apparent from the following figures. The sections along the plane A-A in Figures 1c, 1d, 1e are shown in the position where the window lies with the fixed frame downwards on a horizontal base.

[0020] In Figure 2a, planes of the C-C and D-D sections used in Figures 2c, 2d and 2e are indicated in the top view of the window. Figure 2a is again only schematic, without distinguishing between the edges of the casement by the edges of the fixed frame. Figure 2b is a view of the roof window from the exterior in a direction perpendicular to the glazing unit when the window is fully opened. The arrow schematically shows the direction of movement of the openable casement 3 during opening operation. Figures 2c, 2d and 2e depict the operation of the opening mechanisms. Figure 2c depicts section C-C

of the window in a closed position. Figure 2d depicts the same section plane for the window partially open, i.e. for the position of the casement on the trajectory between the closed position according to Figure 2a and the fully open position according to Figure 2b. Figure 2e depicts section D-D of a part of the roof window in a closed position according to Figure 2a. Sections 2c, 2d and 2e also show one of the opening mechanisms and these sections are drawn in a position where the window lies with the fixed frame downwards on a horizontal base. For the sake of clarity, in Figures 2d and 2e some reference signs are omitted for the elements already depicted in the previous figures. Figures 2c, 2d and 2e capture only one of the possible advantageous shapes of the frame and casement profiles, corresponding to Figure 1c.

[0021] Figures 3b, 3c illustrate one preferred material embodiment of the frame profile and the casement profile. Figure 3a then schematically shows, again without marking the edges of the fixed frame and the casement frame, a top view of the window with section planes corresponding to Figures 3b (section A-A) and 3c (section D-D). The shape implementation in Figure 3b is similar to that in Figure 1d, but the casement profile also has a beveled corner part. To make the material composition clearly visible, the surfaces lying in the section plane are not hatched in Figures 3b and 3c. In Figures 3b and 3c, the window is in the closed position and at the same time in the position when it lies with its fixed frame on a horizontal base.

Detailed Description of Preferred Embodiments of Invention

[0022] Only some preferred embodiments of the invention are described below. However, numerous other embodiments are possible, falling within the scope of protection of the present invention and differing from those described below, for example in detailed geometric arrangement, material of frame profiles, choice of glazing unit and surface treatments.

[0023] By profile we mean an element with a longitudinal dimension greater than the transversal dimensions, measured in directions perpendicular to the length of the profile.

[0024] Figure 1b schematically depicts the installation of the roof window in a pitched roof. The fixed frame 2 constituted by frame profiles 7 is firmly connected to the roof construction 1. Each of the frame profiles 7 has an upper surface 7.3, being that surface of frame profile 7 which is its highest placed surface in the position where the roof window lies on a horizontal base with the fixed frame 2 downwards. The position of the upper surface 7.3 of the frame profile 7 is different for different preferred embodiments of the frame profile 7 and the casement profile 8 shown in Figures 1c, 1d and 1e. It is apparent that the shape of the frame profile 7 and the casement profile 8 can be different, the upper surface 7.3, however, always meets the above definition. The figures also de-

pic the outer side wall 7.4 of the frame profile 7, which faces the roof construction when the window is installed into the roof construction 1. In the simplest embodiment according to Figure 1c, this outer side wall 7.4 of the frame profile 7 is perpendicular to the horizontal base on which the window lies, in more complex embodiments according to Figures 1d and 1e the outer side wall 7.4 of the frame profile 7 may also comprise horizontal sections.

[0025] The roof window also comprises an opening casement 3, which comprises an opening frame 4 of the opening casement 3 formed by casement profiles 8. As can be seen, for example, from Figures 1b, 1c, 1d and 1e, each of the casement profiles 8 in the closed position of the window abuts against one of the frame profiles 7. By abuts is meant that at least part of the surface of each casement profile 8 is in close or contact proximity to at least part of the surface of the matching frame profile 7 when the window is closed, so that the window closes and seals sufficiently. This applies along all sides of the roof window to all matching pairs of casement profiles 8 and frame profiles 7, although this is shown in the figures only for some of these pairs. It can be seen that each casement profile 8 matches with one respective opposing frame profile 7, against which it abuts in the closed position.

[0026] The roof window also comprises two opening mechanisms 6, each of which contains a parallelogram. In the illustration according to Figure 1b, one of the opening mechanisms 6 is located in the lower part of the window and the other of the opening mechanisms 6 is located in the upper part of the window, both of these opening mechanisms 6 being on the interior side.

[0027] The figures also show the glazing unit 5, which is usually a common part of the opening casement 3.

[0028] The roof window allows the casement to be opened to the exterior to a position parallel to the plane of the roof, as can be seen in Figures 2b, 2c, 2d, 2e, which has many advantages. The window opening is realized along such a trajectory of the opening casement 3 that in the fully open state it reaches a position in which the casement 3 is placed on one side of the window opening parallel to the roof plane, at a sufficient height so that the raised elements on the roofing do not prevent the opening. By raised elements of the roofing we understand e.g. ventilation roof tile, lightning conductor, solar panel. Thanks to this parallelogram window opening system, it is not only possible to clean the window, but above all to significantly improve its insulating properties, thanks to the innovative geometry of the frame profiles 7 and casement profiles 8, which is described below. Such a geometry of the frame profiles 7 and the casement profiles 8, which is very advantageous from the point of view of insulating properties, is not possible with conventional tilting or swinging windows. Summary of the specific geometry of the frame profiles 7 and casement profiles 8 is as follows:

[0029] In the closed position of the window and at the same time in the position when the roof window lies on

a horizontal base with the fixed frame 2 downwards, each casement profile 8 overlaps downwards in the vertical direction the upper surface 7.3 of the frame profile 7 against which it abuts, on the side facing away from the opening in the fixed frame 2, and this along at least half the length of this upper surface 7.3, or in other words along at least half the length of the respective frame profile 7. This vertical overlap is indicated in the figures by the reference sign b.

[0030] In order to make this vertical overlap b possible, it is of course also necessary to have a horizontal overlap over the upper surface 7.3 on the same longitudinal section of the frame profile 7, where a vertical overlap b is present, as can be seen in Figure 1c. The horizontal overlap can be even more pronounced than just over the upper surface 7.3, as can be seen, for example, in Figures 1d and 1e. Reference sign a in Figures 1c, 1d, 1e and in Figures 3b, 3c denotes a top view horizontal overlap of the casement profile 8 over the top view outer contour of the corresponding frame profile 7 which, in some embodiments, further improves the insulating properties of the roof window. The word horizontal in the case of a horizontal plan overlap a refers to the position of the roof window which lies with the fixed frame 2 placed on a horizontal base, which can be seen, for example, in Figures 1c, 1d and 1e. A top view of the horizontal overlap a on the other side of the openable frame 4 can be seen in Figure 2b. It should be emphasized that neither the vertical overlap b nor the horizontal overlap a are necessarily the same size in all places. That means that along the upper surface 7.3 of one of the frame profiles 7, the vertical overlap b may be differently large than along the upper surface 7.3 of another of the frame profiles 7. Thus, for example, in Figure 3b the value of the vertical overlap b may be different from the value of the vertical overlap b in Figure 3c. Likewise, the value of the top view horizontal overlap a in Figure 3b may be different from the value of the top view horizontal overlap a in Figure 3c. The size of the vertical overlap b can also vary along one upper surface 7.3 of the same frame profile 7. The same applies to the horizontal top view overlap a.

[0031] In the most preferred embodiment, a non-zero vertical overlap b is present along the entire circumference of the window, i.e. along all upper surfaces 7.3 of all frame profiles 7. In a top view or an exterior view of a roof with a roof window in a direction perpendicular to the roof plane, in this most preferred embodiment the openable frame 4 of the openable casement 3 extends with all its outer contours over the outer contours of the fixed frame 2, while the overlap observed in this view corresponds to the plan view horizontal overlap a.

[0032] The vertical overlap b is generally of variable size along the circumference of the window, but in one possible embodiment this vertical overlap b may be of a constant size along the entire circumference of the window. Likewise, the top view horizontal overlap a is generally along the circumference of the window of variable size, but in one embodiment the top view horizontal over-

lap a may be of a constant size along the circumference of the window.

[0033] Without reference to the horizontal position of the window, it is possible to name the part of the casement profile 8, two sides of which are indicated in the section in Figures 1b to 1e as a horizontal overlap a and a vertical overlap b, as a protrusion. It can be seen from the figures that each casement profile 8, on its side facing away from the opening in the fixed frame 2, comprises such a protrusion. In the closed position of the window, this protrusion is arranged to cover at least a part of the outer side wall 7.4 of the opposite frame profile 7 against which the casement profile 8 abuts, and this along at least half the length of the respective opposing frame profile 7.

[0034] The openable frame 4 of the openable casement 3 is thus installed from above on the fixed frame 2 and due to the above-mentioned vertical overlaps b and horizontal overlaps over the upper surfaces 7.3 of the frame profiles, possibly also due to top view horizontal overlaps a, significantly better thermal insulation properties are achieved than with prior art solutions. Due to the vertical overlap b of the openable frame 4, the embodiment according to the present invention significantly limits the heat transfer in the area where the fixed frame 2 extends over the plane of the roof, as can be clearly seen from Figure 1b. The fixed frame 2 and the openable frame 4 of the openable casement 3 usually, and in particular in the embodiment according to Figures 3b, 3c, have comparable thermal insulation properties. In addition, when closing the window, the openable casement 3 of the window abuts against the fixed frame 2 in a direction perpendicular to the roof plane, the seals between the fixed frame and the casement are therefore only stressed by pressure, which is advantageous over tilting or swinging windows.

[0035] The present invention is applicable to any roof pitch, including a zero pitch roof.

[0036] The present invention combining opening mechanisms 6 with a parallelogram and a vertical overlap b can be used for roof windows of any shape. In practice, however, windows in the shape of a parallelepiped, typically a rectangle, are usually used. For parallelepiped-shaped windows, in the closed position, at least one pair of frame profile 7 and the abutting casement profile 8 is parallel to another pair of frame profile 7 and the abutting casement profile 8. For such an embodiment of the roof window, one of the preferred embodiments of the invention can be applied, wherein one of the opening mechanisms 6 openably connects one of these mutually parallel pairs consisting of the frame profile 7 and the casement profile 8, and the other of the opening mechanisms 6 openably connects another pair of the frame profile 7 and the casement profile 8 which is parallel to former pair. One example of this embodiment is in Figure 1b, where an example of a window mounted in a pitched roof construction 1 is shown, and this window is adapted to open the window parallel to the roof plane in a horizontal direction, from the exterior view either to the left or to the

right, the left or right direction being given by the arrangement of the rods 6.1, 6.2 of the two opening mechanisms 6. For opening in the above-defined direction to the left or to the right, the window is fitted with a first opening mechanism 6, which openably connects a horizontally located pair of frame profile 7 and casement profile 8 at the top of the window, and is fitted also with a second opening mechanism 6, which openably connects a horizontally positioned pair of frame profile 7 and the casement profile 8 at the bottom of the window.

[0037] It is also possible to open it in a direction that is still parallel to the roof plane, but this time in the direction of the roof pitch, either upwards above the window or downwards below the window. The up or down direction is again determined by the configuration of the rods 6.1 and 6.2 of the two opening mechanisms 6. To open up or down as described above, the window is fitted with a first opening mechanism 6, which openably connects the first side pair of frame profile 7 and the casement profile 8, which is parallel to the roof pitch, and a second opening mechanism 6, which openably connects the second side pair of frame profile 7 and wing profile 8, which is also parallel to the roof pitch.

[0038] With regard to the detailed design of the opening mechanisms 6, it is advantageous if for the openable connection of the two mutually parallel pairs comprising the frame profile 7 and the casement profile 8, each of the opening mechanisms 6 comprises a first rod 6.1 which is provided at one end with a frame joint 6.5 of a first rod 6.1, which is rotatably attached to the frame profile 7, and at the other end is provided with a casement joint 6.6 of the first rod 6.1, which is rotatably attached to the casement profile 8. Analogously, each of the opening mechanisms 6 also comprises a second rod 6.2 which at one end is provided with a frame joint 6.7 of the second rod 6.2 which is rotatably attached to the frame profile 7, and at the other end is provided with casement-joint 6.8 of the second rod 6.2 which is rotatably attached to the casement profile 8.

[0039] A detailed embodiment of one of the opening mechanisms 6, which are intended to open the window to the right when viewed from the exterior, can be seen in Figures 2c and 2e for the closed position of the window and in Figure 2d for the window which is being opened. The trajectory t1 is marked, along which the casement joint 6.6 of the first rod 6.1 moves when opening the window, and also the trajectory t2 along which the casement joint 6.8 of the second rod 6.2 moves when opening the window. Figure 2b then shows a view from the exterior in a direction perpendicular to the plane of the roof, of the window open to the right.

[0040] The roof window preferably also comprises frame fittings 6.3 and casement fittings 6.4, which are also indicated in Figs. 2c, 2d and 2e. It can be seen that in the closed position of the window and at the same time in the position where the roof window lies on a horizontal base with the fixed frame 2 downwards, each casement profile 8 to which the rods 6.1, 6.2 are rotatably attached,

overlaps the frame profile 7 against which it abuts in the closed state, horizontally in the direction of the space above the opening in the fixed frame 2, and this at least in the area for mounting the frame fittings 6.3 and the casement fittings 6.4. However, this overlap of the casement profile 8 over the frame profile 7 towards the space above the opening in the fixed frame 2 can also be longer, for example along the entire length of the casement profile 8. On this horizontal overlap of the casement profile 8 above the opening in the fixed frame, casement fittings 6.4 are fixed from below for fixing the casement joint 6.6 of the first rod 6.1 and for holding the casement joint 6.8 of the second rod 6.2. Under the casement fittings 6.4 are fixedly mounted to the frame profile 7 frame fittings 6.3 for attaching the frame joint 6.5 of the first rod 6.1 and for attaching the frame joint 6.7 of the second rod 6.2. **[0041]** Figures 3b, 3c show a detail of a pair of frame profile 7 and casement profile 8 in a shape which, except for the beveled upper corner, corresponds to the schematic Figure 1d. In addition, Figures 3b, 3c furthermore show in detail the preferred material structure of the two profiles 7, 8.

[0042] The frame profile 7 comprises a first rigid thermal insulation material 7.1, a surface layer 7.2 and a frame covering element 7.5 made of metal or composite which is placed on the exterior surface of the fixed frame and is terminated in connection with the roof covering so that the roof is protected against the weather, especially rainwater.

[0043] The casement profile 8 comprises a second rigid thermal insulation material 8.1, a wooden profile 8.2 and a casement cover element 8.5 made of metal or composite.

[0044] The frame cover elements 7.5 and the casement cover elements 8.5 can be formed by an assembly of shaped elements made of coated sheet metal or plastic composite material so as to ensure safe drainage of rainwater from this location to the roofing

[0045] The glazing unit 5 is supported by a rigid plastic washer 9. The glazing unit is covered at the edge by a rigid plastic plate 10. In the bearing surface of the fixed frame 2 and the opening frame 4 of the opening casement 3, tubular seals 11 which are made of soft plastic are fitted in the grooves. The opening mechanism 6 is located at the interior side of the roof window. From the interior, the opening mechanism 6 is covered by a covering lamella 12 made of plywood or similar material.

[0046] In a preferred embodiment, at least 50% of the volume of each of the frame profiles 7 is formed by a first rigid thermal insulation material 7.1 with a thermal conductivity coefficient not exceeding 0.05 W/(m.K) and at least 50 % of the volume of each of the casement profiles 8 is formed by a second rigid insulating material 8.1 with a thermal conductivity coefficient not exceeding 0.05 W/(m.K). The first solid thermal insulation material 7.1 may or may not be of the same stuff as the second solid thermal insulation material 8.1.

[0047] In a preferred embodiment, the opening case-

ment 3 can be locked in various positions of opening the window, including a very small stroke of the opening casement 3, which enables influencing the air flow.

[0048] In one preferred embodiment, on the edges of the frame of the opening casement 3 handles are mounted, which serve to manually control the position of the opening casement 3. In another preferred embodiment, the opening mechanism 6 is supplemented by further elements converting the movement along a curved trajectory into a circular movement in a plane parallel to the roof plane, preferably a set of elements with a worm gear to reduce the force required to move the casement. The opening mechanism 6 can be supplemented by a motor drive and can be remotely controlled directly or using a superior control system.

[0049] The profile of the side part of the fixed frame can be identical in height along its entire length, because it is not disturbed by the location of the opening mechanisms. The profile of the openable frame can be identical around the entire circumference.

[0050] In one preferred embodiment, the opening mechanism 6 is hidden by means of a plywood or similar cover lamella 12 fixed by means of magnets or otherwise easily removable cover lamella 12.

[0051] It is advantageous if the profile is solid in a cross section taken in a plane perpendicular to its length. In one preferred embodiment, the rigid thermal insulation material is shaped in such a way that, in addition to plywood blanks, a fixed frame profile is formed, where the recessed sealing stripes are preferably located. Other embodiments of the profiles are possible, where the surface layers comprise a coating and / or a glued foil or a surface layer of plastic composite material. Other material compositions of the profiles are also possible.

[0052] In contrast to tilting and swinging windows, which are known from the prior art, exterior lamella shading systems (blinds) can be easily fitted to the window according to the present invention in a manner similar to vertical windows. In the case of the present invention, the lamella shading system is mounted on the opening casement 3 of the window.

Industrial Applicability

[0053] The invention is applicable to roof windows as well as roof windows assemblies for roofs of any pitch.

Reference signs list

[0054]

- 1 - roof construction
- 2 - fixed frame (of the roof window)
- 3 - openable casement (of the roof window)
- 4 - openable frame (of the casement 3)
- 5 - glazing unit
- 6 - opening mechanism
- 6.1 - first rod (of the opening mechanism 6)

6.2 - second rod (of the opening mechanism 6)

6.3 - frame fittings

6.4 - casement fittings

6.5 - frame joint of the first rod 6.1

6.6 - casement joint of the first rod 6.1

6.7 - frame joint of the second rod 6.2

6.8-casement joint of the second rod 6.2

7 - frame profile

7.1 - first rigid thermal insulation material

7.2 - surface layer

7.3 - upper surface of the frame profile 7

7.4 - outer side wall of the frame profile 7

7.5 - frame covering element (metal or composite)

8 - casement profile

8.1 - second rigid thermal insulation material

8.2 - wooden profile

8.5 - casement cover element (metal or composite)

9 - rigid plastic washer

10 - rigid plastic plate

11 - tubular seal

12 - covering lamella

t1 - trajectory along which the casement joint 6.6 of the first rod 6.1 moves when opening the window

t2 - trajectory along which the casement joint 6.8 of the second rod 6.2 moves when opening the window

a - top view horizontal overlap

b- vertical overlap (over the upper surface 7.3)

Claims

1. A roof window having a casement (3) openable to the exterior to a position parallel to the plane of the roof, the roof window comprising a fixed frame (2) constituted by frame profiles (7) delineating an opening in the fixed frame (2), and an openable casement (3), the openable casement (3) comprising an openable frame (4) constituted by casement profiles (8), wherein each of the casement profiles (8) in the closed position of the window abuts against the respective opposite frame profile (7) and wherein at least two sides of the roof window, each of which consisting of the casement profile (8) and its respective opposite frame profile (7), are parallel to each other, the roof window also comprising two opening mechanisms (6), each of which comprising a parallelogram, whereas these opening mechanisms (6) are mounted on two mutually parallel sides of the window and are arranged for an openable connection of the casement profile (8) and its corresponding opposite frame profile (7) on these mutually parallel sides of the roof window, **characterized in that** each casement profile (8) on its side facing away from the opening in the fixed frame (2) comprises a protrusion, whereas this protrusion is positioned in a closed position of the window to cover at least part of the outer side wall (7.4) of the opposite frame profile (7) against which the casement profile (8) abuts, and

this along at least half the length of the respective opposite frame profile (7).

control of the motor drive, which is controlled by a user or an upstream control system.

2. The roof window according to claim 1, **characterized in that** the opening mechanism (6) comprises a first rod (6.1) which is provided at one end with a frame joint (6.5) of the first rod (6.1), the frame joint (6.5) being rotatably attached to the frame profile (7), and which is provided at its other end with a casement joint (6.6) of the first rod (6.1), the casement joint (6.6) being rotatably attached to that casement profile (8) which corresponds to said frame profile (7) and abuts against it in the closed position, and that the opening mechanism (6) comprises a second rod (6.2) which is provided at one end with a frame joint (6.7) of a second rod (6.2), the frame joint (6.7) being rotatably attached to the frame profile (7), and which is provided at its other end with a casement joint (6.8) of the second rod (6.2), the casement joint (6.8) being rotatably attached to the casement profile (8), which corresponds to the frame profile (7) and abuts against it in the closed position.

5
10
15
20

3. The roof window according to claim 2, **characterized in that** it also comprises frame fittings (6.3) and casement fittings (6.4) and that in the closed position of the window each casement profile (8) to which the rods (6.1, 6.2) are rotatably attached is configured with an overlap of the respective frame profile (7) against which it abuts in the closed position, this overlap being located above a part of the opening in the fixed frame (2) and wherein on this overlap the casement fittings (6.4) are firmly affixed from below for attaching the casement joint (6.6) of the first rod (6.1) and for attaching the casement joint (6.8) of the second rod (6.2), whereas under the casement fittings (6.4) the frame fittings (6.3) are firmly attached to the frame profile (7) for attaching the frame joint (6.5) of the first rod (6.1) and for attaching the frame joint (6.7) of the second rod (6.2).

25
30
35
40

4. The roof window according to any of claims 1 to 3, **characterized in that** at least 50 % of the volume of each of the frame profiles (7) is constituted by a first rigid thermal insulation material (7.1) with a thermal conductivity coefficient 0.05 W/(m.K) maximum, and at least 50 % of the volume of each of the casement profiles (8) is constituted by a second rigid thermal insulation material (8.1) with a thermal conductivity coefficient of 0.05 W/(m.K) maximum.

45
50

5. The roof window according to any of claims 1 to 4, **characterized in that** at least one of the opening mechanisms (6) is provided with a motor drive for opening and closing the window.

55

6. The roof window according to claim 5, **characterized in that** the motor drive is provided with a remote

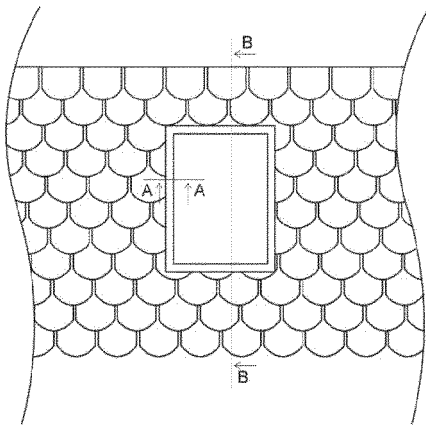


Fig. 1a

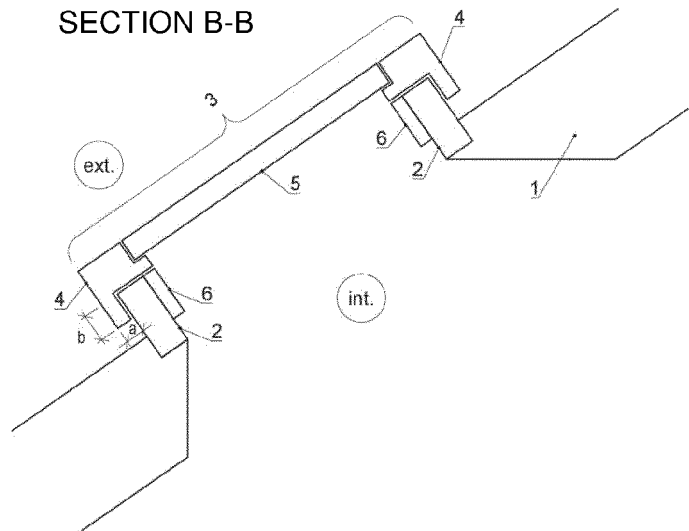


Fig. 1b

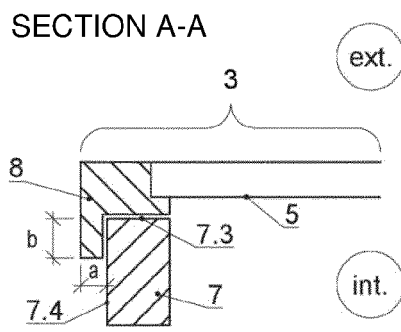


Fig. 1c

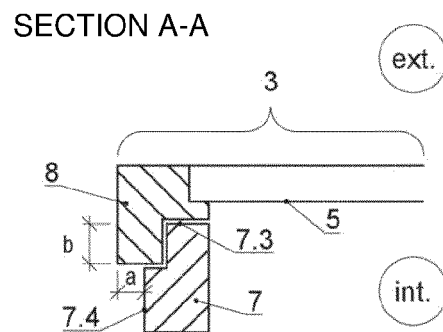


Fig. 1d

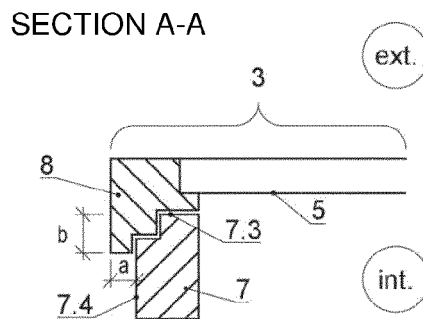


Fig. 1e

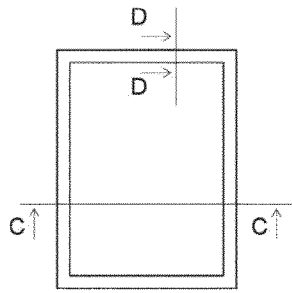


Fig. 2a

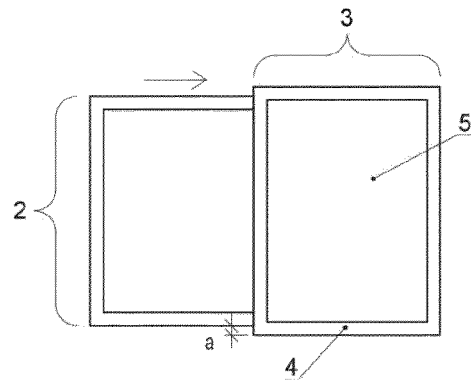


Fig. 2b

SECTION C-C

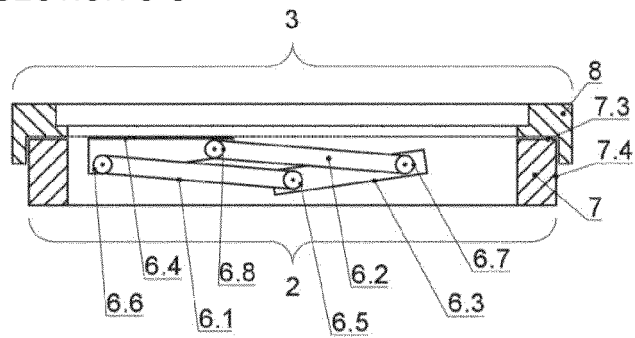


Fig. 2c

SECTION C-C

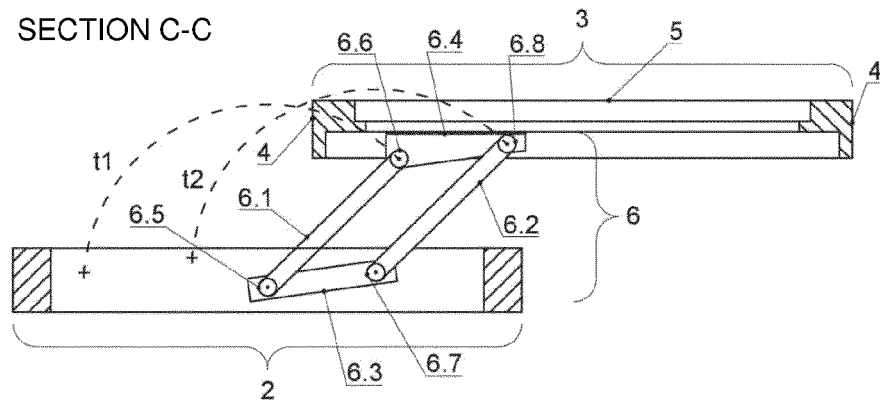


Fig. 2d

SECTION D-D

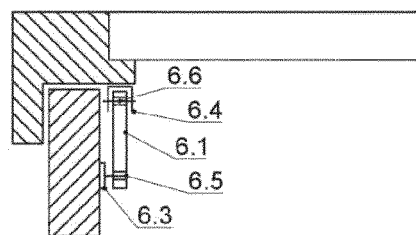


Fig. 2e

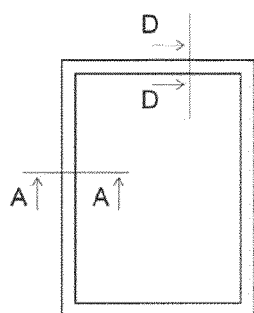


Fig. 3a

SECTION A-A

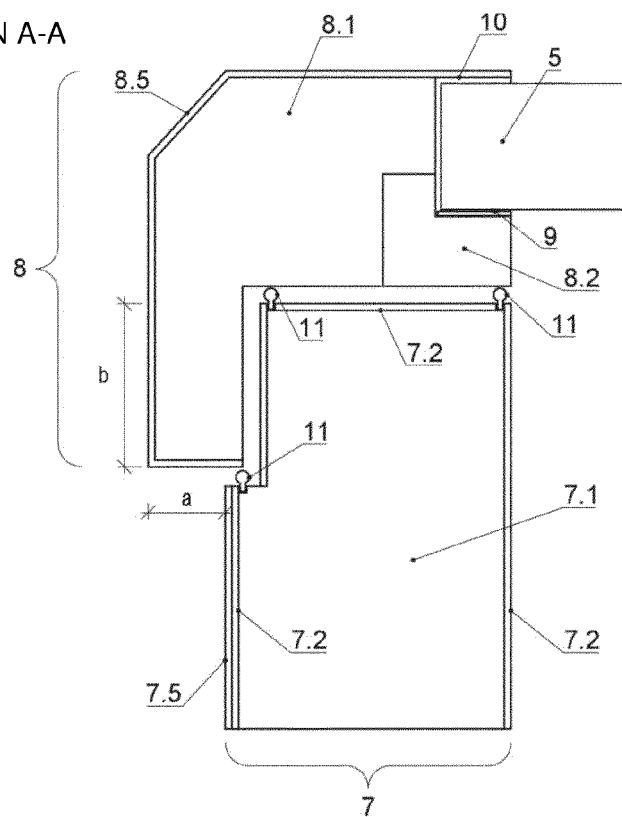


Fig. 3b

SECTION D-D

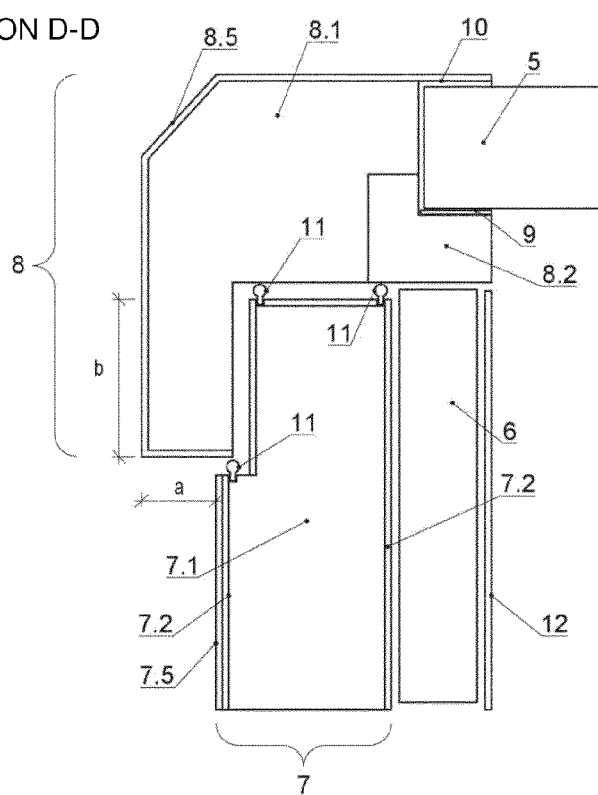


Fig. 3c



EUROPEAN SEARCH REPORT

Application Number

EP 21 02 0511

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

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	DE 299 21 090 U1 (STUERMANN GMBH & CO [DE]) 12 April 2001 (2001-04-12) * figures 7-10 *	1-6	INV. E04D13/035
Y,D	US 4 064 649 A (RASMUSSEN VILLUM BENEDIKT KANN ET AL) 27 December 1977 (1977-12-27) * figures *	1	
Y,D	EP 2 843 149 A1 (STEBLER HOLDING AG [CH]) 4 March 2015 (2015-03-04) * figures *	1	
X	JP H02 240353 A (NABUKO SYST KK) 25 September 1990 (1990-09-25) * figures *	1-6	
Y	DE 24 07 586 B1 (BRAAS & CO GMBH) 12 June 1975 (1975-06-12) * figures *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 January 2022	Examiner Tran, Kim Lien
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

EP 21 02 0511

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.

17-01-2022

10

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 29921090	U1	12-04-2001	NONE	
US 4064649	A	27-12-1977	NONE	
EP 2843149	A1	04-03-2015	NONE	
JP H02240353	A	25-09-1990	NONE	
DE 2407586	B1	12-06-1975	NONE	

15

20

25

30

35

40

45

50

55

EPO FORM P0459

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

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

- CN 101080019003 A [0006]
- CN 207700554 U [0006]
- FR 2335666 A1 [0006]
- CH 633852 A5 [0006]
- US 4064649 A [0006]
- EP 2843149 A1 [0008]