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(54) **TERRACE SKYLIGHT**

(57) The skylight has a frame (O) with a support frame (1) made of an non-isosceles profile with a "Z" profile, directed outwards by a horizontal lower arm (1a) longer than the upper arm (1b). A peripheral layer of thermal insulation (T) adheres to the web (1c). The frame (O) is sealed from above by a glass panel (S) composed of at least two transparent plates (8, 10), tightly connected at the edges with a spacer (11). The upper outer plate (8) has dimensions larger than the lower inner plate (10), and both plates (8, 10) tightly adhere to the support surface on the upper arm (1b) and the upper surface of the thermal insulation (T) by edge seals (12). The thermal insulation layer (I) made of low density insulation material has a height (h) greater than the web height (1c) by the distance between the bottom surfaces of the inner (10) and outer (8) plates. At the length of each side, the support frame (1) is provided with at least two mounting brackets (K), which with a vertical arm (14) are threaded through the slots (15) cut in the corners of the upper arm (1b) of the support frame (1) and adhere to the inner surface of the web (1c). With a horizontal arm (12), they covers the edge area of the inner plate (10) from above and presses it through the flexible pad (16) against the seal (12) on the lower arm (1a) of the support frame (1). At the same time, the outer plate (8) combined with the inner plate (10) is pressed through the seal (12) to the upper surface of the thermal insulation layer (T), whereby the mounting brackets (K) in the pressure position of the glass panel (S) are fastened with screws (18) to the web (1c) of the support frame (1).

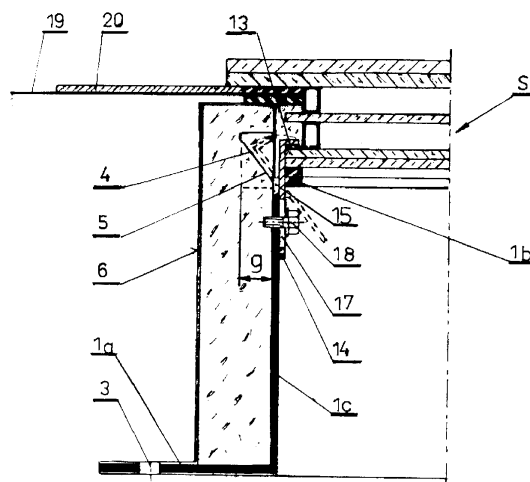


FIG. 3

Description

[0001] The subject of the invention is a terrace skylight, using natural exterior light to illuminate an interior, essentially horizontal building partition, used in particular for installing in the roof of a business, animal-rearing or warehouse facility or production hall, terrace.

[0002] Skylights featuring a frame in the form of a socle fixed along the edge of a rectangular opening to the construction partition structure, tightly closed from above by a glass panel consisting of at least two transparent plates, tightly connected at the edges with a gas-gap spacing are well known.

[0003] For example, the invention described in the specification of European patent EP1664455B1 includes a support frame made of a thin-walled plastic profile, whose outer form is similar to a non-isosceles letter "Z", with a longitudinal hollow filled with foam material featuring low heat conductivity. The profile is directed outwards by a horizontal lower arm which is longer than the upper arm. The support frame is attached with screws to the building structure via a lower arm. On the upper arm, it has two support surfaces, on which the glass panel, composed of spaced outer and inner panels, is sealed tightly by glue joints. The upper outer plate is larger in dimension than the lower inner plate and covers it symmetrically in its vertical projection.

[0004] Another skylight, shown in the description of the application US2010269426A1 and illustrated by the embodiment shown in Fig. 2, includes a frame with a support frame made of an angle directed outwards by a horizontal lower arm. From the inside to the vertical arm, a layer of thermal insulation with a web height and width aligned with the edge of the rectangular opening in the building structure. On the upper surface of the thermal insulation there is a suspension collar - offset into the interior and down the skylight hole. The glass panel's inner plate is embedded in the suspension on the lower support surface. On the collar of the suspension, the bottom frame in the form of a profile with a vertical wall enclosing the vertical frame of the angle bar from the outside and two horizontal arms located above each other is installed through the seal. The lower horizontal arm is terminated with an internally bent wall forming a peripheral gutter below the upper horizontal arm of the lower frame. The lower frame is attached with screws connecting its vertical wall with the vertical arm of the bracket. The upper surface of the horizontal arm of the lower frame is the upper support surface for the outer plate, which is tightly pressed through seals by the horizontal frame of the upper frame with a bracket profile in cross section. The upper frame adheres vertically to the vertical wall of the lower frame and is connected by screws threaded through vertical grooves made in the vertical arm of the upper frame. A similar solution with a suspension in which the inner plate is snap-fastened is described in US5216855.

[0005] The skylight solution is also known from

PL226108B1, the design which enables the installation of a glass panel of varied thickness. The disclosure of the solution is similar to that used in the above-described US2010269426A1, and includes a suspension with a glass panel support surface. Leak-integrity is ensured by lip seals pressed with a snap frame. The frame and suspension are made of plastic profiles with a very complicated box shape, with an internal space divided by many walls.

[0006] The presented state of the art solutions are complex constructions, frames are made of complicated profile shapes, requiring forms technologically difficult to build. The objective of the present invention is to provide a simple and airtight skylight structure that is easy to assemble.

[0007] The invention features two basic versions that differ in how the glass panel is fixed in the frame.

[0008] The first version has a frame with a support frame made of a non-isosceles profile with a Z-section directed outwards by a horizontal lower arm longer than the upper arm. The frame opening is tightly covered by a glass panel consisting of at least two transparent plates, sealed along edges joined together by a spacer. The upper outer plate is larger in dimension than the lower inner plate and covers it symmetrically in its vertical projection. The disclosure of the invention is that the thermal insulation layer made of low density insulation material, especially polyurethane (PUR), polyisocyanurate (PIR), foamed material with closed cells or hard building polystyrene, adheres to the outer surface of the web and has a height greater than web height, at least in terms of the distance between the bottom surfaces of the inner and outer glass panels. Each of the inner sides of the support frame is provided with at least two non-isosceles mounting brackets, which are threaded through the vertical arm through the slots cut in the corners of the upper arm of the support frame and adhere to the inner surface of the web. With a horizontal arm, they cover the edge area of the inner plate from above and press it through a flexible pad against the seal on the lower arm of the support frame. At the same time, the outer plate bonded to the inner plate is pressed through the seal to the upper surface of the thermal insulation layer. The mounting brackets in the pressure position of the glass panel are fastened with screws to the support frame web. Seals and pads are made of terpolymer, EPDM rubber or PVC and their rebate surfaces are additionally bonded with structural adhesive.

[0009] Preferably, the glass panel has at least one transparent central panel with the dimensions of an inner panel.

[0010] It is also preferable if, above the upper arm of the support frame, the inner wall of the thermal insulation is provided with cut-outs with a rectangular triangle profile with a shorter base located at the top and a hypotenuse directed downwards to a point on the inner surface of the thermal insulation under the upper arm. The cut-outs can also have a rectangular profile with the lower side located

under the upper arm. The width of the cut-outs should not be less than the width of the mounting angle and the depth should not be less than the length of the horizontal arm of the mounting bracket. The cut-outs can also be in the form of a continuous, circumferential groove, provided on all internal walls of thermal insulation.

[0011] For optimal leak-integrity, the seal under the outer plate is composed of two layers, between which a piece of PVC coated polyester fabric or EPDM rubber is glued, with the outer dimensions of a rectangle whose sides protrude evenly beyond the outer edges of the frame.

[0012] Further improvement of the skylight leak-integrity consists in the fact that the seal has outer dimensions smaller than the outer panel of the glass panel and that between the peripherally protruding behind the edge of the gasket the lower surface of the outer plate and the upper surface of the sheet of PVC or EPDM coated fabric is glued with structural adhesive. The frame is made of a rigid material, especially steel sheet with a surface protected against corrosion, and has external dimensions which protrude behind the outer edges of the frame - but smaller than the external dimensions of the fabric coated with PVC or EPDM rubber.

[0013] It is preferable that the outer surfaces of the thermal insulation are covered with a protective coating that protects against atmospheric conditions.

[0014] Preferably, the protective coating is EPDM rubber.

[0015] Preferably, the protective coating is resin.

[0016] In the second basic version of the skylight, according to the invention, the glass panel is embedded and sealed in a frame without elements causing mechanical pressure on the seals, mainly due to the properties of the structural adhesive forming self-forming seals that distribute stress evenly.

[0017] In this solution, the support frame is made of an "L" profile, directed outwards by a horizontal lower arm, and the thermal insulation layer adheres to the vertical arm from the inside. The essence of this invention is that, at the upper, inner edge of the thermal insulation layer, it has a peripherally cut socket with a rectangular profile, whose outer dimensions are equal to those of the inner plate. The depth of the socket is not less than the distance between the bottom surfaces of the inner and outer plates, which are seated respectively on terpolymer or EPDM rubber seals in the socket and on the front surface of the thermal insulation layer. The sealing faces of the seals are additionally bonded with structural adhesive. The other - optionally used - solutions are the same as in the above-mentioned first invention.

[0018] The skylight invention has a very simple structure, easy to form and assemble, ensuring the leak-integrity of the building partition. Easy assembly of the first version, according to the invention, with mounting brackets is achieved by using thermal insulation cut-outs, allowing the mounting brackets to be deflected when the glass panel is inserted into the frame opening and then

attached in the glass panel pressure position to the seals. In the second version of the invention, the glass plate is embedded in the frame as a slide-fit end cap in a socket cut out in thermal insulation and sealing the joints with structural adhesive.

The invention can be used for terraces, roofs, pavements, i.e. wherever it is not possible to install a roof or vertical windows. It can also be used as a cover for artificial lighting.

[0019] The skylight, according to the invention, can also be used in reinforced concrete ceiling structures, with a thick layer of thermal insulation, the lower level of which is below the frame - which, with the vertical walls of the socle, significantly reduces the illuminated area in the room under the ceiling. For such conditions, the invention provides a special skylight solution whereby the lighting shoulder is rigidly attached to the outer edge of the lower arm of the support frame. The lighting shoulder consists in a vertical set-off wall and an inclined wall, which terminates at the lower end in a horizontal flange with anchors fixing the skylight to the concrete ceiling. The height of the set-off wall and the angle of inclination of the inclined wall are determined on the cross-section by the "C" point, lying on a straight line passing through the inner edges of the support frame: the end of the upper arm and the corner between the web and the lower arm, and the space above the lighting shoulder is filled with thermal insulation material.

[0020] It is preferable if the walls of the illuminating shoulder are stiffened by transverse ribs: an inclined wall with internal ribs welded to the set-off wall and a flange and a set-off wall with outer ribs to the lower arm of the support frame.

[0021] The inclination outside the socle walls under the skylight significantly increases the surface of the floor lit by daylight in the lower room, compared to the vertical walls of the socle by up to about 50%.

[0022] The description of two examples of basic designs shown in the drawing will enable a full understanding of the skylight structure according to the invention. The illustrations show:

Fig. 1 - perspective view from the center of the frame of a fragment of one skylight wall according to the first version of the invention, with embedded glass panel, without upper frame

Fig. 2 - view according to the Fig. 1 of the frame itself, without the glass panel,

Fig. 3 - a vertical cross-section according to the A-A line indicated in Fig. 1, with the upper frame glued on PVC or EPDM coated fabric,

Fig. 4 - a vertical cross-section of the skylight wall according to the second version of the invention, as in Fig. 3.

On the other hand, Fig. 5 shows the vertical section of the skylight, according to the invention, built up by a thick layer of thermal insulation with a lower level below the

frame with a shoulder attached to the support frame illuminating the bottom space.

[0023] In both basic versions, the skylights, according to the invention, are in the form of a socle attached to the building structure along the edge of a rectangular opening in a substantially horizontal building partition. The "O" frame of the skylight includes a support frame (1), made of wood, metal or plastic, and to which the walls of the perimeter are fitted with "T" thermal insulation. The "O" frame opening is sealed from above by a "S" glass panel with at least two outer plates (8) and an inner plates (10), joined at the edges by linear spacers (11) and of which the upper outer plate (8) has surface dimensions symmetrically covering the bottom inner plate (10).

[0024] In the skylight according to the first invention, shown in Figs. 1, 2 and 3, the support frame (1) is made of an non-isosceles profile with a "Z" profile, directed outwards by a horizontal lower arm (1a), which is longer than the upper arm (1b). On the perimeter of the support frame (1), to the outer surface of the web (1c), the "T" thermal insulation layer of hard building polystyrene is glued and externally protected with a protective coating (6). The thermal insulation "T" has a rectangular cross-section with a width b smaller than the length of the lower arm (1a) and a height h greater than the height "a" of the web (1c) by at least the distance (a1) between the lower surfaces of the inner plate (10) and outer plate (8) of the glass panel "S". Each of the inner sides of the support frame (1) has at least two non-isosceles mounting brackets "K". Mounting brackets "K" with vertical arm (14) are threaded through slots (15) cut in the corners of the upper arm (1b) of the support frame (1). They adheres to the inner surface of the web (1c) by the vertical arm (14) and covers from above the edge zone of the inner plate (10) by the horizontal arm (12) and presses it through a flexible pad (16) to the seal (12) on the lower arm (1a) of the support frame (1). At the same time, rigidly bonded to the inner plate (10), the outer plate (8) is pressed through the seal (12) to the upper surface of the "T" thermal insulation layer. Mounting brackets "K" in the pressing position of the glass panel "S" are attached with screws (18) to the web (1c) of the support frame (1), passed through a vertical groove in the vertical arm (14). Under-glass seals (12) and pads (16) are made of terpolymer or EPDM rubber, wherein their rebate surfaces are additionally bonded with structural adhesive. Better insulating properties are provided by the "S" panel with two gas chambers, separated by the central plate (9), with the dimensions of the internal plate (10). In the internal walls of thermal insulation "T", above the upper arm (1b) of the support frame (1), there are cut-outs with a triangular (4) or rectangular profile (5), in which the space - when inserting the glass panel "S" in the frame opening "O" - mounting brackets "K" are tilted sideways releasing the full light of the opening in the "O" frame with dimensions of the inner plate (10). The condition is that the cut-out width b1 is greater than the width of the b2 bracket and that the cut-out depth g is greater than the length of the

horizontal arm (13) in the mounting brackets "K". Triangular (4) or rectangular (5) cut-outs can be made as points assigned to each of the individual "K" mounting angles, or have a continuous, circumferential groove, provided on all internal walls of thermal insulation "T". Full leak-integrity of the skylight is provided by a solution in which seal (12) under the outer plate (8) is composed of two layers, between which a sheet of a polyester jacket made of PVC or EPDM coated fabric (19) is glued, with the outer dimensions of the rectangle with sides protruding evenly beyond the outer edges of the 'O' frame. The flexible fabric of such a layer hangs on the sides and protects the skylight in rainy conditions with a side wind. The effectiveness of the solution is further improved by the use of the upper plate frame (20), glued with structural adhesive to the lower surface of the periphery of the outer plate (8) and the upper surface of the jacket made of PVC coated fabric (19), wherein the upper frame (20) having outer dimensions larger than the "O" frame contour but smaller than the outer dimensions of the PVC coated fabric (19).

[0025] The second version of the skylight, according to the invention, differs from the one described above mainly due to the lack of mechanically fastening elements of the "S" glass panel in the "O" frame. The support frame (2) is made of an "L" profile, directed outwards by a horizontal lower arm (2a) and in that the thermal insulation layer (T) d is glued around the perimeter of the vertical arm (2b) but from the inside.

[0026] At the upper inner edge, the thermal insulation layer (T) has a peripherally cut socket (7) with a rectangular profile, whose outer dimensions are equal to the dimensions of the inner plate (10), and the depth of the socket (g1) is not less than the dimension a1 the distance between the bottom surfaces of the inner plate (10) and the outer plate (8), which are mounted respectively on EPDM terpolymer seals (12) in seat (7) and on the front surface of the "T" thermal insulation layer. The contact surfaces of seals (12) are additionally covered with structural adhesive. Other solutions in this version of the skylight, according to the invention, are the same as those described above.

[0027] The solution shown in Fig. 5 refers to the construction of the above-mentioned terrace skylights in a reinforced concrete ceiling with a thick layer of insulation, the lower level of which is located below the support frame (1). By the walls of the opening under the skylight perpendicular to the S glass panel, there is a very significant reduction in the floor area of the lower room, illuminated by daylight. The invention offers a solution to this problem by attaching to the outer edge of the lower arm (1a) of the support frame (1) of lighting shoulder (X), which is formed of a vertical set-off wall (21) and an inclined wall (22) at the lower end terminated with a horizontal flange (23). The skylight with lighting shoulder (X) attached to the support frame (1) is attached to the concrete ceiling (25) with anchors (24) threaded through holes in the flange (23). The height (h1) of the set-off wall

(21) and the angle of inclination (α) of the inclined wall (22) are determined in cross section by the point "C" lying on a straight line passing through the inner edges of the support frame (1): the end (A) of the upper arm (1b) and the corner (B) between the web (1c) and the lower arm (1a). The walls of the lighting shoulder (X) are stiffened with transverse ribs: the inclined wall (22) with internal ribs (30) welded to the set-off wall (21) and flange (23) and the set-off wall (21) with outer ribs (29) welded to the lower arm (1a) of the support frame (1). The space above the lighting shoulder (X) is filled with thermal insulation materials (T), at the level of glass panels (S) with hard building polystyrene, on the upper surface with a polystyrene floor underlay and ceramic tiles (26) mounted on the adhesive (27). On the side of the lower room, the lighting shoulder is protected by a gypsum board (28), inclined parallel to the inclined wall (22) at angle α .

[0028] The effect of using lighting shoulder is illustrated by comparing the floor lighting surface in the room with the skylight in the ceiling, respectively for: perpendicular to the glass walls of the socle under the skylight and with a chamfer using a lighting shoulder (X). In example conditions: a room 250 cm high, a square skylight with a 80 cm glass side, with an observer 170 cm tall standing at the skylight edge at a distance of 135 cm, a simple geometric calculus shows the dimensions of the floor lighting from the skylight axis at distances of 470 cm and 710 cm respectively.

Claims

1. **The terrace skylight**, in the form of a socle attached to the building structure along the edge of a rectangular opening, whose the frame (O) contains a support frame (1) made of an non-isosceles Z-shaped profile, directed outwards by a horizontal lower arm (1a) longer than the upper arm (1b), and to which web (1c) the thermal insulation layer (T) is peripherally glued, whereby the frame opening (O) from above is tightly covered by a glass panel (S) composed of at least two transparent plates (8, 10), tightly connected to each other through a glued spacer (11), and of which the upper outer plate (8) has surface dimensions symmetrically covering in a vertical projection the lower inner plate (10), **characterized in that**

- a layer of thermal insulation (T) made of low density insulation material, especially polyurethane (PUR), polyisocyanurate (PIR), foamed material with closed cells or hard building polystyrene, is glued to the outer surface of the web (1c) and has a cross-section transverse width (b) smaller than the length of the lower arm (1a) and a height (h) greater than the height (a) of the web (1c) by at least the distance (a1) between the bottom surfaces of the inner (10)

and outer (8) glass panel (S), and that

- on each of the inner sides of the support frame (1) there are at least two non-isosceles mounting brackets (K), which are threaded with the vertical arm (14) through the slots (15) cut in the corners of the upper arm (1b) of the support frame (1) and adhere to the inner surface of the web (1c) and the horizontal arm (12) cover the edge area of the inner plate (10) from above and press it through the flexible pad (16) against the seal (12) on the lower arm (1a) of the support frame (1), and simultaneously integrated with the inner plate (10), the outer plate (8) is pressed through the seal (12) to the upper surface of the thermal insulation layer (T), wherein the mounting brackets (K) in the pressure position of the glass panel (S) are fastened with screws (18) to the web (1c) of the support frame (1), and in addition seals (12) and pads (16) are formed of terpolymer or EPDM rubber and their contact surfaces are additionally bonded with structural adhesive.

2. The skylight, according to claim 1, **characterized in that** the glass panel (S) has at least one transparent central plate (9) with the dimensions of the inner plate (10).
3. The skylight, according to claim 2, **characterized in that** upper arm (1b) of the support frame (1) in the inner wall of the thermal insulation (T) is provided with cut-outs (4) with a right-angled triangle profile, with a shorter base at the top and a hypotenuse directed downwards to a point on the inner surface of the thermal insulation (T) under the upper arm (1b).
4. The skylight, according to claim 2, **characterized in that** the upper arm (1b) of the support frame (1) in the inner wall of the thermal insulation (I) is provided with cut-outs (5) with a rectangular profile, the lower side located under the upper arm (1b).
5. The skylight, according to claims 3 or 4, **characterized in that** the cut-outs (4, 5) have a width (b1) not less than the width (b2) of the mounting angle (K) and a depth (g) not less than the length of the horizontal arm (13) of the angle mounting (K).
6. The skylight, according to claim 3 or 4, **characterized in that** the cut-outs (4, 5) are in the form of a continuous circumferential groove made on all internal walls of the thermal insulation (T).
7. The skylight, according to claim 1, **characterized in that** the seal (12) under the outer plate (8) consists of two layers, between which a piece of a polyester jacket made of PVC-coated fabric (19) or EPDM rubber is glued, with the outer dimensions of a rectangle, whose sides protrude evenly beyond the outer edges

of the frame (O).

8. The skylight, according to claim 7, **characterized in that** the seal (12) has smaller outer dimensions than the outer plate (8) of the glass panel (S) and that between the peripherally protruding edge of the seal (12) the lower surface of the outer plate (8) and the upper surface of a coat made of PVC coated fabric or EPDM rubber (19) is glued with structural adhesive the plate top frame (20), made of rigid material, especially steel sheet with a surface protected against corrosion, and with outer dimensions protruding beyond the outer edges of the frame (O) but smaller than the external dimensions of a PVC coated fabric (19). 5
9. The skylight, according to claim 1, **characterized in that** the outer surfaces of thermal insulation (T) are covered with a protective coating (6), protecting against atmospheric influences. 10
10. The skylight, according to claim 1 or 9, **characterized in that** the protective coating is EPDM rubber. 15
11. The skylight, according to claim 1 or 9, **characterized in that** the protective coating is resin. 20
12. **Terrace skylight**, in the form of a socle attached to the building structure along the edge of a rectangular opening, the frame of which (O) contains a support frame (2) made of an "L" profile, directed outwards by a horizontal lower arm (2a) and in which the thermal insulation layer (T) adheres around the perimeter, from the inside to the vertical arm (2b), wherein the frame opening (O) from above is tightly covered by a glass panel (S) consisting of at least two transparent plates (10, 8), tightly connected along the edges with each other through a glued spacer (11), and the upper outer plate (8) of which has surface dimensions symmetrically covering the bottom inner plate in a vertical projection (10), **characterized in that** 25
 - a layer of thermal insulation (T) made of low density insulation material, especially polyurethane (PUR), polyisocyanurate (PIR), foamed material with closed cells or hard building polystyrene, has a height (h) higher than the height of the vertical arm (2b) a support frame (2), and that 30
 - at the upper, inner edge of the thermal insulation layer (T) has a circumferentially cut socket (7) with a rectangular profile, whose outer dimensions are equal to the dimensions of the inner plate (10), and the depth of the socket (g1) is not less than the dimension (a1) of the distance between the lower surfaces of the inner (10) and outer (8) plates, which are seated respectively on seals (12) made of terpolymer or EPDM rubber in the seat (7) and on the front surface of the thermal insulation layer (T), with the seal surfaces (12) are additionally bonded with structural adhesive. 35
13. The skylight, according to claim 10, **characterized in that** the glass panel (I) has at least one transparent central plate (9) with the dimensions of the inner plate (10). 40
14. The skylight, according to claim 10, **characterized in that** the seal (12) under the outer plate (8) consists of two layers, between which a piece of a polyester jacket made of PVC-coated fabric (19) or EPDM rubber is glued, with the outer dimensions of a rectangle, whose sides protrude evenly beyond the outer edges of the frame (O). 45
15. The skylight, according to claim 12, **characterized in that** the seal (12) has smaller outer dimensions than the outer plate (8) of the glass panel (S) and that between the peripherally protruding over the edge of the seal (12) the lower surface of the outer plate (8) and the upper surface of the coat made of PVC coated fabric or EPDM rubber (19) the top plate frame (20) is glued with structural adhesive, made of rigid material, especially steel sheet with a surface protected against corrosion, and having external dimensions protruding beyond the outer edges of the frame (O) but smaller than the external dimensions of the fabric coated with PVC or EPDM rubber (19). 50
16. The skylight, according to claim 10, **characterized in that** the outer surfaces of thermal insulation (I) are covered with a protective coating (7), protecting against atmospheric influences. 55
17. The skylight, according to claim 10 or 16 **characterized in that** the protective coating is EPDM rubber.
18. The skylight, according to claim 10 or 16 **characterized in that** the protective coating is resin.
19. The skylight, according to claim 1 or 12, **characterized in that** the outer edge of the lower arm (1a) of the support frame (1) has a rigid lighting frame (X) formed of a vertical set-off wall (21) and an inclined wall (22), which at its lower end is ended with a horizontal flange (23) with anchors (24) fixing the skylight to the concrete ceiling (25), where the height (h1) of the set-off wall (21) and the angle of inclination (α) of the inclined wall (22) is determined on the cross-section transverse by a point "C" lying on a straight line passing through the inner edges of the support frame (1): end (A) of the upper arm (1b) and corner (B) between the web (1c) and the lower arm (1a), and the space above the lighting frame (X) is

filled with thermal insulation material (T).

- 20.** The skylight, according to claim 19, **characterized in that** the walls of the lighting frame (X) are stiffened by transverse ribs: inclined wall (22) with internal ribs (30) welded to the set-off wall (21) and the collar (23) and the set-off wall (21) outer (29) to the lower arm (1a) of the support frame (1).

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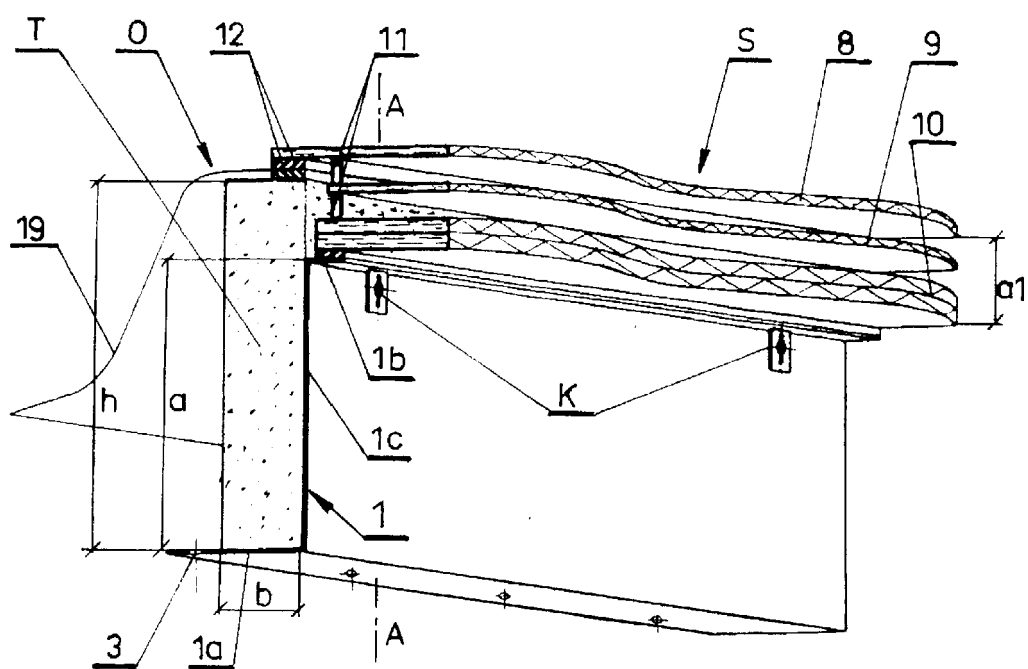


FIG.1

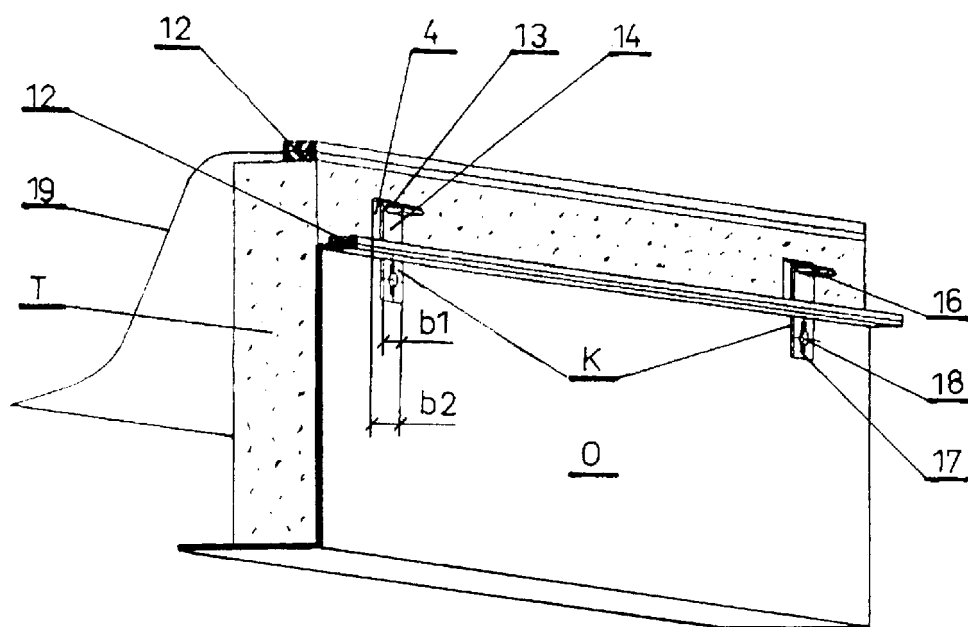


FIG. 2

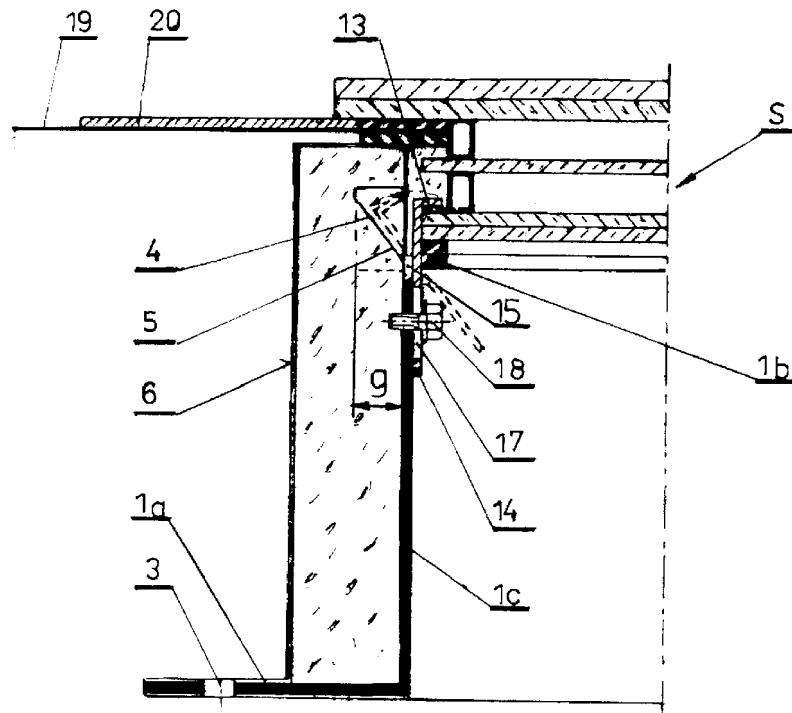


FIG.3

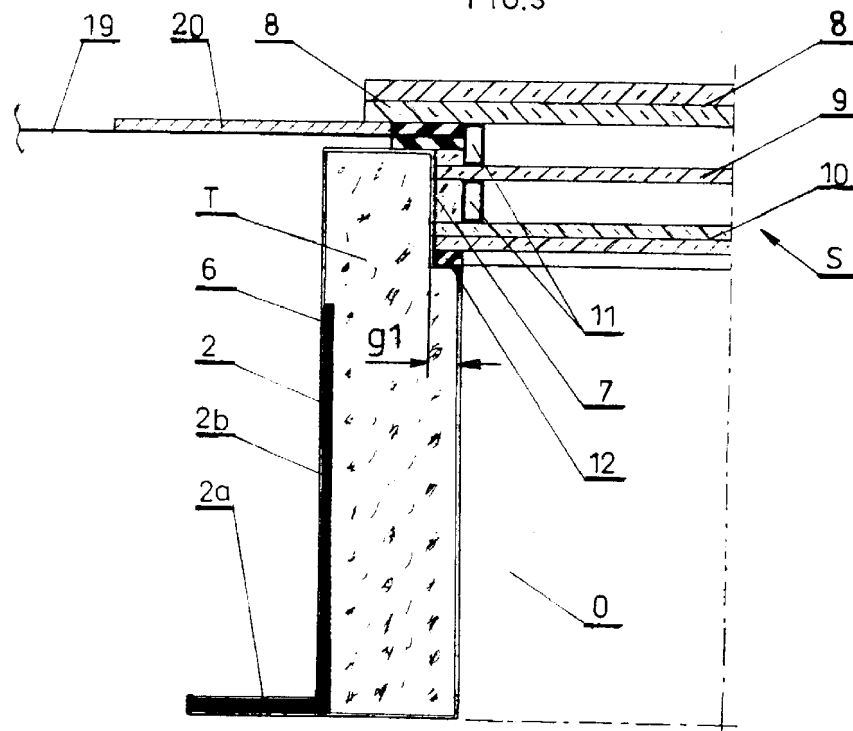
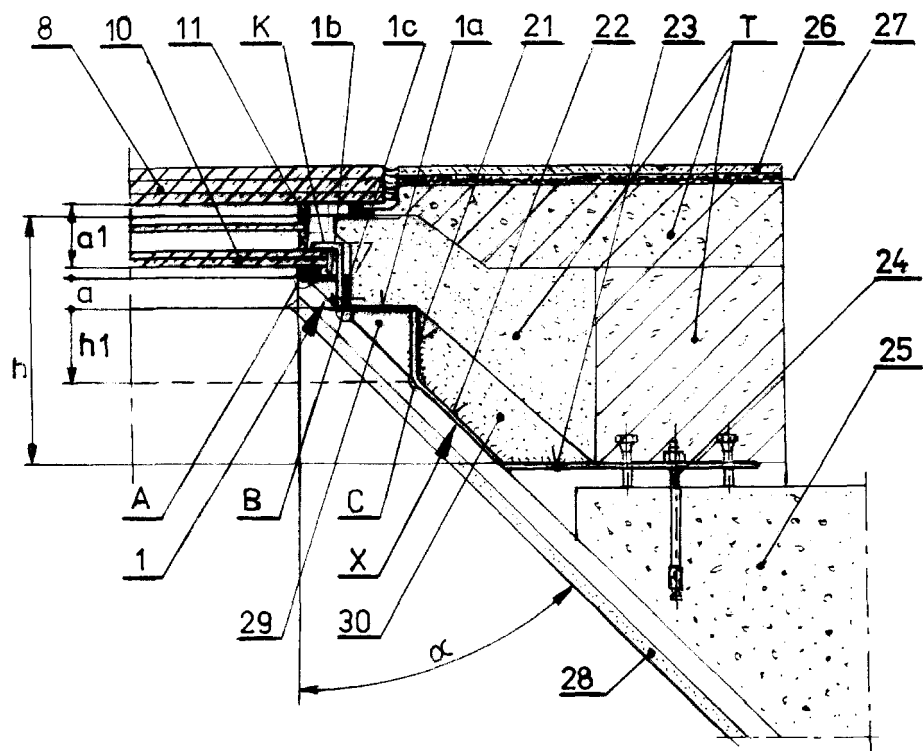


FIG.4



REFERENCES CITED IN THE DESCRIPTION

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