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(54) **Frame element for a roof panel, and roof panel provided with such a frame element**

(57) Frame element for a roof panel for a pitched roof, comprising an edge profile of open cross-section for receiving therein the edge zone on an end surface of this roof panel, in addition to fixing means for fixing this edge profile to a support element of the roof, for instance provided with a hollow tubular profile extending

along the edge profile and closed in transverse direction, a surface of which tubular profile intended as upper surface encloses an obtuse angle with a surface of the roof panel intended as upper side, which obtuse angle is at least equal to the obtuse angle which this latter surface forms with a horizontal plane in the position of use, and roof panel provided with such a frame element.

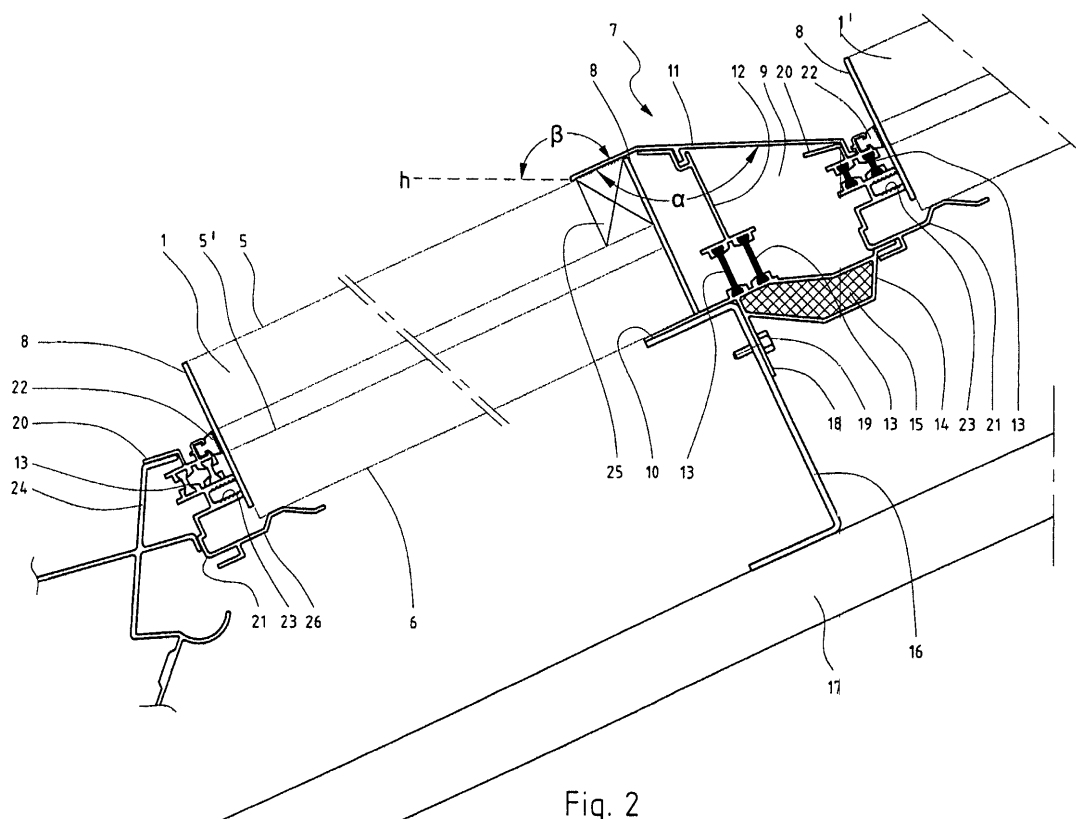


Fig. 2

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Description

[0001] The invention relates to a frame element for a roof panel for a pitched roof, for instance for a roof panel for the roof of a greenhouse or a glasshouse.

[0002] A pitched roof of a greenhouse or glasshouse, wherein glass panels with a thickness of for instance 4 mm are arranged on an underlying structure of roof trusses and purlins, is generally known.

[0003] Likewise known is a roof which is assembled from transparent panels of an acrylate or polycarbonate plastic, which in practical situations have for instance a thickness of about 16 mm, to comply with requirements of mechanical strength.

[0004] Transparent plastic roof panels provide the advantage that they are light in weight and can withstand the impact of hail.

[0005] Transparent plastic roof panels have the drawback that the transmission thereof is lower than the transmission of glass roof panels, which is disadvantageous when plastic roof panels are used in a greenhouse or glasshouse, since a lower transmission results in a lower yield of the plants cultivated in this greenhouse or glasshouse.

[0006] In order to obviate the drawback of the relatively low transmission of plastic, another known roof panel is assembled from two relatively thin, parallel, transparent plastic plates which each have a zigzag structure and which are mutually connected between corresponding ridge lines of the zigzag structure by means of strips of the same plastic material. Two imaginary, parallel planes are formed by the upper and lower ridge lines of this zigzag structure, the mutual distance between these planes defining the thickness of the roof panel. This thickness is of course markedly greater than the thickness of a single glass or plastic roof panel, and amounts to for instance 65 mm, while the panels are relatively short, for instance 2.6 m. Such roof panels can be coupled to each other in simple manner on their longitudinal sides, i.e. along sides parallel to the ridge lines of the zigzag structure. These assembled roof panels cannot be coupled to each other on their end surfaces, as a result of which these panels are only suitable for the use on roofs of long greenhouses and glasshouses with a relatively narrow span. These assembled roof panels are unsuitable for roofs with a wide span.

[0007] It is an object of the invention to provide a frame element for a roof panel for a pitched roof, which frame element enables the application of relatively thick and short roof panels, for instance panels with a zigzag structure or double-walled flat panels, for wide roof spans.

[0008] It is a further object to provide a frame element which provides the option of fixing a roof panel on a roof without the necessity of framing this roof panel completely, i.e. all around.

[0009] These objects are achieved, and other advantages gained, with a frame element for a roof panel for

a pitched roof, comprising an edge profile of open cross-section for receiving therein the edge zone on an end surface of this roof panel, in addition to fixing means for fixing this edge profile to a support element of the roof.

[0010] A frame element according to the invention enables making a roof panel suitable for the fixing of this panel on a roof, wherein it is not necessary to provide the entire panel with a frame. All that is necessary is that the roof panel is received with an edge zone in the edge profile on one end surface, the surface directed toward the ridge of the roof in the position of use, whereafter it can be fixed to a support element of the roof, for instance to a purlin, with the fixing means.

[0011] In one embodiment a frame element according to the invention is provided with a hollow tubular profile extending along the edge profile and closed in transverse direction.

[0012] A hollow tubular profile of suitably chosen dimensions provided with suitably chosen coupling and sealing means enables watertight coupling of a roof panel to a subsequent roof panel at a higher position or to a fixed part of a greenhouse, for instance an upright. The cavity in the tubular profile can furthermore be applied as discharge conduit for condensation or leakage water.

[0013] In a preferred embodiment, in the case of a tubular profile a surface thereof intended as upper surface encloses an obtuse angle with a surface of the roof panel intended as upper side, which obtuse angle is at least equal to the obtuse angle which this latter surface forms with a horizontal plane in the position of use.

[0014] Because the obtuse angle between the upper surface of the tubular profile and the upper surface of the roof panel is at least equal to the obtuse angle which this latter surface forms with a horizontal plane in the position of use, precipitation coming to lie on the tubular profile will flow off in the direction of the associated roof panel at a lower position.

[0015] In one embodiment the upper parts in the position of use of the edge profile and the tubular profile are preferably coupled in thermally insulated manner to the lower parts in the position of use of the edge profile and the tubular profile.

[0016] With this embodiment the formation of condensation droplets on the underside of the frame element is countered. This is particularly important when the frame element is applied in a greenhouse or glasshouse, since (usually very cold) condensation droplets, when falling on the leaves of young plants thereunder, are disastrous for the development thereof.

[0017] The formation of condensation is countered still further in an embodiment wherein the tubular profile is provided with a layer of thermally insulating material on its side intended as underside.

[0018] In order to enable discharge of condensation water possibly accumulating in the interior, i.e. in the hollow part of the tubular profile, the tubular profile is preferably provided with at least one outlet for discharging

condensation water formed in the tubular profile.

[0019] In a practically advantageous embodiment, the edge profile and the tubular profile comprise a joint cover which is coupled releasably to the lower parts in the position of use of the edge profile and the tubular profile.

[0020] A releasable cover provides the obvious advantage that parts of edge profile and tubular profile lying thereunder are easily accessible for repair or replacement.

[0021] In yet another embodiment, the tubular profile is provided with coupling means for coupling a second roof panel to this tubular profile.

[0022] In another frame element according to the invention the tubular profile is provided with hinge means for hingedly coupling the frame element to a support element of the roof.

[0023] Such a frame element can for instance be used to fix a roof panel which functions as a window to be opened.

[0024] A frame element according to the invention can be manufactured from all materials suitable for a profile, and is preferably manufactured from aluminium.

[0025] The invention further relates to a roof panel which is received with its edge zone on an end surface in the edge profile of an above described frame element.

[0026] The invention will be elucidated hereinbelow on the basis of exemplary embodiments and with reference to the drawings.

[0027] In the drawings

Fig. 1 shows a perspective view of a part of a roof panel with a zigzag structure according to the prior art,

Fig. 2 shows a side view of a part of a pitched roof of a greenhouse with roof panels according to fig. 1, which are mounted using a first embodiment of a frame element according to the invention, and

Fig. 3 shows a side view of a part of a pitched roof of a greenhouse with roof panels according to fig. 1, which are mounted using a second, third and fourth embodiment of a frame element according to the invention.

[0028] Corresponding components are designated in the figures with the same reference numerals.

[0029] Fig. 1 shows a part of a roof panel 1 which is assembled from two relatively thin, parallel, transparent plastic plates 2, 3 which each have a zigzag structure, which are mutually connected between corresponding ridge lines 5, 5'; 6, 6' of the zigzag structure by means of strips 4 of the same plastic material, and which are connected on their end surfaces by end plates 8 (shown in fig. 2), each having two corresponding zigzag edges. The thickness of this panel is defined by the mutual distance d between the two imaginary planes formed by the upper 5 and lower ridge lines 6 of the zigzag structure.

[0030] Fig. 2 shows a part of a pitched roof with a roof

panel 1 which is provided on its side directed toward the ridge with a frame element 7, which is fixed to a purlin 16 extending over roof trusses 17. Frame element 7 is provided for this purpose with a strip 18 which extends downward from a base plate 10 and which is screwed against purlin 16 with screws 19. Frame element 7 is assembled from a U-shaped open edge profile, which is directed to the left in the figure and in which is received the edge zone on the upper end surface of roof panel 1, and from a tubular profile with a cavity 9. On the end surface in the part where roof panel 1 is received in the edge profile the V-shaped channels in the top side of this roof panel 1 are filled with a suitable thermally insulating plastic foam 25 in order to prevent heat loss from the greenhouse. The edge profile and the tubular profile have in common the base plate 10, a releasable cover 11 and a partition wall 12, which is coupled in thermally insulated manner to base plate 10 by means of plastic or rubber strips 13. The upper surface of cover 11 above cavity 9 encloses an obtuse angle α with the upper surface of roof panel 1 which is greater than the obtuse angle β which the upper surface of the roof panel encloses with a horizontal plane h , as a result of which water coming to lie on cover 11 above cavity 9 can flow off to the lower roof panel 1. Under cavity 9 a thermally insulating material 15 is arranged in a second tubular profile 14 to prevent formation of condensation droplets under cavity 9. Condensation moisture in cavity 9 is discharged via outlets (not shown) extending through the second tubular profile 14 and the insulating material 15 therein. On its side remote from the edge profile the first tubular profile is closed by two profile parts 20, 21, which are coupled in thermally insulated manner by means of plastic or rubber strips 13 and which are respectively provided with a groove for receiving therein a rubber sealing edge 22 and screw threads 23 for respectively sealing and fixing the end plate 8 of the subsequent higher placed roof panel 1'. Formed on lower profile part 21 is a collecting gutter 26 for collecting moisture which condenses on the underside of a roof panel 1. This moisture is discharged to cavity 9 via openings (not shown) in lower profile part 21. Profile parts 20, 21 can also be applied under roof panel 1 if this, as in the figure, is the lowest-lying roof panel and ends above a gutter 24 (partly shown on the left in the figure). A drainage of this roof panel 1 to the gutter is thus provided, wherein leakage of precipitation or condensation water to the space below the relevant part of the roof is precluded.

[0031] Fig. 3 shows a part of a pitched roof close to ridge 27 of this roof, where in a simple embodiment of a U-profile 28 according to the invention the upper roof panels 1" are fixed to respectively a central column 31 and the ridge 27 by means of protruding strips 29, 30. Formed in the roof above openings between upper panels 1" are windows which can be closed with movable roof panels 1', which are received with their edge zone directed toward a raised ridge 32 in a simple embodiment of a frame element 33, the closed tubular profile

of which is provided with a protruding hinge part 34 of semicircular cross-section which is received in a corresponding semicircular opening 35 in the raised ridge 32. Arranged once again round the lowest end edge zone of roof panel 1' are profile parts 20, 21 which are coupled to frame element 33 by means of a tubular beam 37 received in U-profiles 36, 38. The thus formed skylight can be operated with an arm 39 and rests on a likewise simple embodiment of a frame element 40 for a lower-lying roof panel 1, wherein rubber strips 41, 42 provide a seal.

Claims

1. Frame element (7, 28, 33, 40) for a roof panel (1, 1', 1'') for a pitched roof, comprising an edge profile of open cross-section for receiving therein the edge zone on an end surface of said roof panel (1, 1', 1''), in addition to fixing means (18, 29, 30, 34) for fixing said edge profile to a support element (16, 27, 31, 32) of the roof.
2. Frame element (7, 33) as claimed in claim 1, **characterized in that** it is provided with a hollow tubular profile (9) extending along the edge profile and closed in transverse direction.
3. Frame element (7, 33) as claimed in claim 2, **characterized in that** a surface of the tubular profile (9) intended as upper surface (11) encloses an obtuse angle (α) with a surface of the roof panel (1, 1') intended as upper side, which obtuse angle (α) is at least equal to the obtuse angle (β) which this latter surface forms with a horizontal plane (h) in the position of use.
4. Frame element (7) as claimed in claim 3, **characterized in that** the upper parts (11, 12) in the position of use of the edge profile and the tubular profile (9) are coupled in thermally insulated manner to the lower parts (10) in the position of use of the edge profile and the tubular profile (9).
5. Frame element (7) as claimed in any of the claims 2-4, **characterized in that** the tubular profile (9) is provided with a layer of thermally insulating material (15) on its side intended as underside.
6. Frame element (7) as claimed in any of the claims 2-5, **characterized in that** the tubular profile (9) is provided with at least one outlet for discharging water from the cavity in the tubular profile (9).
7. Frame element (7) as claimed in any of the claims 2-6, **characterized in that** the edge profile and the tubular profile (9) comprise a joint cover (11) which is coupled releasably to the lower parts (10) in the position of use of the edge profile and the tubular profile (9).
8. Frame element (7) as claimed in any of the claims 2-7, **characterized in that** the tubular profile (9) is provided with coupling means (22, 23) for coupling said tubular profile (9) to a second roof panel (1').
9. Frame element (33) as claimed in claims 2-3, **characterized in that** the tubular profile (9) is provided with hinge means (34) for hingedly coupling the frame element (33) to a support element (32) of the roof.
10. Frame element (7, 28, 33, 40) as claimed in any of the foregoing claims, **characterized in that** it is manufactured from aluminium.
11. Roof panel (1, 1', 1'') which is received with its edge zone on an end surface in the edge profile of a frame element (7, 28, 33, 40) as claimed in any of the foregoing claims.

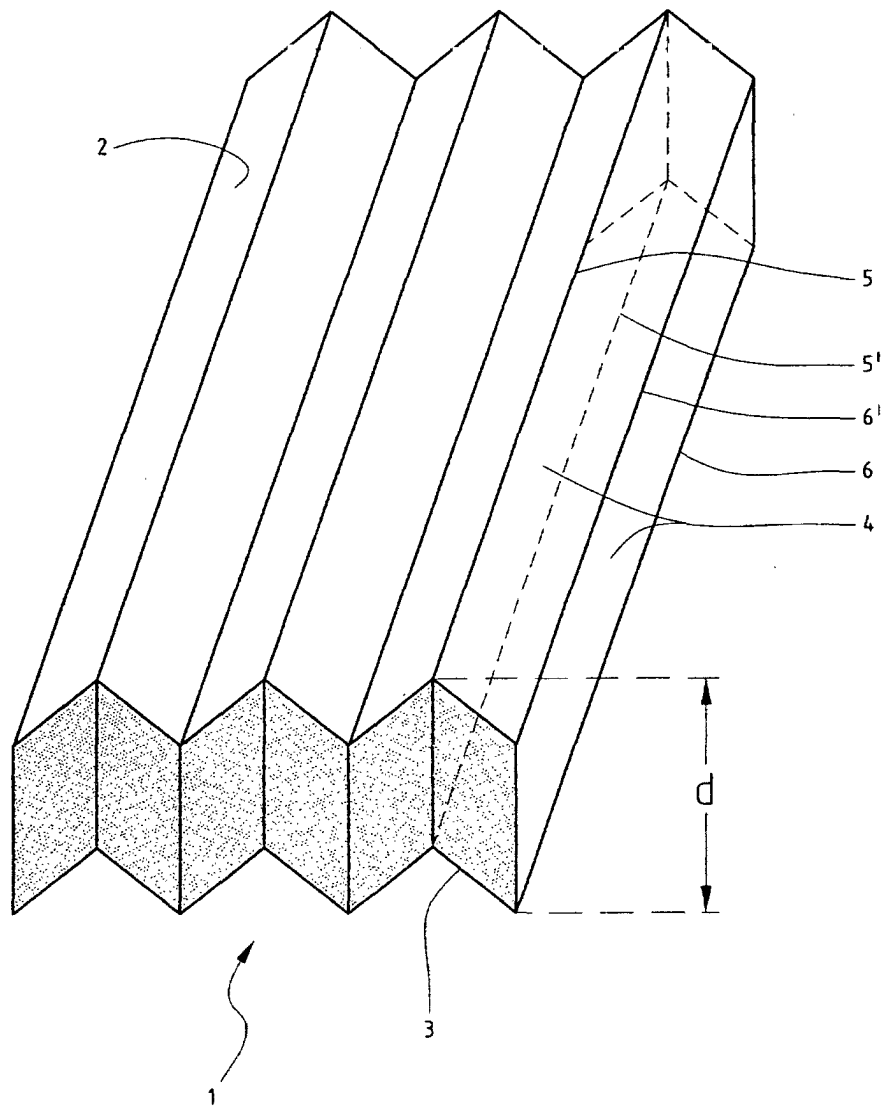


Fig. 1

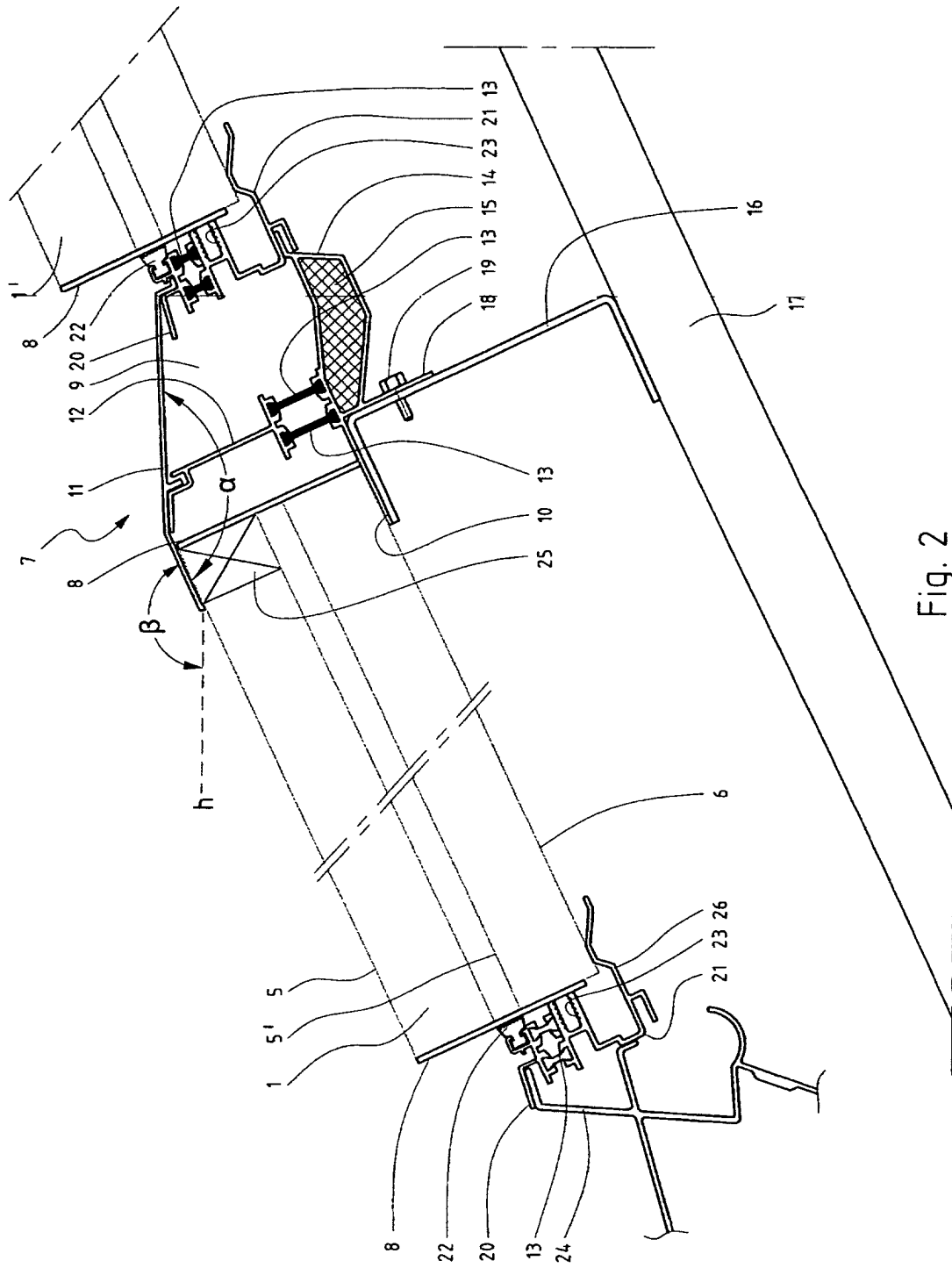
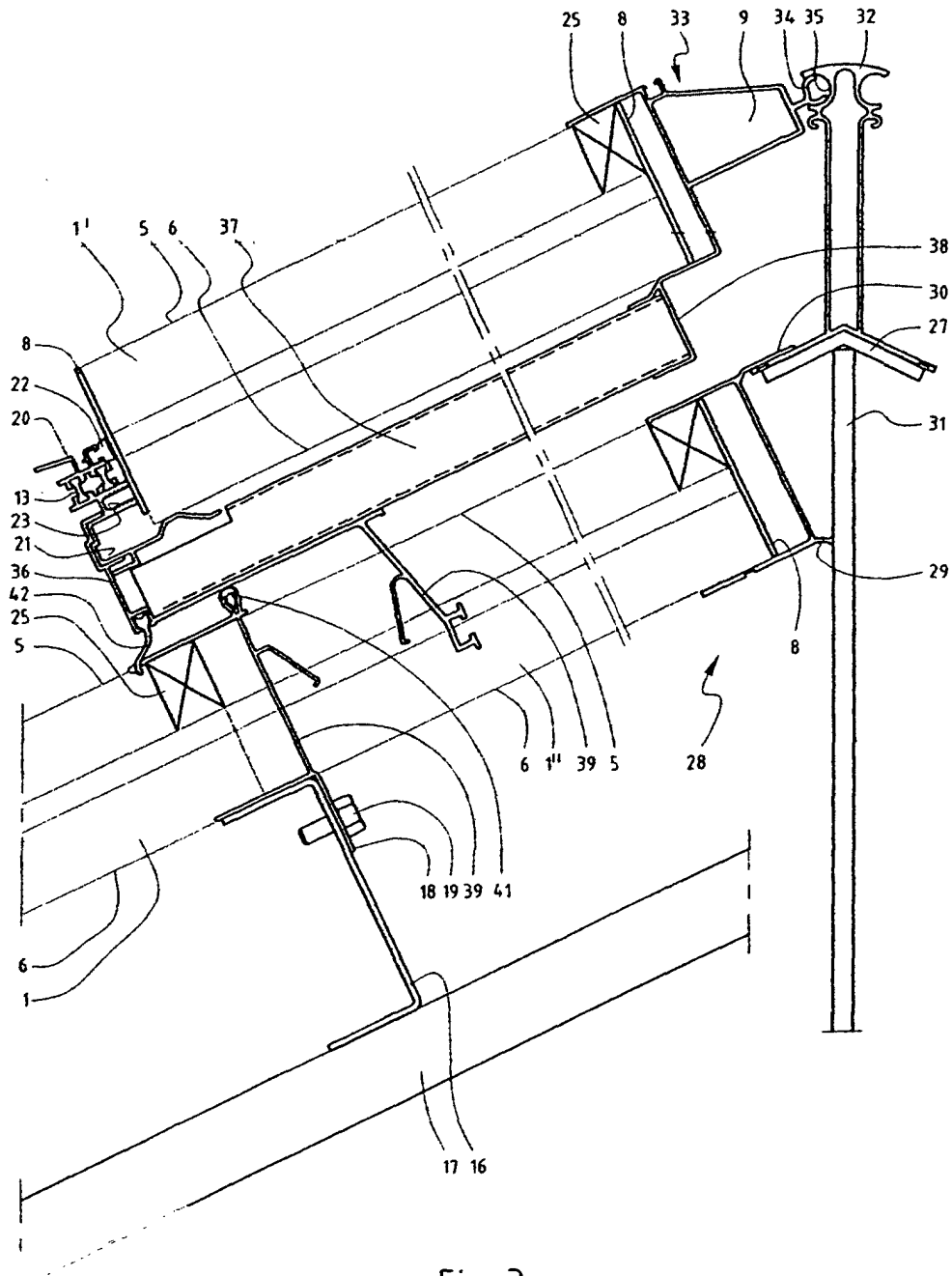


Fig. 2





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Application Number
EP 05 07 5909

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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