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(54) **Window**

Fenster

Fenêtre

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**EP-A- 0 679 773 WO-A-98/31896  
DE-A- 19 653 007 DE-U- 20 203 854**

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**Description**

**[0001]** The present invention relates to a window for installation in an inclined roof surface, comprising a window frame having a plurality of frame pieces, each frame piece having an upper side, a lower side, an inner side and an outer side, a height direction being defined by a direction extending from the lower side to the upper side, a set of cover members, each cover member having a first leg for covering the upper side of a respective frame piece and a second leg extending at an angle with respect to the first leg and covering a part of the outer side of the frame piece, a flashing frame including flashing members, each flashing member having a first leg lying substantially in the plane of the roof and a second leg extending at an angle with respect to the first leg, said second leg being at least partly overlapped by the second leg of the corresponding cover member, and at least one insulating frame including a plurality of insulating frame pieces, each insulating frame piece having a first side facing the window frame piece and a second side facing the flashing member and/or cover member.

**[0002]** Windows or other roof penetrating structures installed in roof surfaces are particularly exposed to thermal loss. In order to improve the overall insulating properties, insulation of at least a part of the outer side of the window frame has been suggested. In the prior art, this insulation has been carried out in a number of manners.

**[0003]** For instance, DE patent publication No. 38 37 377, EP 0744512 and WO 98/31896 disclose arrangements in which only a small part of the outer side of the window frame pieces is covered.

**[0004]** EP patent No. 679773 discloses a supporting frame and an insulating frame which overlap the entire outer side of the window frame according to the preamble of claim 1. However, such an arrangement necessitates that a relatively large aperture is formed in the roof, just as the width of the frame is affected, which is often not desirable from an aesthetic point of view.

**[0005]** In all of the above arrangements, special precautions must normally be taken in order to secure a weather-tight transition between the roof window and the surrounding roofing. In most cases, this entails an adaptation of the flashing and cover members, or the provision of customized parts, which render the manufacturing and installation more expensive.

**[0006]** With this background it is an object of the present invention to provide a window of the kind mentioned in the introduction, in which the installation and utilisation conditions are improved, and which at the same time makes it possible to provide satisfactory insulating properties.

**[0007]** In a first aspect of the invention, this and further objects are met by the provision of a window of the kind mentioned in the introduction, which is furthermore characterized in that, in a first insulating frame, each insulating frame piece has a bottom portion having a predetermined maximum width and positioned substantially in the plane of the first leg of the flashing member, the width between the first side and the second side decreasing from said maximum width in the height direction of the insulating frame piece such that the second side forms a predetermined angle other than perpendicular with the bottom portion, and that the second leg of the flashing member and the second leg of the cover member each extends substantially in parallel with the second side of the insulating frame piece.

**[0008]** By this design, a satisfactory balance has been found between the need for improving the insulating properties and considerations of installation and utilisation of the window. By forming the second leg of both the cover member and the flashing member with a predetermined angle corresponding to the angle of the second side of the insulating frame piece, the position of the window with respect to the plane of the roof may be adjusted, as these second legs may be displaced with respect to each other.

**[0009]** Advantageous embodiments are set forth in the dependent claims.

**[0010]** In the following the invention will be described in further detail with reference to the schematic drawings, in which

Fig. 1 is an exploded perspective view of a window in an embodiment of the present invention,

Fig. 2 is a cross-sectional view, on a larger scale, of the window of Fig. 1 along the line II-II,

Fig. 3 is a view corresponding to Fig. 2 of an alternative embodiment of the window according to the invention, and

Fig. 4 is a perspective view of an embodiment of a detail of an embodiment according to the invention.

**[0011]** The window shown in the drawings comprises a window frame having a plurality of frame pieces. In all of the embodiments shown in the drawings, the window is rectangular and the window frame comprises four frame pieces 1, 2, 3, 4, as shown in the embodiment of Figs. 1 and 2, and the right-hand frame piece 101 only is visible in Fig. 3. The window furthermore comprises a window sash, which is openable with respect to the window frame. The right-hand sash piece 5 and 105, respectively, is shown in Figs. 2 and 3. In the following, only the right-hand side frame piece of the window frame and the elements associated with this frame piece will be described in further detail. It is noted that this description applies, with any necessary modifications, to the other frame pieces and the elements associated to these pieces.

**[0012]** Referring now to Figs. 1 and 2, the frame piece 1 has an upper side 1a a lower side 1b, an outer side 1c and an inner side 1d. A height direction A is defined by a direction extending from the lower side 1b to the upper side 1a,

and a width direction B is defined by a direction extending from the inner side 1d to the outer side 1c. The window is secured to the underlying roof structure (not shown) in any suitable manner, e.g. as indicated by mounting brackets 6 and 7 positioned at the corners between adjoining frame pieces, i.e. as shown between the frame pieces 1,2 and 2,3, respectively. In this case, the mounting brackets 6,7 rest on and are secured to the laths and/or rafters of the underlying roof structure.

**[0013]** A set of cover members 11-14 is provided for protection of the window frame against the weathering. The cover member 11 of the right-hand frame piece 1 has a first leg 11a for covering the upper side 1a of the frame piece 1 and a second leg 11b extending at an angle with respect to the first leg 11a and covering a part of the outer side 1c of the frame piece 1.

**[0014]** In order to provide a weather-tight transition between the window and the surrounding roofing (not shown), a flashing frame is provided. In the embodiment shown, the flashing frame includes four flashing members 21-24. The right-hand flashing member 21 has a first leg 21a lying substantially in the plane of the roof and a second leg 21b extending at an angle with respect to the first leg 21a. The second leg 21b is partly overlapped by the second leg 11b of the corresponding cover member 11. At the intersection between adjoining flashing members, the flashing members may be connected with each other in any suitable manner, e.g. by folding, welding or by any other method. Furthermore, a plurality of flashing corner members may be provided for connection of adjoining flashing members. In order to secure that water gathered at the top of the window is led down along the sides of the window and further down to the roofing below the window, possibly via a skirt 22c which in a manner known *per se* is connected with the flashing member 22, the first leg 21a of the flashing members should have a predetermined width, preferably such a width that corresponds to standard flashing members. This entails that the flashing members protrude a slight distance further out from the window in comparison with windows having standard flashings, where the first and second legs are substantially parallel with each other.

**[0015]** In order to improve the overall insulating properties of the window, a kit of insulating frames is provided. Such a kit may be provided separately, e.g. in a packaging separate from the window, or in connection with the window. As will be described in further detail in the following, the kit comprises at least a first insulating frame.

**[0016]** The first insulating frame includes a plurality of insulating frame pieces. In Fig. 1, only the right-hand and left-hand side insulating frame pieces 31 and 33, and the bottom insulating frame piece 32 are visible. The right-hand side insulating frame piece 31 has a first side 31a facing the window frame piece 1 and a second side 31b facing the flashing member 21 and the cover member 11. The insulating frame piece 31 has a bottom portion 31c having a predetermined maximum width  $w$  and positioned substantially in the plane of the first leg 21a of the flashing member 21. In the embodiment shown, the insulating frame 31 has a substantially triangular cross-section and ends in a top portion 31d substantially in the plane of upper side 1a of the window frame piece 1. In this manner, the window frame piece 1 is surrounded by insulation over substantially the whole height above the mounting bracket 6. Generally, the width between the first side 31a and the second side 31b decreases from the maximum width  $w$  in a direction parallel with the height direction A such that the second side 31b forms a predetermined angle  $\alpha$  other than perpendicular with the bottom portion 31c. The angle  $\alpha$  may suitably lie in the interval of 45-80°, preferably 60-70°, in the embodiment shown approx. 70°.

**[0017]** The second leg 11b of the flashing member 11 and the second leg 21b of the cover member 21 each extends substantially in parallel with the second side 31b of the insulating frame piece 31. In the embodiment shown, the second leg 21b of the flashing member and the second leg 11b of the cover member are positioned at a distance  $d$  from the second side 31b of the insulating frame piece 31. This makes it possible to let air circulate in the space provided. The second leg 21b of each flashing member 21 and the second leg 11b of each cover member 11 may be connected with each other, e.g. integrally. It is advantageously possible to adjust the position of the flashing member and the cover member in order to accommodate different thicknesses of the roofing and/or the under roof, which may affect the position of the flashing in relation to the window and thus the cover.

**[0018]** In order to insulate also the area of the window frame situated below the plane defined by the respective bottom parts of the frame pieces of the first insulating frame, a second, third and/or fourth insulating frame may be provided as indicated in Fig. 3. In the embodiment of Fig. 3, parts having similar and analogous function as corresponding parts in Figs. 1 and 2 are denoted by the same reference numerals to which 100 has been added.

**[0019]** The second insulating frame, represented by its right-hand member 141, may have any suitable configuration, but is advantageously an insulating frame as defined in Applicant's EP patent application No. 1061199 A1. In the embodiment shown, the piece 141 of the second insulating frame extends from at least the lower side of the window frame piece 101b substantially up to the bottom portion 131c of the insulating frame piece 131, in the installation situation in question up to the mounting bracket 106. The second insulating frame may have such width that the desired insulating properties below the level of the mounting brackets are attained by the second insulating frame alone.

**[0020]** However, the kit of insulating frames may also incorporate a third and a fourth insulating frame, of which frame pieces 151 and 161, respectively, are shown in Fig. 3. The respective cross-section of the second, third and fourth insulating frame pieces may as indicated be chosen such that a solid trapezoid shape is obtained. Other shapes are conceivable as well, including those in which spaces are provided in between individual pieces. The outwards facing

section of the contour, here represented by the outer side 151b of the third insulating frame piece 151, is chosen such that a good connection with the surrounding insulation 170 is easily obtained.

[0021] The pieces of the insulating frame of frames may in principle have any extent in the longitudinal direction of the corresponding piece of the window frame. It is, however, advantageous if the insulating frame piece extends over substantially the entire length of the window frame piece. In case the window frame is secured to the underlying roof structure by means of mounting brackets positioned at the corners, the pieces of the first insulating frame may meet in any kind of joint, e.g. mitred joints. The pieces of the second, third and/or fourth insulating frames may have a length slightly shortened with respect to the corresponding piece of the first insulating frame.

[0022] In the embodiment of Fig. 3, the window frame is secured to the underlying roof structure by means of angular mounting brackets 106 which are attached to the side pieces of the window frame by means of a first leg 106a. In order to accommodate the leg 106a fastened to the side piece of the frame, the pieces of the first insulating frame may, at least at the side pieces, be provided with recesses. One possible design of forming such recesses is indicated in Fig. 4, in which a piece 231 of the first insulating frame is shown. In the side which is intended to face the window frame side piece, the insulating frame piece 231 is provided with a number of weakening lines 231e in the height direction of the piece 231. The weakening lines 231e may e.g. be provided as perforations extending to a predetermined depth in the width direction of the insulating frame piece 231. It is to be understood that a corresponding section of the material of the insulating frame piece 231 is only fastened to the remaining section of the piece 231 along these weakening lines 231e. A suitable distance between the weakening lines 231e is chosen such that one or two sections of material between adjacent weakening lines 231e are torn away in order to provide a recess to accommodate the first leg 106a of the mounting bracket 106. It is of course also conceivable to form the insulating frame piece without potential recesses, and to form the recesses manually. Eventually, the insulating frame may be used without recesses altogether, even in the case of mounting brackets situated at the side pieces of the window frame.

[0023] The pieces of the insulating frame or frames may be made from polyurethane foam or any other suitable material. The pieces of one insulating frame may e.g. be produced as a coherent string of extruded material that is cut into appropriate lengths.

[0024] The invention should not be regarded as being limited to the embodiments shown, but various modifications and combinations may be carried out.

## Claims

1. A window for installation in an inclined roof surface, comprising
  - a window frame having a plurality of frame pieces (1, 2, 3, 4), each frame piece (1) having an upper side (1a), a lower side (1b), an inner side (1d) and an outer side (1c), a height direction being defined by a direction extending from the lower side to the upper side,
  - a set of cover members (11, 12, 13, 14), each cover member (11) having a first leg (11a) covering the upper side (1a) of a respective frame piece (1) and a second leg (11b) extending at an angle with respect to the first leg (11a) and covering a part of the outer side (1c) of the frame piece (1),
  - a flashing frame including flashing members (21, 22, 23, 24), each flashing member (21) having a first leg (21a) for lying substantially in the plane of the roof and a second leg (21b) extending at an angle with respect to the first leg (21a), said second leg (21b) being at least partly overlapped by the second leg (11b) of the corresponding cover member (11), and
  - at least one insulating frame including a plurality of insulating frame pieces (31, 32, 33, 34), each insulating frame piece (31) having a first side (31c) facing the window frame piece (1) and a second side (31b) facing the flashing member (21) and/or cover member (11),

**characterized in that,**

  - in a first insulating frame (31, 32, 33, 34), each insulating frame piece has a bottom portion (31c) having a predetermined maximum width and positioned substantially in the plane of the first leg (21a) of the corresponding flashing member (21), the width between the first side (31a) and the second side (31b) decreasing from said maximum width in the height direction of the insulating frame piece such that the second side (31b) forms a predetermined angle ( $\alpha$ ) other than perpendicular with the bottom portion (31c), and that
  - the second leg (21b) of the flashing member (21) and the second leg (11b) of the cover member (11) each extends substantially in parallel with the second side (31b) of the insulating frame piece.
2. A window according to claim 1, in which the top portion of each insulating frame piece (31, 32, 33, 34) of said first insulating frame is positioned substantially in the plane of the upper side of the window frame piece.
3. A window according to claim 1 or 2, in which the second leg (21b) of the flashing member (21) and the second leg

(11b) of the cover member (11) are positioned at a distance from the second side (31b) of the insulating frame piece (31) of said first insulating frame.

- 5
4. A window according to any one of the preceding claims, in which said predetermined angle ( $\alpha$ ) is 45-80°, preferably 60-70°.
- 10
5. A window according to any one of the preceding claims, in which a second insulating frame (141) is provided, each piece of said second insulating frame extending from at least the lower side of the window frame piece (101) substantially up to the bottom portion of the insulating frame pieces (131) of said first insulating frame.
- 15
6. A window according to claim 5, in which a third insulating frame (151) is provided, preferably also a fourth insulating frame (161).
7. A window according to any one of the preceding claims, in which a plurality of flashing corner members is provided for connection of adjoining flashing members.
- 20
8. A window according to any one of the preceding claims, in which the first leg (21a) of the flashing members has a predetermined width.
9. A window according to any one of the preceding claims, in which the second leg (21b) of each flashing member and the second leg (11b) of each cover member are connected with each other.
- 25
10. A window according to claim 9, in which said connection is made integral.
11. A window according to any one of the preceding claim, in which the insulating frame is made from polyurethane foam or any other suitable material.

### Patentansprüche

- 30
1. Fenster zum Einbau in eine geneigte Dachfläche, umfassend einen Fensterrahmen mit einer Mehrheit von Rahmenstücken (1,2,3,4), wobei jedes Rahmenstück (1) eine obere Seite (1a), eine untere Seite (1b), eine innere Seite (1d) und eine äußere Seite (1c) aufweist, wobei eine Höhenrichtung durch eine sich von der unteren Seite bis zur oberen Seite erstreckende Richtung definiert wird,
- 35
- einen Satz von Deckenelementen (11,12,13,14), wobei jedes Deckenelement (11) einen die obere Seite (1a) eines jeweiligen Rahmenstücks (1) überdeckenden ersten Schenkel (11a) und einen sich um einen Winkel bezüglich des ersten Schenkels (11a) erstreckenden und einen Teil der äußeren Seite (1c) des Rahmenstücks (1) überdeckenden zweiten Schenkel (11b) aufweist,
- 40
- einen Eindeckrahmen umfassend Eindeckelemente (21,22,23, 24), wobei jedes Eindeckelement (21) einen ersten Schenkel (21a) zur Positionierung im Wesentlichen in der Dachebene und einen sich um einen Winkel bezüglich des ersten Schenkels (21a) sich erstreckenden zweiten Schenkel (21b), welcher Schenkel (21b) mindestens teilweise vom zweiten Schenkel (11b) des entsprechenden Deckenelements (11) überlagert wird, und
- 45
- mindestens einen Isolierrahmen umfassend eine Mehrheit von Isolierrahmenstücken (31,32,33,34), wobei jedes Isolierrahmenstück (31) eine dem Fensterrahmenstück (1) zugewandte erste Seite (31c) und eine dem Eindeckelement (21) und/oder dem Deckenelement (11) zugewandte zweite Seite (31b) aufweist,
- dadurch gekennzeichnet, dass**
- in einem ersten Isolierrahmen (31,32,33,34) jedes Isolierrahmenstück ein Bodenteil (31c) aufweist, welches eine vordefinierte Maximalbreite aufweist und im Wesentlichen in der Ebene des ersten Schenkels (21a) des entsprechenden Eindeckelements (21) positioniert ist, wobei die Breite zwischen der ersten Seite (31a) und der zweiten
- 50
- Seite (31b) von der erwähnten Maximalbreite in der Höhenrichtung des Isolierrahmenstücks derart abnimmt, dass die zweite Seite (31b) einen vordefinierten Winkel ( $\alpha$ ) bildet, der zum Bodenteil (31c) nicht rechtwinklig ist, und dass der zweite Schenkel (21b) des Eindeckelements (21) und der zweite Schenkel (11b) des Deckenelements (11) sich jeweils im Wesentlichen parallel zur zweiten Seite (31b) des Isolierrahmenstücks erstrecken.
- 55
2. Fenster nach Anspruch 1, bei welchem das Bodenteil jedes Isolierrahmenstücks (31,32,33,34) des erwähnten ersten Isolierrahmens im Wesentlichen in der Ebene der oberen Seite des Fensterrahmenstücks positioniert ist.
3. Fenster nach den Ansprüchen 1 oder 2, bei welchem der zweite Schenkel (21b) des Eindeckelements (21) und der

zweite Schenkel (11b) des Deckenelements (11) in einem Abstand zur zweiten Seite (31b) des Isolierrahmenstücks (31) des erwähnten ersten Isolierrahmens positioniert sind.

- 5 4. Fenster nach einem der vorhergehenden Ansprüche, bei welchem der erwähnte vordefinierte Winkel ( $\alpha$ ) 45-80°, vorzugsweise 60-70° beträgt.
- 10 5. Fenster nach einem der vorhergehenden Ansprüche, bei welchem ein zweiter Isolierrahmen (141) vorgesehen ist, wobei jedes Stück des erwähnten zweiten Isolierrahmens sich von mindestens der unteren Seite des Fensterrahmenstücks (101) im Wesentlichen bis zum Bodenteil des Isolierrahmenstücks (131) des erwähnten ersten Isolierrahmens erstreckt.
- 15 6. Fenster nach Anspruch 5, bei welchem ein dritter Isolierrahmen (151), bevorzugt auch ein vierter Isolierrahmen (161), vorgesehen ist.
- 20 7. Fenster nach einem der vorhergehenden Ansprüche, bei welchem eine Mehrheit von Eindeckenelementen zum Verbinden angrenzender Eindeckenelemente vorgesehen ist.
- 25 8. Fenster nach einem der vorhergehenden Ansprüche, bei welchem der erste Schenkel (21a) der Eindeckenelemente eine vordefinierte Breite aufweist.
- 30 9. Fenster nach einem der vorhergehenden Ansprüche, bei welchem der zweite Schenkel (21b) jedes Eindeckenelements und der zweite Schenkel (11b) jedes Deckenelements miteinander verbunden sind.
- 35 10. Fenster nach Anspruch 9, bei welchem das erwähnte Verbinden integral durchgeführt ist.
- 40 11. Fenster nach einem der vorhergehenden Ansprüche, bei welchem der Isolierrahmen aus Polyurethanschaum oder einem anderen geeigneten Werkstoff hergestellt ist.

## 30 Revendications

- 35 1. Fenêtre à installer dans une surface de toit inclinée, comprenant un cadre de fenêtre présentant une pluralité de parties de cadre (1,2,3,4), chaque partie de cadre (1) ayant un côté supérieur (1a), un côté inférieur (1b), un côté intérieur (1d) et un côté extérieur (1c), une direction de hauteur étant définie par une direction s'étendant du côté inférieur au côté supérieur,  
40 un jeu d'éléments de recouvrement (11,12,13,14), chaque élément de recouvrement (11) ayant un premier pied (11a) recouvrant le côté supérieur (1a) de la partie de cadre (1) respective et un deuxième pied (11b) s'étendant à un angle par rapport au premier pied (11a) et couvrant une portion du côté extérieur (1c) de la partie de cadre (1),  
45 un cadre de raccordement comprenant des éléments de raccordement (21,22,23,24), chaque élément de raccordement (21) ayant un premier pied (21a) à allonger essentiellement dans le plan du toit et un deuxième pied (21b) s'étendant à un angle par rapport au premier pied (21a), deuxième pied (21b) qui est au moins partiellement recouvert par le deuxième pied (11b) de l'élément de recouvrement (11) correspondant, et au moins un cadre isolant comprenant une pluralité de parties de cadre isolant (31,32,33,34), chaque partie de cadre isolant (31) ayant un premier côté (31c) en face de la partie du cadre de fenêtre (1) et un deuxième côté (31b) en face de l'élément de raccordement (21) et/ou de l'élément de recouvrement (11).  
**caractérisée en ce que**  
dans un premier cadre isolant (31,32,33,34), chaque partie de cadre isolant présente une portion inférieure (31c) ayant une largeur maximale prédéterminée et située essentiellement dans le plan du premier pied (21a) de l'élément de raccordement (21) correspondant, la largeur entre le premier côté (31a) et le deuxième côté (31b) décroissant  
50 à partir de ladite largeur maximale dans la direction de hauteur de la partie de cadre isolant, si bien que le deuxième côté (31b) établit un angle prédéterminé (a) autre que perpendiculaire à la portion inférieure (31c), et **en ce que** le deuxième pied (21b) de l'élément de raccordement (21) et le deuxième pied (11b) de l'élément de recouvrement (11) s'étendent chacun essentiellement parallèlement au deuxième côté (31b) de la partie de cadre isolant.
- 55 2. Fenêtre selon la revendication 1, dans laquelle la portion supérieure de chaque partie de cadre isolant (31,32,33,34) dudit premier cadre isolant est située essentiellement dans le plan du côté supérieur de la partie du cadre de fenêtre.
3. Fenêtre selon la revendication 1 ou 2, dans laquelle le deuxième pied (21b) de l'élément de raccordement (21) et

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le deuxième pied (11b) de l'élément de recouvrement (11) sont situés à une distance du deuxième côté (31b) de la partie de cadre isolant (31b) dudit premier cadre isolant.

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4. Fenêtre selon l'une quelconque des revendications précédentes, dans laquelle ledit angle (a) prédéterminé est 45-80°, préférablement 60-70°.
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5. Fenêtre selon l'une quelconque des revendications précédentes, dans laquelle un deuxième cadre isolant (141) est pourvu, chaque partie dudit deuxième cadre isolant s'étendant vers le haut d'au moins le côté inférieur de la partie du cadre de fenêtre (101) essentiellement jusqu'à la portion inférieure de la partie de cadre isolant (131) dudit premier cadre isolant.
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6. Fenêtre selon la revendication 5, dans laquelle un troisième cadre isolant (151) est pourvu, de préférence également un quatrième cadre isolant (161).
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7. Fenêtre selon l'une quelconque des revendications précédentes, dans laquelle une pluralité de coins de raccordement est pourvue pour liaison d'éléments de raccordement.
8. Fenêtre selon l'une quelconque des revendications précédentes, dans laquelle le premier pied (21a) des éléments de raccordement présente une largeur prédéterminée.
- 25
9. Fenêtre selon l'une quelconque des revendications précédentes, dans laquelle le deuxième pied (21b) de chaque élément de raccordement et le deuxième pied (11b) de chaque élément de recouvrement sont reliés l'un à l'autre.
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10. Fenêtre selon la revendication 9, dans laquelle ladite liaison est faite en une pièce.
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11. Fenêtre selon l'une quelconque des revendications précédentes, dans laquelle le cadre isolant est fait de la mousse de polyuréthane ou tout autre matériau approprié.

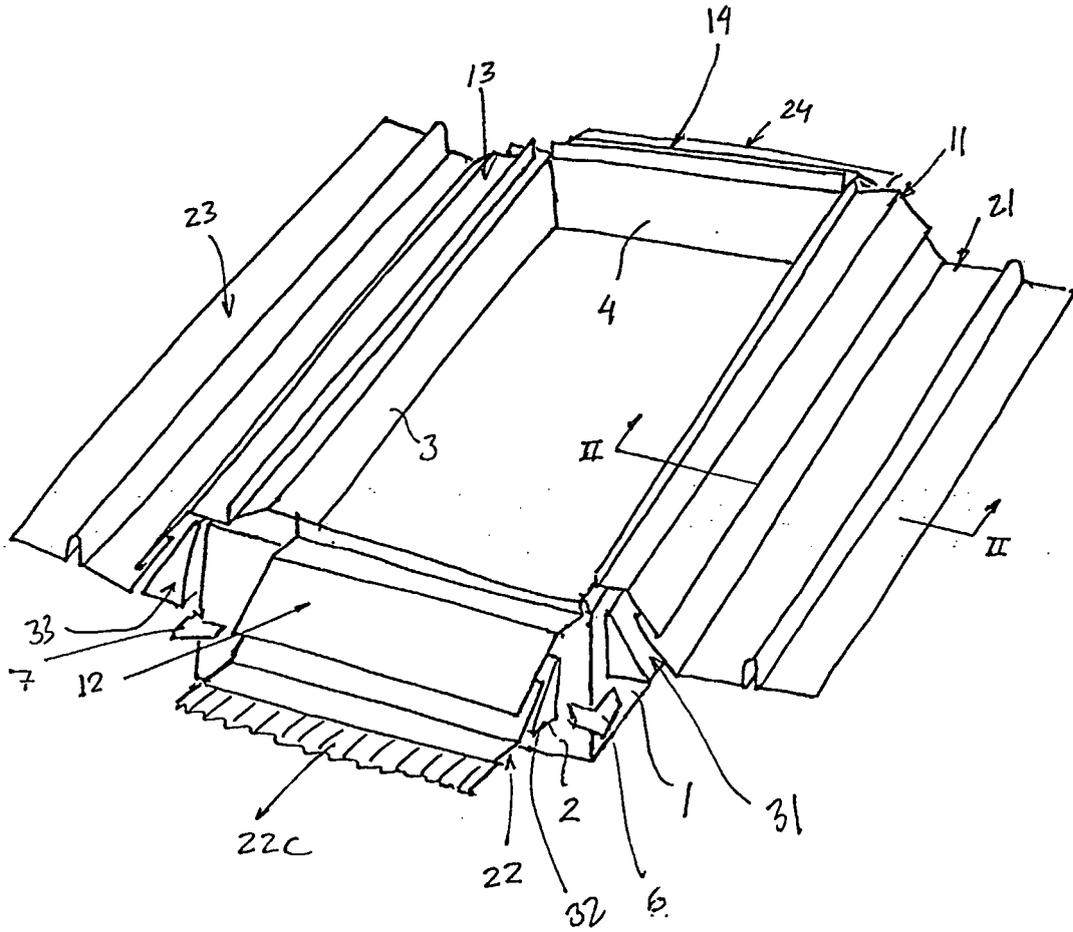


Fig. 1

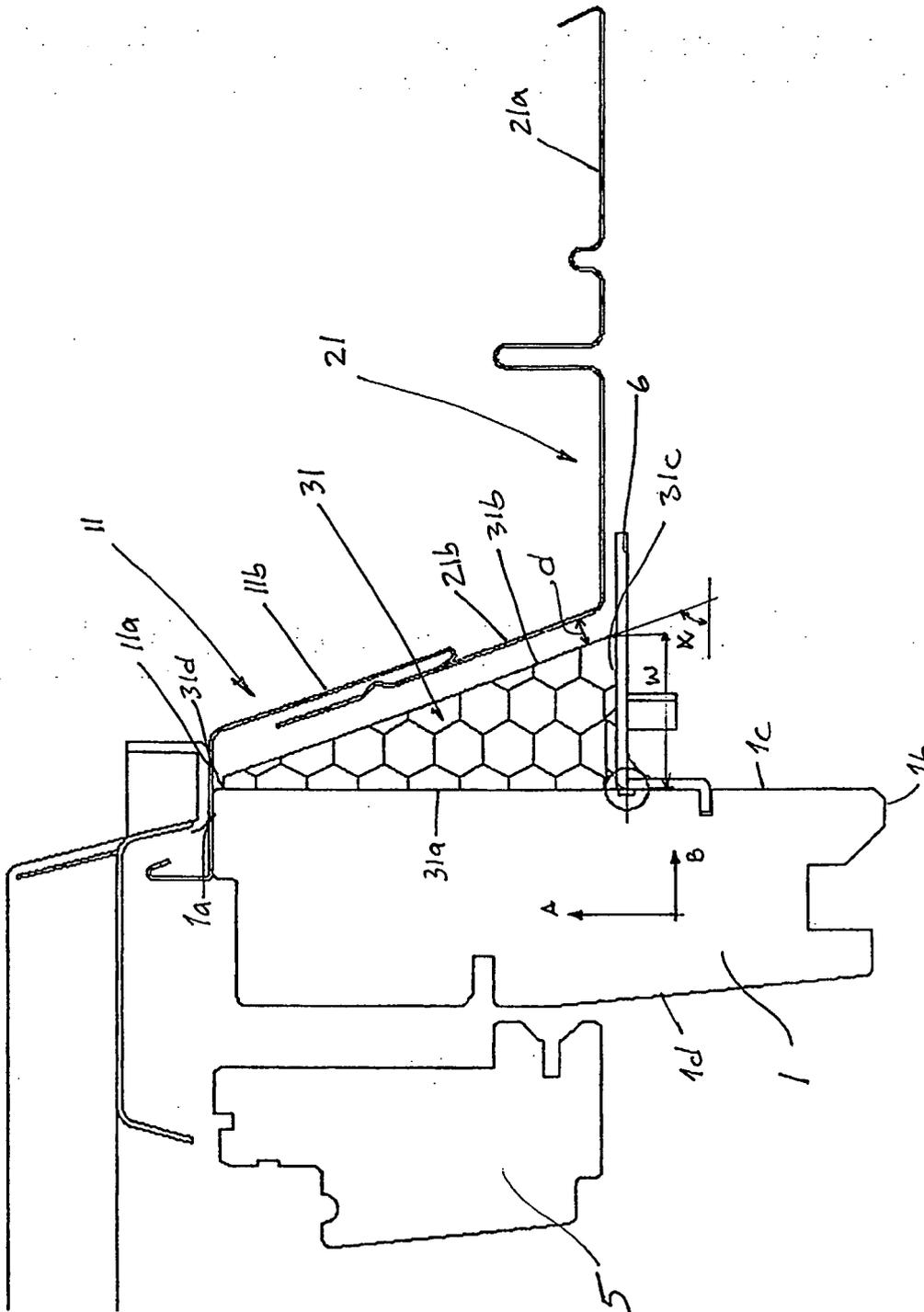
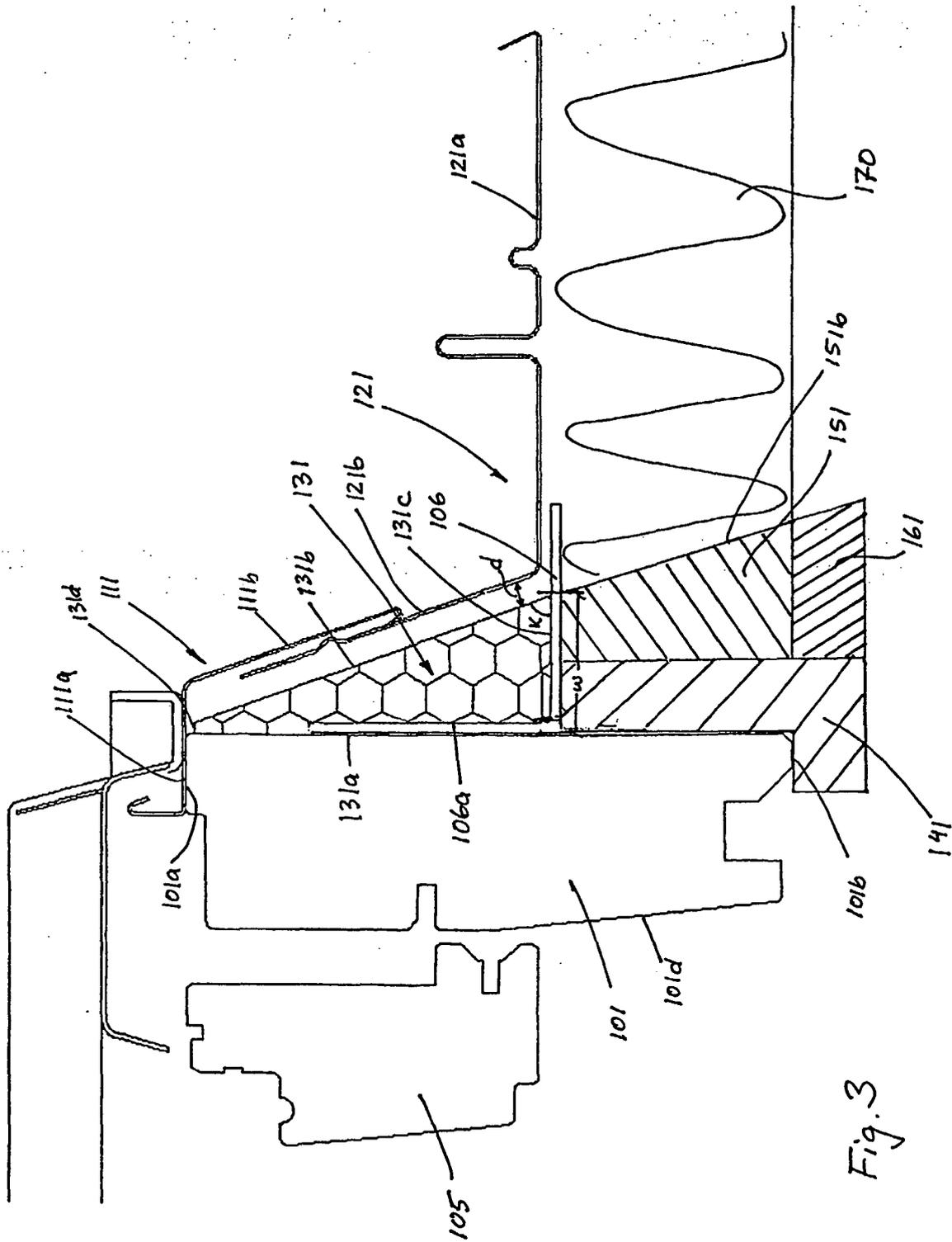


Fig. 2



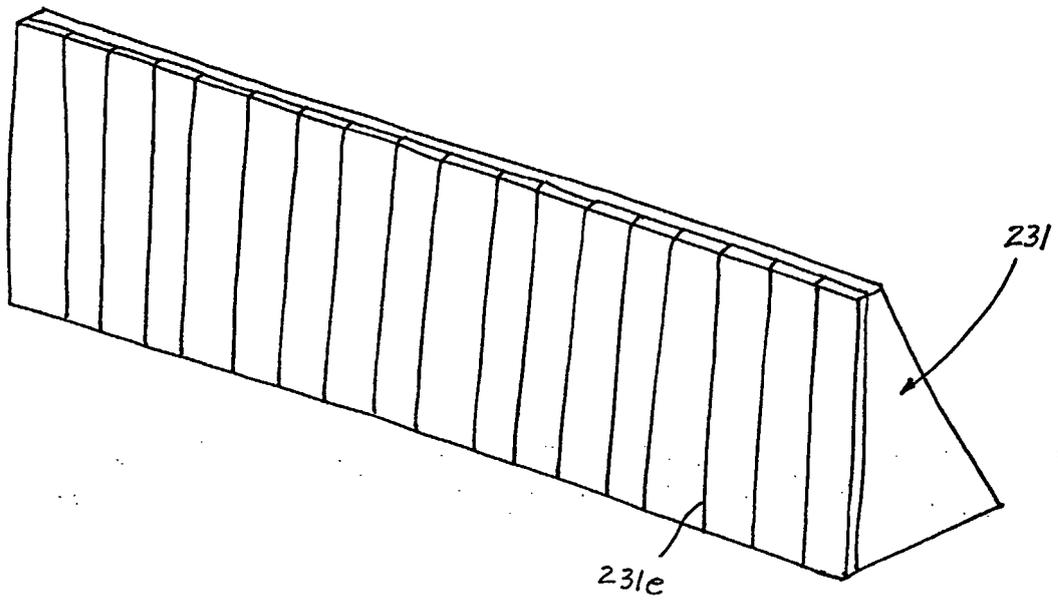


Fig. 4