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(54) **Method for installing dry cladding on a flat structural surface, insulation panel for use in such a method and method for producing such an insulation panel**

(57) The present invention provides a method for installing dry cladding on a flat structural surface, which method comprises the successive steps of

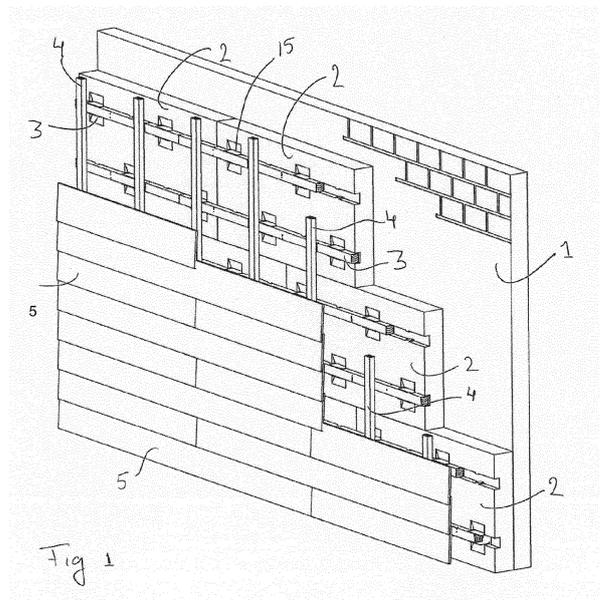
A effecting the fixation of foam-like insulation panels to a flat structural surface of a building, wherein aligned brackets are provided on the side of the insulation panels remote from the supporting surface, each bracket having at least one connecting leg that is directed outward, at least substantially perpendicularly to the supporting surface,

B connecting fixing means oriented parallel to each other to the at least one connecting leg of the brackets,

C connecting the dry wall cladding to the fixing means on the side remote from the supporting surface.

The invention further provides an insulation panel for use in such a method, and a method for producing such an insulation panel.

The invention also provides an insulation panel and a method for producing an insulation panel.



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## Description

**[0001]** The present invention relates to a method for installing dry cladding on a flat structural surface, to an insulation panel for use in such a method and to a method for producing such an insulation panel.

**[0002]** In cases where an outer leaf in the form of dry wall cladding is to be installed on a structural inner leaf, usually consisting of stone-like materials such as concrete, brickwork, lime-sand stone but possibly also wood or steel, and the use of insulation material between the cladding and the surface of said inner leaf is desired, use is traditionally made of aligned right-angled brackets which are fixed to the inner leaf at regular intervals. Then horizontally or vertically oriented laths, usually made of wood, are connected to the brackets, whereupon mineral wool, such as rock wool or glass wool, is provided between the laths as an insulating material. The laths are aligned prior to being connected to the brackets so as to ensure a level appearance of the final wall cladding. Subsequently, a foil and, following that, evenly spaced laths oriented perpendicular to the horizontally or vertically oriented laths are fixed to said laths over said laths and said mineral wool. Finally, the wall cladding, usually in the form of a horizontally or vertically oriented strip-like or plate-shaped material as marketed by companies such as Deceuninck, VMZINC or Trespa, is fixed to the laths.

**[0003]** A drawback of this traditional method is that it is labour-intensive and thus relatively costly. An alternative system has been on the market under the name of ISO.finish for a few years, which system makes use of insulation panels which are directly fixed to the inner leaf. Then vertical laths are provided on the outer side of the insulation panels by means of plugs and wall screws that extend through the insulation panels into the inner leaf. The wall screws are also provided with external screw thread, making it possible to align the vertical laths with each other with a certain spacing being present between the insulation panels and the vertical laths. In addition, in order to fix said alignment, the vertical laths are connected to the inner leaf by means of wall screws that extend at an angle of about 30 degrees to the horizontal. As is the case in the traditional method, the wall cladding is finally fixed to the vertical laths. In practice this system has been found to be only a little less labour-intensive than the traditional method. Accordingly, said system is used to a limited extent in practice.

**[0004]** The object of the invention, according to a first aspect thereof, is to provide a method which makes it possible to install dry cladding in a less labour-intensive manner without this being realised at the expense of the possibility to adjust the position of the cladding relative to the supporting surface whilst also providing insulation material. In order to achieve that object, the invention provides a method for installing dry cladding on a flat structural surface, which method comprises the successive steps of

A effecting the fixation of foam-like insulation panels to a flat structural surface of a building, wherein aligned brackets are provided on the side of the insulation panels remote from the supporting surface, each bracket having at least one connecting leg that is directed outward, at least substantially perpendicular to the supporting surface,

B connecting fixing means oriented parallel to each other to the at least one connecting leg of the brackets,

C connecting the dry wall cladding to the fixing means on the side remote from the supporting surface.

15 The above steps A - C make it possible to install dry wall cladding, including intermediate insulation material, to a structural supporting surface in a relatively user-friendly and quick manner. More specifically, this advantage is connected with the use of aligned brackets provided on the side of insulation panels remote from the supporting surface.

20 **[0005]** When the above method is used, step A may comprise the successive steps of

25 A1 providing foam-like insulation panels on the supporting surface, and  
A2 attaching the brackets to the side of the foam-like insulation panels remote from the supporting surface.

30 The advantage of such a method is that it can be realised with relatively simple, for example completely flat, insulation panels.

35 **[0006]** If use is made in step A2 of connecting means that extend at least partially within the material of an insulation panel, this will have a positive effect as regards the ease with which the method can be carried out. Such connecting means may be screws or nails, for example, but also strip portions that are folded over, so that part thereof extends into the material of the insulation panel.

40 **[0007]** The speed of working can be further increased if the connecting means are pin-shaped and extend straight through the insulation material into the supporting surface. In such an embodiment, hammer plugs can be quite suitably used as the pin-shaped connecting means. In principle it is possible in that case to connect an insulation panel to a supporting surface and connect the bracket to the insulation panel (and the supporting surface) in one go.

45 **[0008]** It may also be advantageous, however, to connect the foam-like insulation panels to the supporting surface prior to step A2. Such a connection could also function merely to make it possible to position the insulation correctly relative to adjacent insulation panels and the supporting surface, with the definitive fixation being carried out during a next step, for example simultaneously with the fixation of a bracket to the insulation panel according to the preceding preferred embodiment.

**[0009]** It may also be advantageous if the foam-like insulation panels are already provided with the brackets upon fixation of the insulation panels to the supporting surface according to step A. The method according to the invention can thus be carried out relatively quickly, because it is no longer necessary to connect the at least one bracket to the insulation panel "in situ", so that also the "in situ" alignment of the brackets is no longer required. This preferred embodiment certainly does not rule out the possibility that the fixation of the brackets to the insulation panel could be improved upon fixation of the insulation panel to the supporting surface. This might for example be the case if a hammer plug is hammered both through a mounting hole in the bracket and through the material of the insulation panel into the supporting surface.

**[0010]** In another preferred embodiment, the insulation panels are provided with continuous grooves and the insulation panels are connected to the supporting surface in such a manner during step A that continuous grooves of adjacent insulation panels are in line, and the fixing means are connected to the connecting legs of the brackets in such a manner during step B that the fixing means will extend at least partially into the continuous grooves. In this way the depth of the combination of the insulation panel and the elongated fixing means, i.e. the dimensions of said combination seen in a direction perpendicular to the supporting surface, can be kept within bounds. This is advantageous not only for space reasons but also in view of the bending moment that acts on the structural surface on account of the weight of the cladding and the insulation panels provided with elongated fixing means.

**[0011]** If the fixing means are connected to the connecting legs of the bracket in such a manner during step B that the fixing means extend only partially within the continuous grooves, a wall cavity can be created directly behind the cladding in a simple manner.

**[0012]** According to an alternative preferred embodiment, in which the insulation panels are provided with continuous grooves and the insulation panels are connected to the supporting surface in such a manner during step A that continuous grooves of adjacent insulation panels are in line, the fixing means are connected to the connecting legs of the brackets in such a manner during step B that the fixing means will extend directly above the continuous grooves without extending into said grooves. Thus, a certain adjusting space can be created on the side of the fixing means that faces the insulation panel, which space will not be necessarily utilised in practice but which can nevertheless make it advantageous to use continuous grooves in the insulation panels, for example having a depth of 2 cm, so as to thus reduce the overall depth.

**[0013]** Good ventilation of the fixing means, which is important, in particular if wooden laths are used as the fixing means, can be obtained if the fixing means are at least substantially clear of the walls of the grooves.

**[0014]** Preferably, the minimum spacing between walls

of the grooves and the fixing means, insofar as the latter extend into the grooves, at least along the larger part of the length of the fixing means, ranges between 1 mm and 10 mm. Good ventilation is not possible below the lower limit of 1 mm, whilst above the upper limit of 10 mm the dimensions of the grooves are larger than necessary for a good ventilation, so that the insulation panel must be made thicker in order to realise the required insulation values.

**[0015]** A quick and correctly aligned connection of the fixing means to the brackets is made possible in particular if, in preparation of step B, the fixing means are clamped in a continuous groove prior to step B. Such clamping can be obtained advantageously if the grooves are provided with clamping projections on opposite sides of the grooves and the fixing means are clamped between the clamping projections prior to step B. The spacing between the clamping projections and the fixing means locally equals 0 cm at the location of the clamping projections, of course.

**[0016]** The cladding that can be installed by means of the method according to the invention may also be in the form of a strip-shaped material. Depending on the orientation in which the strip-shaped cladding material is to be installed, it may be advantageous if elongated further fixing means oriented parallel to each other are connected to the fixing means on the side of the fixing means remote from the supporting surface between step B and step C, wherein the further fixing means are oriented at least substantially perpendicular to the fixing means and wherein the dry wall cladding is fixed to said further fixing means during step C. The invention does not require a direct connection of the cladding to the fixing elements, therefore, but the connection between the fixing means and the cladding may also be realised indirectly, for example via the aforesaid further fixing means.

**[0017]** The method according to the invention can be used advantageously in particular if the supporting surface forms the inner leaf of a building and the cladding forms the outer leaf of the building. Alternative uses are also conceivable, however, for example cladding an overhanging part of a building on the bottom side thereof.

**[0018]** The method according to the invention can furthermore be used advantageously if the supporting surface consists of a stone-like material.

**[0019]** According to a second aspect of the invention, there is provided an insulation panel as described above, more specifically for use in a method wherein the foam-like insulation panels are already provided with the brackets upon fixation of the insulation panels to the supporting surface according to step A. The insulation panel according to the invention comprises a first panel surface and a second panel surface opposite the first panel surface, wherein the insulation panel is provided with at least one bracket on the side of the first panel surface, each bracket comprising at least one outwardly directed connecting leg oriented at least substantially perpendicular to the first panel surface. By fitting insulation panels with a

bracket as described above, connecting the bracket to the insulation panel can take place in an efficient manner in a production environment rather than at a building location, i.e. "in situ".

**[0020]** The above advantage in particular, but not exclusively, applies if the insulation panel is provided with a number of aligned brackets on the side of the first panel surface. After all, in practice the alignment of the brackets can take place more quickly and also more precisely in a production environment than at a building location.

**[0021]** A solid connection between the bracket and an elongate fixing means, such as a wooden lath or a metal section, can be realised in a simple manner if each bracket comprises two spaced-apart connecting legs for accommodating at least part of an elongated fixing means therebetween. Such a bracket will also be better capable of absorbing the bending moment resulting from the weight of the cladding.

**[0022]** Positioning an elongated fixing means between the two connecting legs before connecting the elongated fixing means to the two connecting legs will be easier if the two connecting legs include an angle of 1 - 20 degrees with each other.

**[0023]** A constructionally advantageous embodiment is obtained if the brackets are U-shaped, or at least comprise a U-shaped part, and the two spaced-apart connecting legs in part define the U-shape.

**[0024]** For connecting an elongated fixing means to the at least one connecting leg it is preferable if at least one round mounting hole is provided in the at least one connecting leg. Through such a fixing role a screw can be inserted, for example.

**[0025]** In order to make easy alignment of the elongated fixing means possible, it is advantageous if a number of round mounting holes are provided in the at least one connecting leg at various transverse positions of the insulation panel. The term "transverse direction" is to be understood to mean the cross direction or, in other words, the thickness direction, of the insulation panel.

**[0026]** In another preferred embodiment, at least one slotted hole extending at least partially in transverse direction is provided in the at least one connecting leg. Such a slotted hole could be used advantageously, for example, for pre-positioning an elongated fixing means before definitively connecting the same to the connecting leg.

**[0027]** If the at least one bracket has a surface which is oriented parallel to the first panel surface, in which surface at least one further mounting hole is provided, said further mounting hole can be utilised very usefully for connecting the insulation panel to the supporting surface therethrough, using an elongated connecting means, such as a hammer plug, as a result of which the connection between the insulation panel and the brackets is moreover strengthened.

**[0028]** Providing the insulation panel with at least one recess on the side of the first panel surface, at the location of which recess the at least one bracket is provided,

achieves that the bracket can be slightly recessed in the insulation panel. This has a positive effect on the overall depth. The loss of insulation value for the insulation panel resulting from the presence of the recess can be compensated by making the insulation panel slightly thicker. The extent to which the insulation panel must be made thicker will usually be smaller in practice than the extent to which the bracket is recessed. Thus a net decrease of the overall depth of the combination of the insulation panel and the associated bracket(s) is realised in this preferred embodiment.

**[0029]** It is advantageous if the at least one connecting leg, insofar as it extends within the recess, is clear of material of the insulation panel on two opposite sides of the connecting leg for positioning a fixing means on one side of the connecting leg and connecting the fixing means to the connecting leg via the opposite side of the connecting leg. This can be realised, for example, if the at least one recess has a bottom and the recess widens, seen in cross-sectional view, from the bottom to the side of the first panel surface. Said widening can be very usefully utilised in practice for keeping some space open on the side of the connecting leg remote from an elongate fixing means for fitting connecting means such as screws from that side for fastening the elongate fixing means to the connecting leg. The recess may comprise at least one sloping flank or a curved flank, for example, for realising the aforesaid widening.

**[0030]** According to another preferred embodiment, the material of which the insulation panel in the direct vicinity of the at least one bracket, i.e. in the direct vicinity of the at least one recess in the case of a recess as described above for a preferred embodiment, is made may be different from the material of which the insulation panel outside said direct vicinity is made. The difference may concern the colour of the material, for example. With a view to cutting an insulation panel to size or, in general, working the insulation panel it is thus possible to indicate visually in which areas any "hidden" parts of the bracket in question extend. Furthermore it is possible to select a higher insulation value for the material of the insulation panel in the direct vicinity of the bracket so as to compensate for the reduced thickness.

**[0031]** In particular if a recess as described above for a preferred embodiment is used, it may also be very advantageous, precisely because of the reduced thickness of the insulation panel at the location of the recess and because of the fact that the load of the cladding is transmitted via the brackets, if the material of which the insulation panel in the direct vicinity of the at least one bracket/recess is made has a higher compression strength than the material of which the insulation panel outside said direct vicinity is made.

**[0032]** To limit the overall depth it may also be very advantageous if the insulation panel is provided with at least one continuous groove on the side of the first panel surface for accommodating an elongated fixing means at least partially, preferably only partially, therein. The

fixing means may thus be entirely or partially recessed in the insulation panel. In the latter case, in which part of the fixing means extends on the outer side of the first panel surface, therefore, a wall cavity can be realised in a simple manner between the cladding and the first panel surface of the insulation panel.

**[0033]** Preferably, the at least one recess forms part of the at least one continuous groove.

**[0034]** It is furthermore preferable in that regard if the at least one recess is deeper than the continuous groove. Thus it can be achieved that the space available seen in transverse cross-section for the elongated fixing means within the recess at least equals the space that is available for the fixing means in the groove, in spite of the presence of the bracket and of any connecting means, such as a hammer plug, by means of which the bracket is connected to the insulation panel and to the supporting surface.

**[0035]** If the continuous groove is provided with lateral projections on opposite sides, said lateral projections can be used for clampingly accommodating an elongated connecting means therebetween during the alignment of the connecting means and before the connecting means is definitively connected to at least one connecting leg of a bracket. Moreover, the lateral projections can help prevent the elongated connecting means, which will not always be or remain dead straight in practice, from coming into contact with a side wall of the groove. This would interfere with good ventilation around the connecting means, which is advantageous in particular if connecting means in the form of wooden laths are used, so that there will be a greater risk of an accelerated deterioration of the quality of the connecting means over time.

**[0036]** For comparable reasons as regards obtaining a good ventilation around the connecting means it may also be advantageous if the continuous groove is provided with a number of bottom projections in the bottom of the groove.

**[0037]** For production reasons it is preferable if the lateral projections or the bottom projections form an integral part of the insulation panel. Attaching the projections in question separately will not be necessary in that case.

**[0038]** In particular if a continuous groove and a recess as described above are used, it is preferable if the free end of the at least one connecting leg is located on the outer side of the first panel surface. In practice it has been found that it is possible in that case to obtain a satisfactory compromise between the aim to achieve a minimum overall depth and the aim to achieve a minimum material usage. Moreover, positioning connecting means at right angles for connecting fixing means to the connecting legs will be possible in that case.

**[0039]** Positioning insulation panels correctly against a supporting surface will be easier if the insulation panel is provided with at least one first connecting part and at least one second connecting part, respectively, on the circumferential sides of at least one pair of two opposite circumferential side, wherein, the position and the con-

figuration of first connecting parts and second connecting parts of adjacent insulation panels are adapted to suit each other upon use of the insulation panels so as to achieve a correct alignment of adjacent insulation panels with each other.

**[0040]** Preferably, a first connecting part and the second connecting part of adjacent insulation panels are designed for being snapped together. The snap connection provides a certain extent of mutual fixation of adjacent insulation panels, which makes it easier to fix the insulation panels correctly to a supporting surface.

**[0041]** In particular if the insulation panel is provided with continuous grooves it is advantageous if the first connecting part and the second connecting part are designed to prevent the two associated insulation panels from shifting relative to each other in the longitudinal direction of the boundary surface in a snapped-together position of the first connecting part and the second connecting part. Thus it is readily possible to align the continuous grooves of adjacent insulation panels with each other.

**[0042]** For constructional reasons it is preferable in that case if the first connecting part and the second connecting part associated with an insulation panel are provided at the opposite ends of a continuous groove.

**[0043]** In order to make it possible to connect the at least one bracket to the insulation panel, the at least one bracket is preferably provided with at least one connecting leg had extends into the material of the insulation panel. In principle it is thus not necessary to use separate connecting elements or connecting means for connecting the at least one bracket to the insulation panel.

**[0044]** With a view to achieving an optimally efficient production process it is advantageous if a connection is effected between the insulation panel and the at least one bracket during the production process of the insulation panel. A separate production step will not be needed in that case.

**[0045]** According to a third aspect of the invention, there is provided a method for producing an insulation panel according to the invention as described in the foregoing, more specifically a method for producing an insulation panel which comprises a connecting leg that extends into the material of the insulation panel. The method according to the invention comprises the steps of

K engaging means engaging the outwardly directed end of the at least one connecting leg of a bracket with engaging elements thereof,

L positioning means positioning the engaging means in such a manner that the at least one connecting part extends into a mould space,

M introducing plastic material into the mould space, N causing the plastic material inside the mould space to form into an insulation panel, wherein the at least one connecting part is at least partially surrounded by the formed plastic material for providing the insulation material with the bracket,

O removing the insulation panel provided with the bracket from the mould space.

The advantage of the method according to the invention is that during the production of the insulation panel a separate connecting step for effecting a connection between the bracket and the insulation panel is not needed after completion of the production of insulation panels.

[0046] The method according to the invention is quite suitable for use with insulation panels made on the basis of a foamable material. A preferred embodiment is therefore **characterised in that** the plastic material according to step M is a foamable material and in that causing the plastic material to form in accordance with step N comprises forming a foam of the foamable material. Examples of such materials include: PS, PPO, PUR, PIR, PET, EPP, EPE, PLA, EPS or combinations thereof. The aforesaid materials in particular comprise one or more additives for providing flame-retardant properties, for example graphite, carbon black, aluminium powder, Al(OH)<sub>3</sub>, Mg(OH)<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, iron, zinc, copper and alloys thereof. Special examples of flame retardants also include chromium compounds or bromated polymer compounds, in particular hexabromocyclododecane (HBCD) and/or bromated polystyrene compounds. So-called processing aids include polyphosphate compounds, diphenyl phosphonate, bisphenol A-bis(diphenyl phosphate) and resorcinol aromatic polyphosphate compounds or one or more of the aforesaid compounds.

[0047] Alternatively, the invention is also suitable for use with insulation panels made of the basis of another type of plastic material. The invention is in particular suitable for the processing of plastic material that hardens during the production of the plastic material, a process that is also referred to as curing. Accordingly, another preferred embodiment is **characterised in that** causing the plastic material to form according to step N concerns the curing of the plastic material. Such durable plastic materials are thermally cured to obtain a solid material, viz. through heating or radiation, for example actinic radiation, in particular electron beam radiation. Such curable materials are liquid and consequently they can be readily poured into moulds having "complex" shapes. After the mould cavity has been filled with the liquid plastic material, the bracket is placed in the liquid, whereupon curing of the material by means of the aforesaid method takes place.

[0048] An efficient method can be obtained if during step M the engaging elements define part of the shape of the mould space. Thus there is no need for separate means for closing an opening in the mould wall that is necessary for introducing the bracket into the mould space, but closing the opening in question can be done by means of the engaging elements.

[0049] In that situation the engaging elements can also function excellently for creating a recess in the first panel surface in accordance with an above-discussed preferred embodiment of an insulation panel according to

the invention. Within this framework it is preferable if the mould space is in part defined by two parallel mould wall parts for forming the first panel wall and the second panel wall respectively, of an insulation panel or at least part thereof against said wall parts, wherein the engaging elements extend within the space defined between the two parallel mould wall parts during step M for forming a recess side of the first panel wall at the location of the at least one bracket.

[0050] The bracket can be advantageously released by the engaging elements if the engaging elements that extend within the space defined between the two parallel wall parts are pivotable about respective pivot axes between an engaging position and the releasing position, and if the engaging elements have an arcuate circumference on the side where they define part of the mould space, with the pivot axes being located in the centre of such an arcuate shape.

[0051] The invention will be explained in more detail hereinafter with reference to embodiments - not to be interpreted as limitative to the invention - with reference being had to the following figures.

Figure 1 is an isometric view of the structure of an outside wall of a building;

Figure 2 is a perspective view of an insulation panel as used in figure 1;

Figure 3 is an isometric view of a bracket as used in the insulation panel shown in figure 2, which comprises four such brackets;

Figure 4 is a cross-sectional view of the insulation panel shown in figure 2;

Figure 5 is a detail view of figure 4;

Figure 6 is a top plan view of figure 5;

Figures 7a and 7b schematically show two unconnected insulation panels and two connected insulation panels positioned one on top of the other, respectively;

Figure 8 schematically shows two unconnected insulation panels positioned beside each other;

Figures 9a-9h schematically show in horizontal view successive stages during the production of an insulation panel according to the invention; and

Figures 10a and 10b show two successive stages during the production of an alternative insulation panel according to the invention.

[0052] Figure 1 shows an outside wall of a building with an inner leaf 1 in the form of a brick wall 1 and an outer leaf built up of strips 5. The brick wall 1 is a structural surface which is flat, at least substantially so, on the side facing the strips 5. The structural nature of the brick wall 1 implies that the load that acts on the outer leaf 5, for example due to the wind and also due to the weight of the strips 5, is deflected to the foundation of the building in question via the brick wall 1.

[0053] Present between the brick wall 1 and the strips 5 is an insulated supporting structure. Said supporting

structure comprises insulation panels 2, which are arranged in stretcher bond against the wall 1. The supporting structure further comprises evenly spaced horizontal wooden laths 3 and vertical wooden laths 4, which are likewise evenly spaced. The vertical laths 4 are connected to the horizontal laths 3 by connecting means such as screws or nails. The strips 5 are likewise connected to the vertical laths 4 by connecting means such as screws or nails. The horizontal laths 3 are in turn connected to the insulation panels 2 via brackets 15 (yet to be discussed).

**[0054]** Figure 2 is a more detailed view of an insulation panel 2. The insulation panel 2 is a rectangular in shape and has two opposite panel surfaces 11a, 11b (see also figures 4 and 5) and two pairs of opposite circumferential sides 12a, 12b and 13a, 13b. In the panel surface 11a, which faces the cladding 5 in installed condition, two continuous grooves 14 are provided in the longitudinal direction of the panel 2 at one quarter and three quarters of the width of the panel 2. Each of the grooves 14 has two opposite side walls 17 and a bottom 18. Lateral projections 31 are provided on the two opposite side walls 17 of the grooves 14, whilst bottom projections 32 are provided on the bottom 18 of the grooves 14.

**[0055]** Besides the two grooves 14, the insulation panel 2 is provided with four recesses 16, at the location of which the insulation panel 2 is provided with the aforesaid brackets 15. The recesses 16 and, accordingly, the brackets 15 are provided in a staggered pattern, with each of the grooves 14 crossing two recesses 16. The recesses 16 thus form part of the grooves 14, as it were. The recesses 16 are cup-shaped, at least substantially so, seen in cross-sectional view.

**[0056]** The insulation panel 2 comprises projecting edges 41, 51 on the circumferential sides 12a and 13a, respectively, and grooves 42 and 52 on the circumferential sides 12b and 13b, respectively (see also figure 8). As shown in figures 7a and 7b, the grooves 42 are provided with a slightly rounded recess in their corners (44), whilst the projecting edges 41 are slightly widened with a slight convexity at the location of their corners. The shapes and the dimensions of the projecting edges 41 and the grooves 42 (like those of the projecting edges 51 and the grooves 52) are adapted to suit each other, such that they can snap together. This is advantageous not only upon placement of the insulation panels, as will become apparent hereinafter, but also from the viewpoint of the insulating function of the insulation panels 2. Using the snap connection, adjacent insulation panels 2 can be fixed in place temporarily whilst a closed seam is created, so that the insulating effect of the insulation panels will be maintained also at the location of the seams between adjacent insulation panels.

**[0057]** As is clearly visible in particular in figures 2 and 8, the projecting edge 51 on the circumferential side 13a is interrupted at the location indicated at 53, in line with the grooves 14. At the opposite ends of the grooves 14, the grooves 52 on the contrary comprise a part which is

less recessed, at the location indicated at 54, so that adjacent insulation panels can slightly fit together at the location of the continuous grooves 14, preventing them from moving with respect to each other in a direction perpendicular to the longitudinal direction of the grooves 14. In this way a correct alignment of insulation panels 2 located adjacent to each other can be ensured.

**[0058]** Figure 3 shows one of the four brackets 15 with which the insulation panel 2 is provided. Each bracket 15 comprises a U-shaped part provided with two connecting legs 21 and a back part 22. The connecting legs 21 diverge slightly, for example at an angle of 10 degrees, so as to facilitate the placement therebetween of a lath 3, as will become clear hereinafter. Each of the connecting legs 21 comprises a number of round mounting holes 24, which are provided at different transverse positions, as well as slotted holes 25, which extend in transverse direction. The concept "transverse" as used within this context must be considered in relation to the form of the insulation panel 2. A mounting hole 26 is furthermore centrally provided in the back part 22 (see figure 6). The bracket 15 also comprises four connecting legs 23. It can be readily appreciated that the bracket 15 can be formed of a flat plate in a relatively simple manner by making four cuts and bending over the connecting legs 21.

**[0059]** The brackets 15 are locally provided with a recess 16, such that the U-shape of the bracket is in line with the associated groove 14. The bottom of the recess 16 lies deeper than the bottom 18 of the groove 14, so that the back part 22 is located below the level of the bottom 18 of the groove 14.

**[0060]** As is also shown in figure 5, the recess 16 has sloping flanks 19 on the outer sides of the connecting legs 21, which flanks are comparatively slightly arcuate in shape. Thus, space is available for screwing (or hammering) connecting means, such as screws or nails, from the outer side of the connecting legs 21, via one or a number of the holes 24, 25, into a lath or the like that is positioned between two connecting legs 21 of a bracket 15. The connecting legs 23 extend into the material of the insulation panel 2, as is clearly shown in particular in figure 5. Thus a connection exists between the bracket 15 in question and the insulation panel 2. The manner in which insulation panels 2 provided with such brackets 15 can be produced will be explained yet with reference to figures 9a et seq.

**[0061]** The cladding 5 is fixed to the wall 1 as follows. Insulation panels 2 are placed against the wall 1, in such a manner that the panel surface 11a faces away from the wall 1 and the grooves 14 extend horizontally. Then the insulation panels 2 are fixed to the wall 1 by means of hammer plugs, which are hammered through the mounting holes 26 into the wall 1 via the material of the insulation panel 2. To that end holes are of course pre-drilled in the insulation panel 2 and the wall 1 via the mounting holes 26. The insulation panels 2 are thus fixed to the wall row by row, with the adjacent insulation panels 2 being correctly positioned relative to each other by

means of the snap connection as described in the foregoing before fixation takes place. The grooves 14 of rows of insulation panels 2 arranged above each other are spaced an equal distance apart, for example a distance of 30 cm or 60 cm.

**[0062]** As a next step, the horizontal laths 3 are placed into the grooves 14 and between the connecting legs 21 of the associated brackets 15. The dimensions of the laths 3 are adapted to those of the lateral projections 31, so that the laths 3 can be clamped therebetween. This significantly simplifies the alignment of the laths 3. Such alignment may be necessary, for example because the wall 1 is not completely flat or because laths 3 are not quite straight. Alignment is important in order to ensure that eventually the cladding 5 is flat over the entire surface of the wall 1. In case the lateral projections 31 should provide insufficient clamping force, it will also be possible to effect a provisional connection between the brackets 15 and the lath 3 by turning a screw into the lath 3 via the slotted hole 25, so that alignment perpendicular to the wall 1 remains possible. Once the laths 3, which may extend over several insulation panels 2, are correctly aligned, the laths 3 are definitively connected to the brackets 15 and thus to the insulation panel 2 by turning screws into the laths 3 via the mounting holes 24. The bottom projections 32 function as stop members in that case so as to ensure that the laths 3 will remain clear of the bottom 18 of the grooves 14. The lateral projections 31 have a comparable function, viz. to prevent the laths 3 from coming into contact with the side walls 17. Thus, ventilation around the laths 3 is possible, which has an advantageous effect on the life of the laths 3. The height of the projections 31, 33 may be about 5 mm, for example.

**[0063]** After the grooves 4, or at least a necessary part thereof, have been provided with the laths 3 in the above-described manner, vertical laths 4 are screwed against the horizontal laths 3 at regular intervals. Finally, horizontally oriented cladding strips 5 are in turn fixed to the vertical laths 4, for example by means of screws or nails. The method as described in the foregoing can be carried out relatively quickly and yet precisely, possibly by one person.

**[0064]** Alternatively it is possible within the framework of the present invention to orient the cladding strips vertically and fix them directly to the horizontally oriented laths 3. In that case no use is made of laths 4, therefore. Furthermore it is alternatively also possible to fix the insulation panels 2 to the wall 1 in a position turned through 90 degrees, so that the grooves 4 and logically also the laths 3 will extend in vertical direction. In this way it becomes possible to fix horizontally oriented cladding strips 5 directly to the vertical laths 3. Thus it is not necessary within the framework of the invention to connect cladding made up of cladding strips 5 to laths such as the laths 3, which are connected to the brackets 15, via an additional layer of laths such as the laths 4.

**[0065]** Schematic figures 9a-9h show how an insulation panel 2 can be made. In these figures the insulation

panel 2 is shown in simplified form, viz. with only one recess 16, one bracket 15 and one groove 14, which is provided in the centre of the width of the insulation panel 2. For producing the same, use is made of a first mould part 61 and a second mould part 68. The first mould part 61 has a closed steam chamber 62 which is surrounded by, inter-alia, the mould wall 77. Furthermore, the first mould part 61 comprises a pulling part 63 that can move up and down relative to the steam chamber 62 as indicated by the double arrow 78. The pulling part 63 is tubular in shape and has four walls 64, which, like the mould wall 77, are porous to steam. The first mould part 61 further comprises upright mould walls 65, which determine the eventual circumference of the insulation panel 2. Because of the schematic nature of figures 9a-9h, the mould walls 65 are not shown to be provided with the grooves or edges that are needed for forming the above-described edges and grooves on/in the circumference of the insulation panel 2. The mould walls 65 may to that end also be provided with moving parts so as to make the final release of an insulation panel 2 possible.

**[0066]** The second mould part 68 likewise comprises a steam chamber 76 which is surrounded by, inter alia, a mould wall 66 that is porous to steam. The mould part 68 further comprises two clamping elements 70, which can pivot toward and away from each other about a pivot 69. Provided between the clamping elements 70 is a clamping block 72, which is provided with a sensor 73 on the side facing the first mould part 61. Each of the clamping elements 70 has an arcuate outer surface 71, a centre of which arcuate shape coincides with the pivot 69, and straight clamping surfaces 75 on the side facing the clamping block 72. Like the clamping block 72, the clamping elements 70 extend partially within a central opening that is provided in the mould wall 66. The shape of the circumferential edge of the central opening conforms to that of the arcuate outer surface 71 of the clamping elements 70, so that the size of the gap between the clamping elements 70 and the circumferential edge of the central opening in the mould walls 66 will remain constant upon pivoting of the clamping elements about the pivot 69. Preferably, said gap is as small as possible so as to prevent plastic material from escaping from the mould space 76 via the gap, as will become clear hereinafter.

**[0067]** The production of an insulation panel 2 can take place as follows: a bracket 15 is positioned straight above the clamping block 72 by means of a robot arm 74 (figure 9a) and subsequently moved in the direction of the clamping block 72, with the sensor 73 at some point signalling the presence of the bracket 15. The clamping block 72 has the shape of the space defined by the U-shaped part of the brackets 15. After the presence of the brackets 15 at the location of the clamping block 17 has been signalled by means of the sensor 73 (figure 9b), the clamping elements 17 will close by pivoting toward each other about the pivot 69 (figure 9c). In said closed position, the clamping surfaces 75 of the clamping elements 70 extend

parallel to the lateral surfaces of the clamping block 72, and the connecting legs 21 of the bracket 15 are clamped (at least for the larger part) between the respective clamping elements 70 and the clamping block 72 (figure 9c). The robot arm 74 disconnects from the bracket 15 and moves to pick up a new bracket 15. The mould part 61 then moves toward the mould part 68, so that a mould space 76 is formed. The mould space 76 is defined by the mould walls 77, 66 and 65, but also by a part of the curved sides 71 of the clamping elements 70 and a part of the bracket 15 (figure 9d). The mould part 76 extends over the entire thickness of the final insulation panel 2. Besides, the pulling part 63 is moved in the direction of the second mould part 68 relative to the first mould part 61. As a result, the walls 64 surround the direct vicinity of the bracket 15 within the mould space 76.

**[0068]** After the closed mould space 76 has been formed, a foamable plastic material, such as EPS, for example, is supplied to the mould space 76, as indicated by the arrows 81 and 82, by supply means not shown.

**[0069]** The properties of the plastic material being supplied as indicated by the arrow 82 to the mould space 76 inside the cylinder formed by the walls 64 are different, for example as regards colour or compression strength of the material after foaming thereof, from those of the plastic material being supplied as indicated by the arrows 81 to the mould space 76 on the outer side of the walls 64. Figure 9e shows the situation thus obtained.

**[0070]** Subsequently steam is added from the steam spaces 62 and 67 to the mould spaces 76 via the porous mould walls 66 and 77, as indicated by the arrows 83, causing the plastic material inside the mould spaces 76 to foam. Once the mould space 76 is completely filled with foamed material, the pulling part 63 is pulled up, so that the walls 64 are removed from the mould space 76. Due to the high temperature, the foamed material that was initially present within the walls 64 will bond to the plastic material that was initially present outside the walls 64 (figure 9f). It should be noted that in the foregoing mention has consistently been made of foaming by means of steam. In certain embodiments it is also possible, however, to use hot air or a combination of hot air and steam. However, the present invention is by no means limited to the use of steam as a heat source.

**[0071]** In one embodiment it is furthermore possible to use a plastic material that assumes a "solid" form upon being subjected to a thermal treatment or a radiation treatment. In such an embodiment a mould space is used into which the still liquid plastic material is first introduced, for example by pouring or via supply lines, whereupon the intended curing or hardening step is carried out.

**[0072]** In the embodiment in which the liquid or viscous mixture comprises a polyurethane (PUR) foam, polyol mixed with activators and other components, for example, is supplied via a supply line, with isocyanate being supplied via another supply line. The aforesaid flows, viz. the polyol mixture and isocyanate, come into contact with each other in the mould space, whereupon a homoge-

neous mixture is formed in the mould space, with the resulting chemical reaction turning the mixture into the intended foam. In a similar manner it is also possible to obtain a PIR (polyisocyanate) foam. Subsequently the mould part 61 moves away from the mould part 68 again (figure 9g), with an insulation panel 2 being formed from the plastic material that was initially present in the mould space 76. The material in question extends over the entire thickness of the insulation panel 2. Said insulation panel 2 is provided with the bracket 15 because the connecting legs 23 extend into the material of the insulation panel 2. Located in the direct vicinity of the bracket 15 is a zone 92 within which the foamed plastic material has different properties, for example a higher compression strength, than within the zone 93 that is located outside the zone 92.

**[0073]** After the clamping elements 70 have opened by pivoting away from the clamping block 72, the insulation panel 2 can be picked up by means of a manipulator 85. Because of the fact that the curved sides 71 of the clamping elements 70 have in part defined the mould space 76, a recess 16 having curved flanks 19 on the outer side of the connecting legs 21 (figure 9h) exists at the location of the bracket 15.

**[0074]** Figures 10a and 10b relate to a method for producing an alternative type of insulation panel 2', viz. an insulation panel which does not comprise a recess. In these figures the first mould part 61, or at least a mould part having a comparable function, is not shown. Figure 10a is comparable to figures 9d and 9e. The mould space 101 is closed, and according to the method the plastic material and also the steam are subsequently supplied. The clamp 15', whose connecting legs 23' include an angle with each other rather than being in line like the connecting legs 23, extend into the mould space 101. In figure 10a the two connecting legs 21 of the bracket 2' are clamped between the clamping elements 104, 105 of two respective pairs of clamping elements 104, 105 which are provided at the location of an opening 110 in the mould wall 102. The clamping elements 104, 105 form part of a composite clamping body 108, which also comprises a guide 107 along which the clamping elements 104, 105 can slide toward and away from each other. Centrally provided in the mould wall 102 is a clamping block 109 with a sensor 103. The clamping block 109 has sloping sliding flanks 111, whilst the circumference of the central opening also has sloping sliding flanks 112, at least in part. Pairs of sliding flanks 111, 112 located on one side of the clamping block 109 define a V shape whose point is directed toward the mould space 101. The clamping elements 104, 105 of a pair of clamping elements tend to move away from each other under the influence of spring action (not shown). By moving the clamping body 108 in the direction indicated by the arrow 112 with respect to the mould wall 102, starting from the situation shown in figure 10a, a situation as shown in figure 10b is obtained. The ends of the clamping elements 104, 105 of the respective pairs have moved away from

each other along the guide 107. The clamping engagement of the connecting legs 21 by the clamping elements 104, 105 has thus been lost. By moving the clamping body in the direction opposite that of the arrow 112 with respect to the mould wall 102 after a new bracket 15' has been placed at the position shown in figures 10a again by means of a manipulator (not shown in figures 10a or 10b), such as a robot arm 74, and the sensor 103 has confirmed the presence of the new bracket 15', the new bracket 15' is clamped again for producing a next insulation panel 2'.

## Claims

1. A method for installing dry cladding on a flat structural surface, which method comprises the successive steps of

A effecting the fixation of foam-like insulation panels to a flat structural surface of a building, wherein aligned brackets are provided on the side of the insulation panels remote from the supporting surface, each bracket having at least one connecting leg that is directed outward, at least substantially perpendicular to the supporting surface,

B connecting fixing means oriented parallel to each other to the at least one connecting leg of the brackets,

C connecting the dry wall cladding to the fixing means on the side remote from the supporting surface.

2. A method according to claim 1, wherein the foam-like insulation panels are already provided with the brackets upon fixation of the insulation panels to the supporting surface according to step A.
3. A method according to claim 1 or 2, wherein the insulation panels are provided with continuous grooves and wherein the insulation panels are connected to the supporting surface in such a manner during step A that continuous grooves of adjacent insulation panels are in line, and wherein the fixing means are connected to the connecting legs of the brackets in such a manner during step B that the fixing means will extend at least partially into the continuous grooves.
4. A method according to any one of claims 1 - 3, wherein the insulation panels are provided with continuous grooves and wherein the insulation panels are connected to the supporting surface in such a manner during step A that continuous grooves of adjacent insulation panels are in line, and wherein the fixing means are connected to the connecting legs of the brackets in such a manner during step B that the

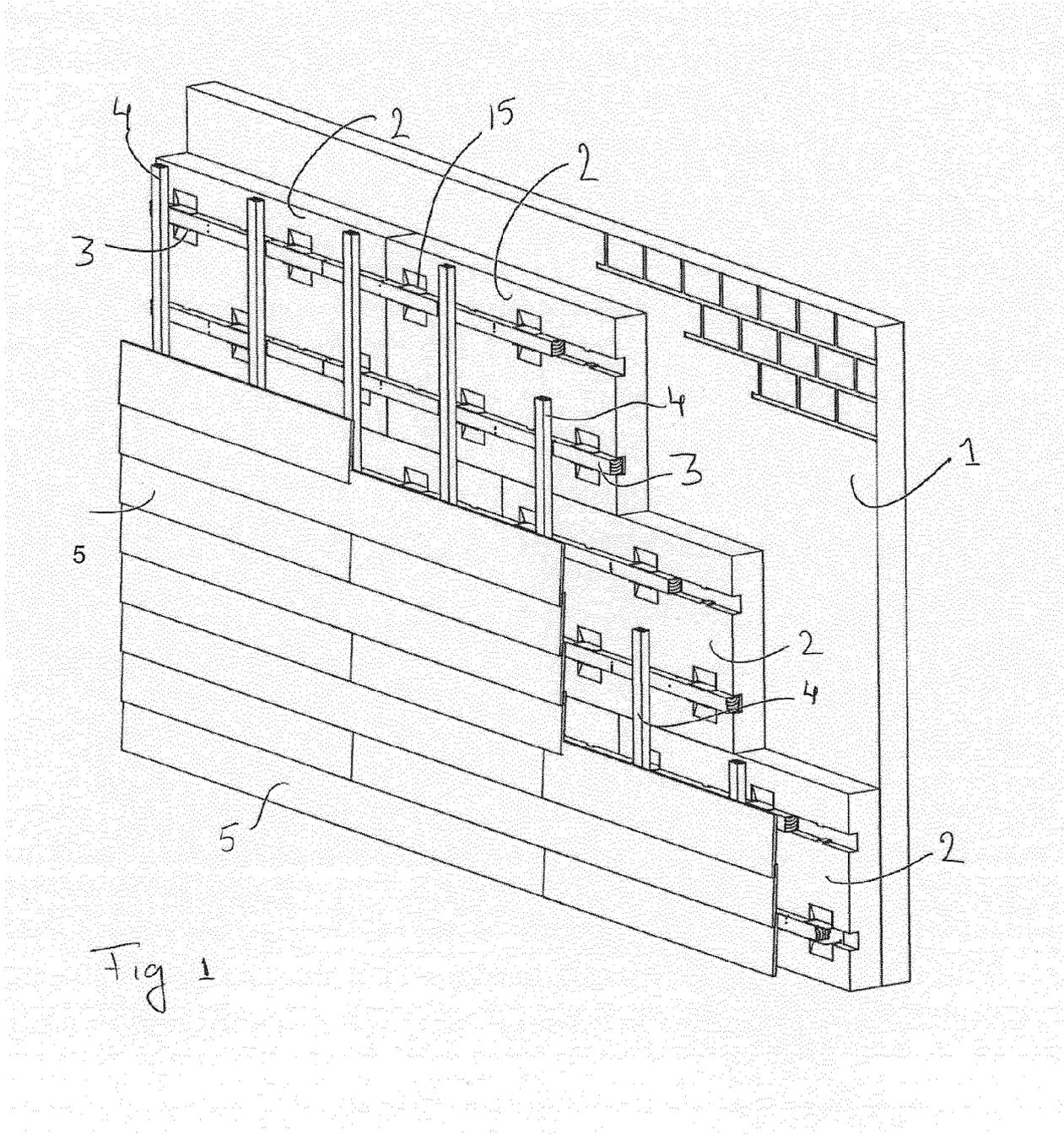
fixing means will extend directly above the continuous grooves without extending into said grooves, wherein preferably the fixing means will be at least substantially clear of the walls of the grooves after step B.

5. A method according to any one of the preceding claims, wherein the supporting surface, which preferably consists of a stone-like material, forms the inner leaf of a building and the cladding forms the outer leaf of the building.
6. An insulation panel for use in a method according to claim 2 or a claim dependent thereon, wherein the insulation panel comprises a first panel surface and a second panel surface located opposite the first panel surface, and wherein the insulation panel is provided with at least one bracket on the side of the first panel surface, each bracket comprising at least one outwardly directed connecting leg oriented at least substantially perpendicular to the first panel surface.
7. An insulation panel according to claim 6, wherein the insulation panel is provided with a number of aligned brackets on the side of the first panel surface.
8. An insulation panel according to claim 6 or 7, wherein each bracket comprises two spaced-apart connecting legs for accommodating at least part of an elongated fixing means therebetween.
9. An insulation panel according to claim 8, wherein the brackets are U-shaped or at least comprise a U-shaped part, and wherein the two spaced-apart connecting legs in part define the U-shape.
10. An insulation panel according to any one of claims 6 - 9, wherein the insulation panel is provided with at least one recess on the side of the first panel surface, at the location of which recess the at least one bracket is provided, wherein preferably the at least one connecting leg, insofar as it extends within the recess, is clear of material of the insulation panel on two opposite sides of the connecting leg for positioning a fixing means on one side of the connecting leg and connecting the fixing means to the connecting leg via the opposite side of the connecting leg.
11. An insulation panel according to any one of claims 6 - 10, wherein the material of which the insulation panel in the direct vicinity of the at least one bracket is made is different from the material of which the insulation panel outside said direct vicinity is made, preferably at least in that the material of which the insulation panel in the direct vicinity of the at least one bracket is made has a higher compression strength than the material of which the insulation

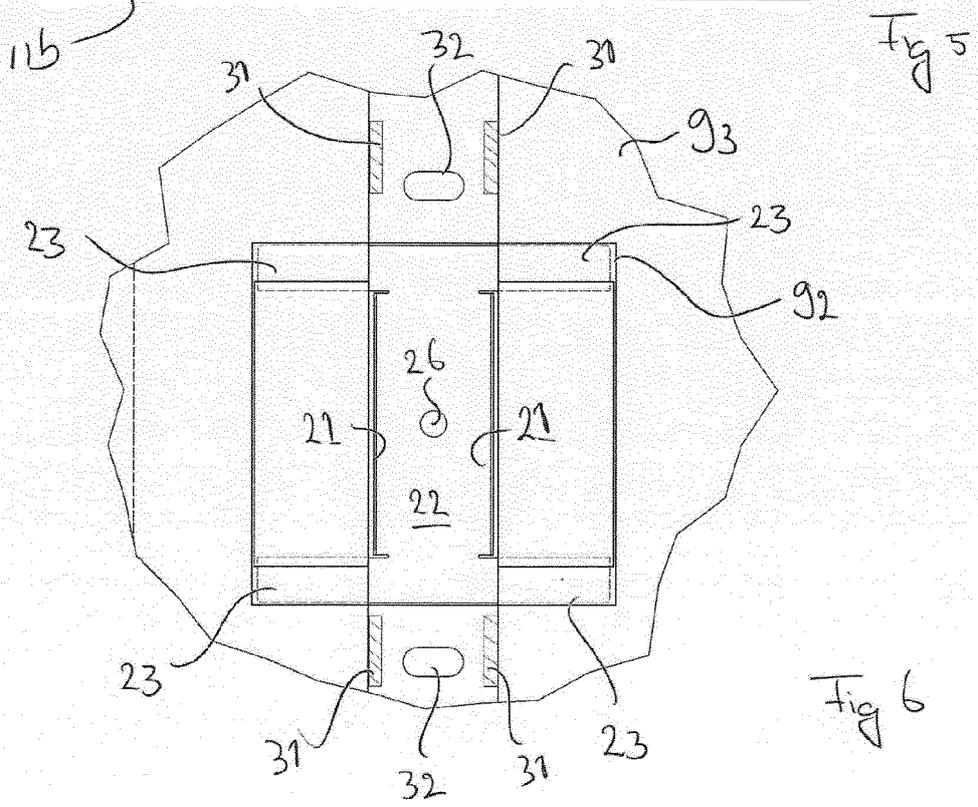
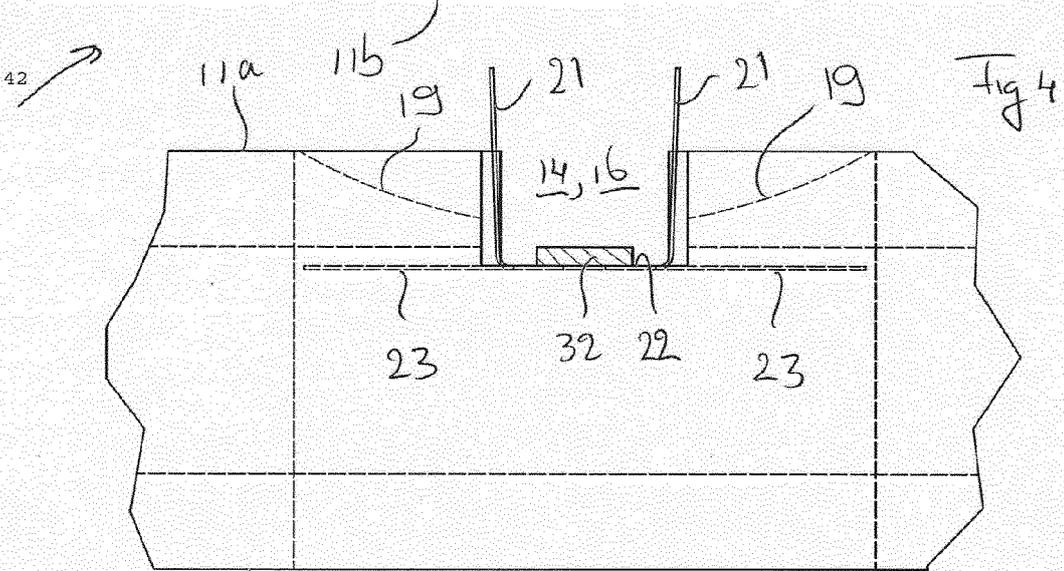
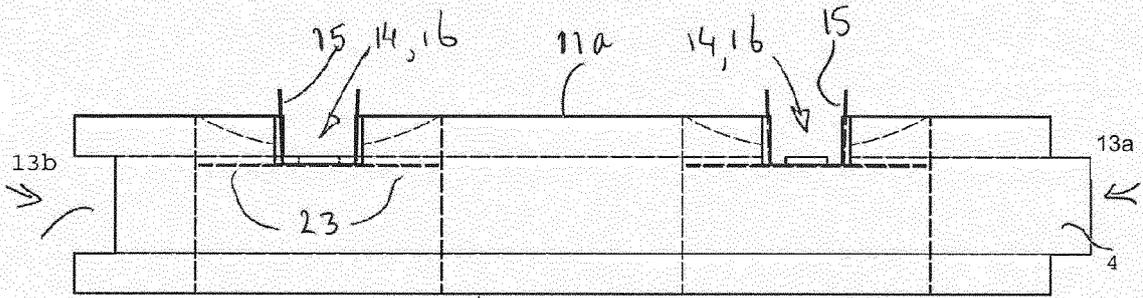
panel outside said direct vicinity is made.

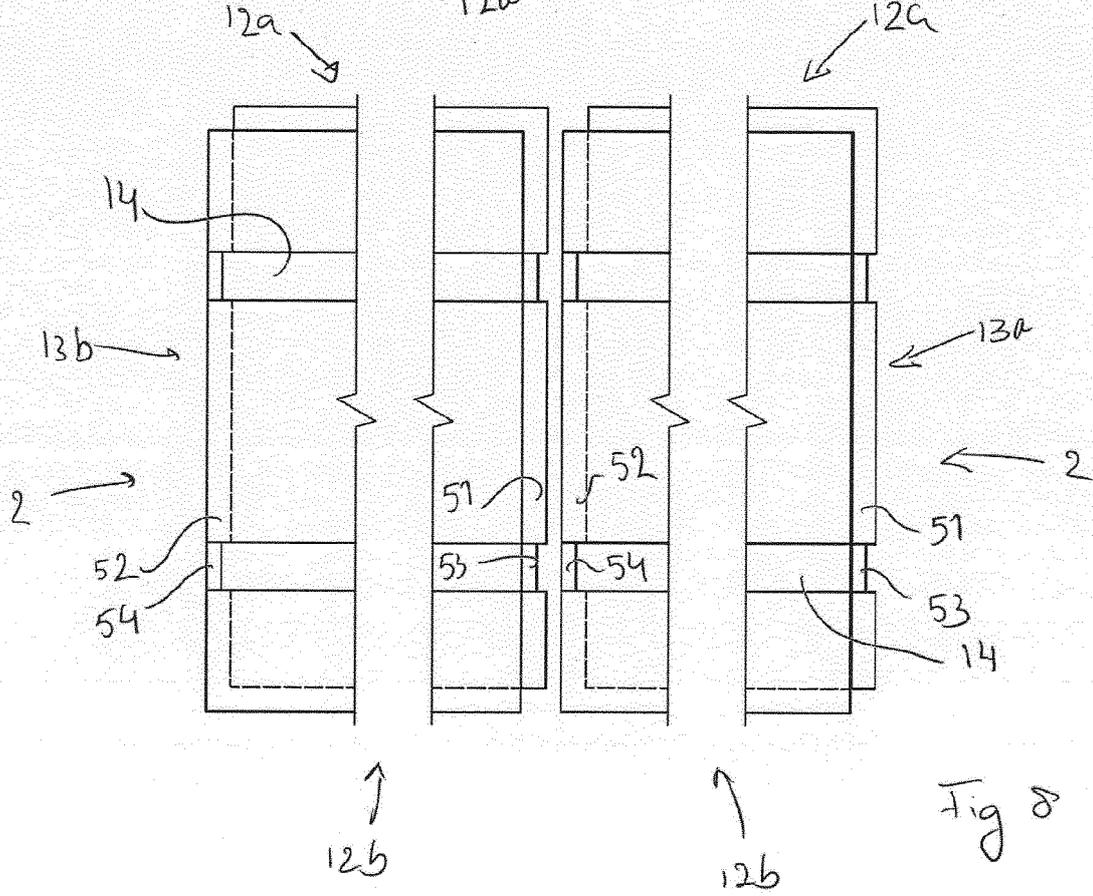
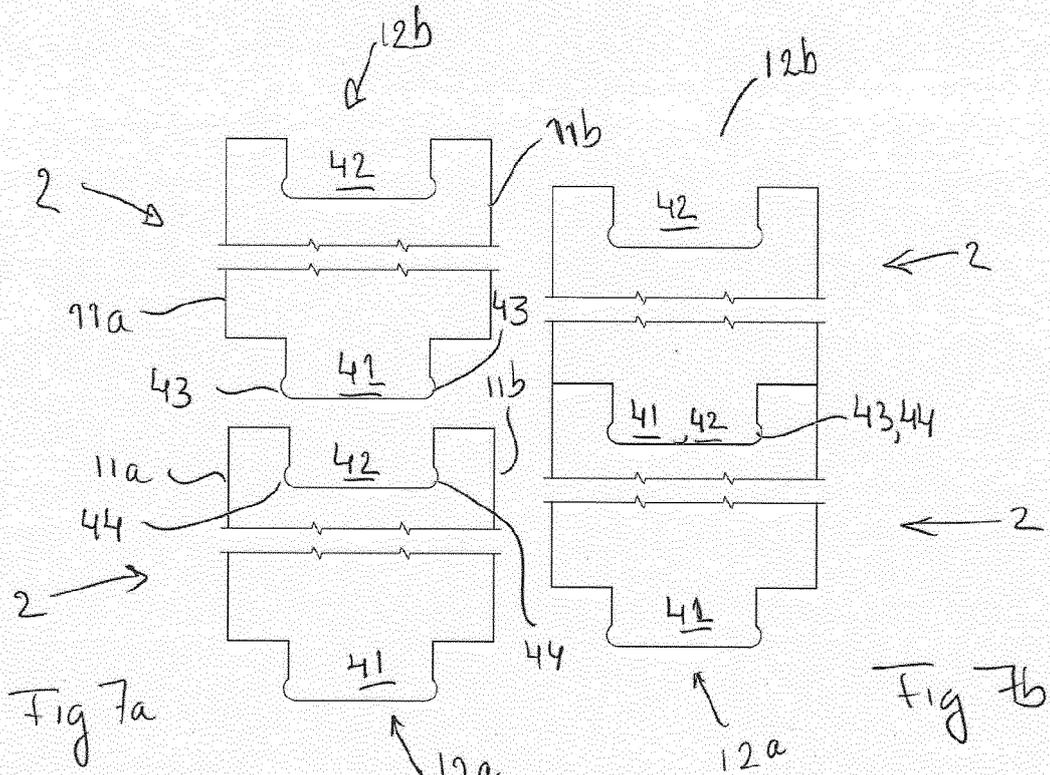
12. An insulation panel according to any one of claims 6 - 11, wherein the insulation panel is provided with at least one continuous groove on the side of the first panel surface for accommodating an elongated fixing means at least partially, preferably only partially, therein. 5
13. An insulation panel according to any one of claims 6 - 12, wherein the insulation panel is provided with at least one first connecting part and at least one second connecting part, respectively, on the two circumferential sides of at least one pair of two opposite circumferential sides, wherein the position and the configuration of first connecting parts and second connecting parts of adjacent insulation panels are adapted to suit each other in use of the insulation panels so as to achieve a correct alignment of adjacent insulation panels with each other, wherein a first connecting part and a second connecting part, respectively, of adjacent insulation panels are designed for being snapped together. 10  
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14. An insulation panel according to any one of claims 6 - 13, wherein the at least one bracket is provided with at least one connecting leg which extends into the material of the insulation panel, being connected therewith, which connection between the insulation panel and the at least one bracket has been effected during the production process. 25  
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15. A method for producing an insulation panel according to claim 14 or a claim dependent thereon, comprising the steps of 35
- K engaging means engaging the outwardly directed end of the at least one connecting leg of a bracket with engaging elements thereof, 40
- L positioning means positioning the engaging means in such a manner that the at least one connecting part extends into a mould space, 40
- M introducing plastic material into the mould space, 45
- N causing the plastic material inside the mould space to form into an insulation panel, wherein the at least one connecting part is at least partially surrounded by the formed plastic material for providing the insulation material with the bracket, 50
- O removing the insulation panel provided with the bracket from the mould space. 50

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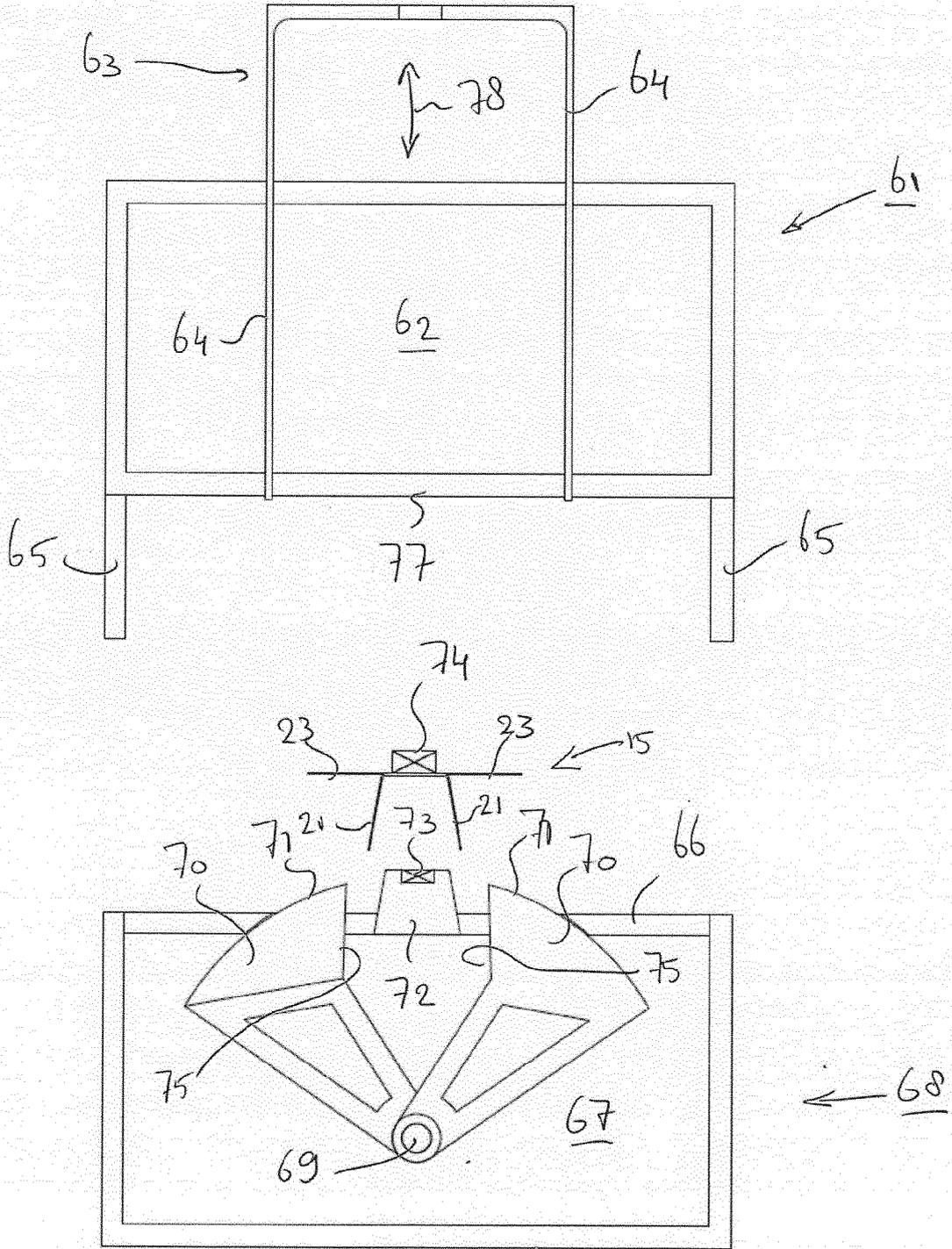


Fig 9a

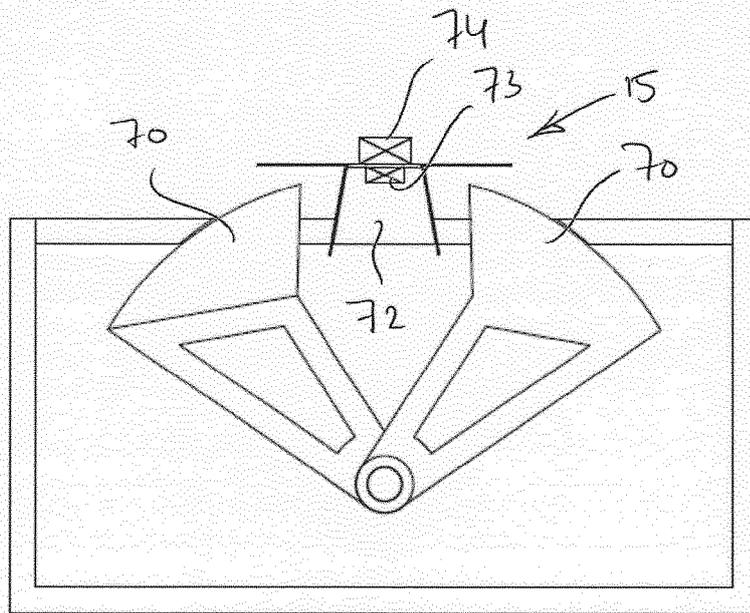
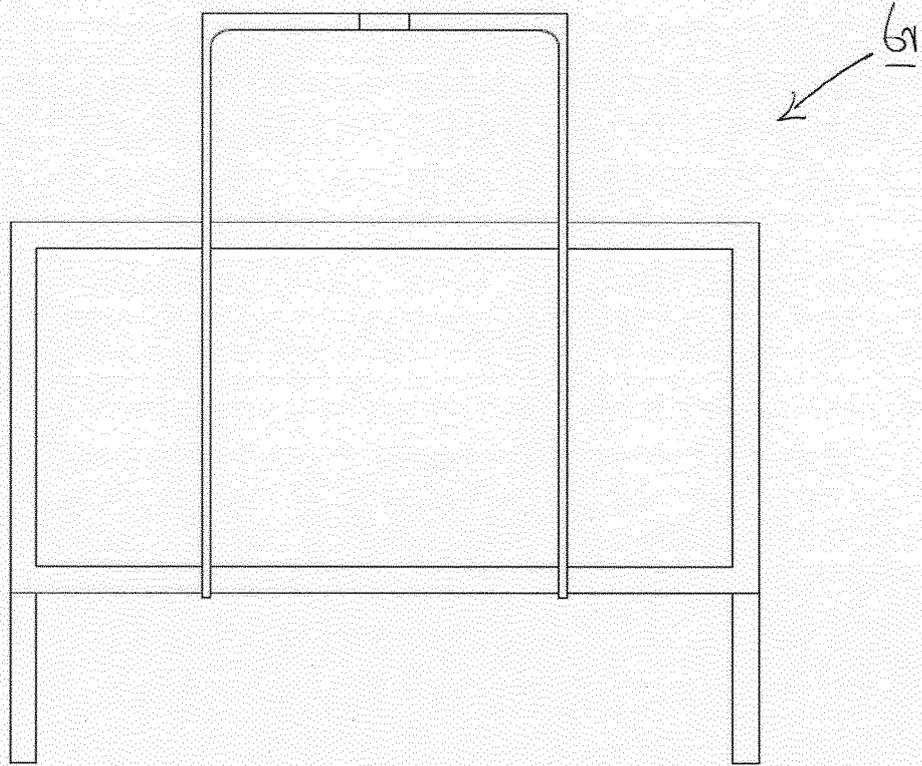


Fig 9b

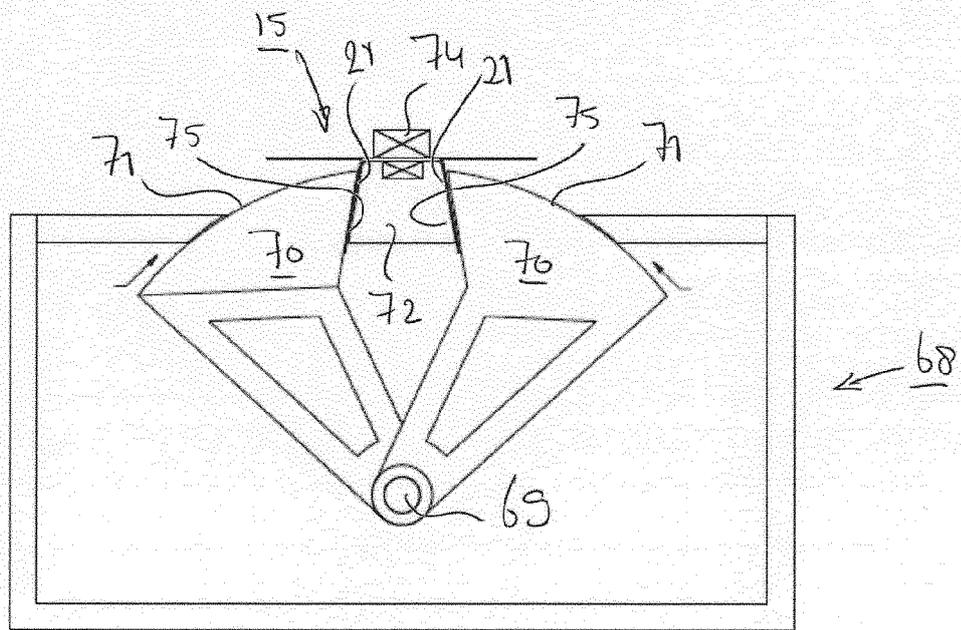
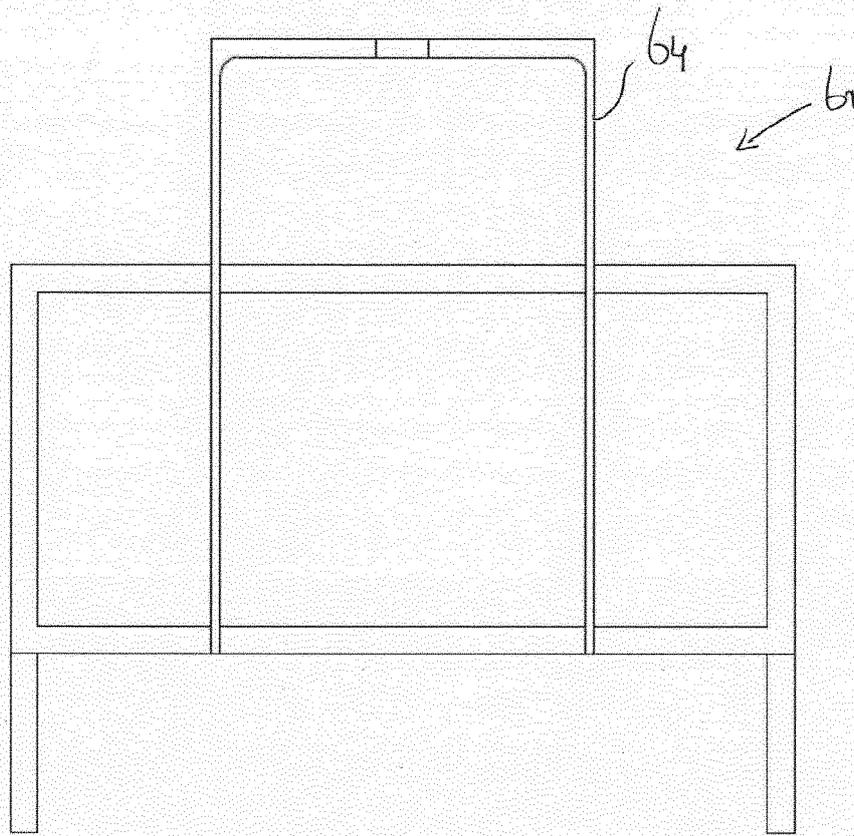


Fig 9c

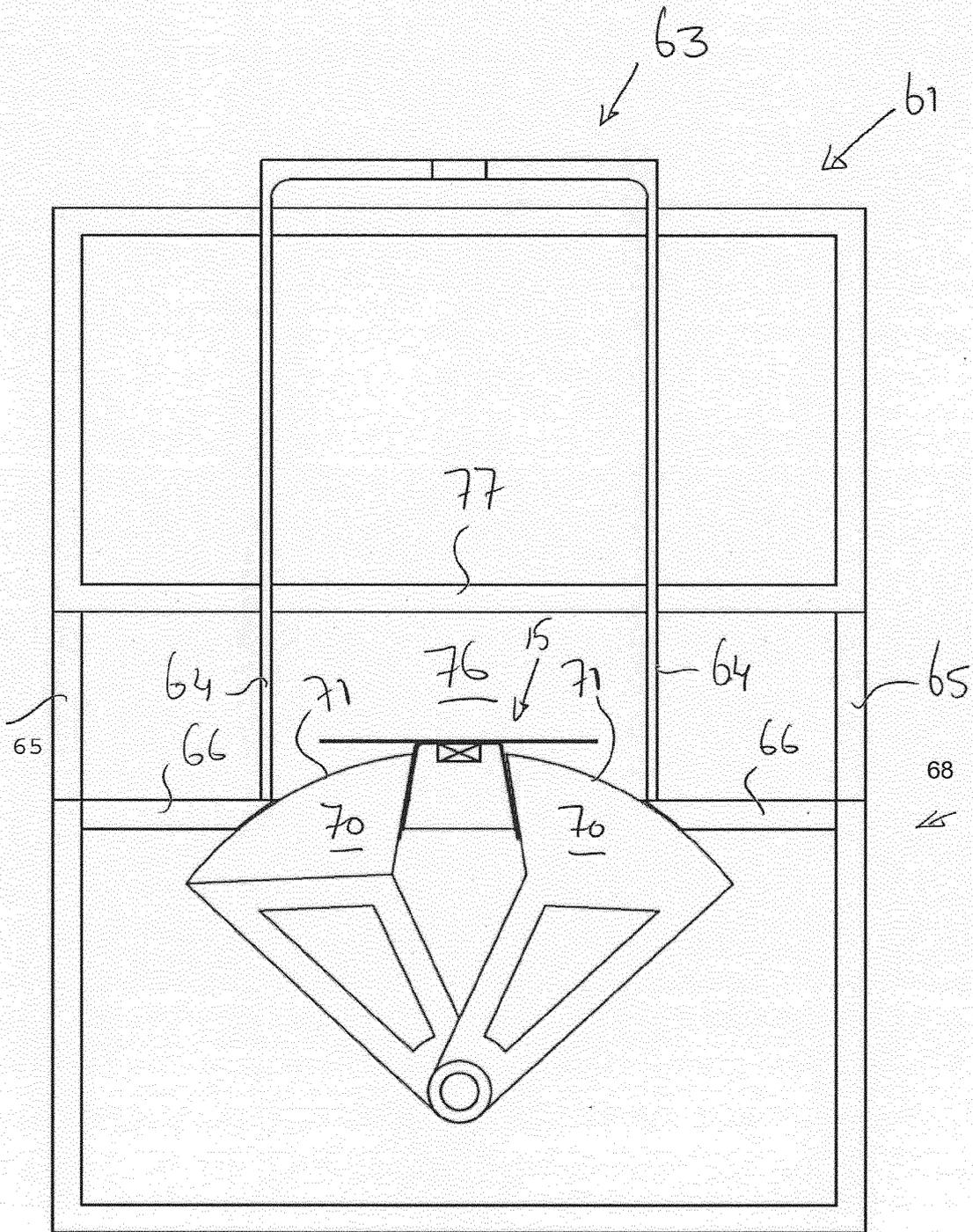
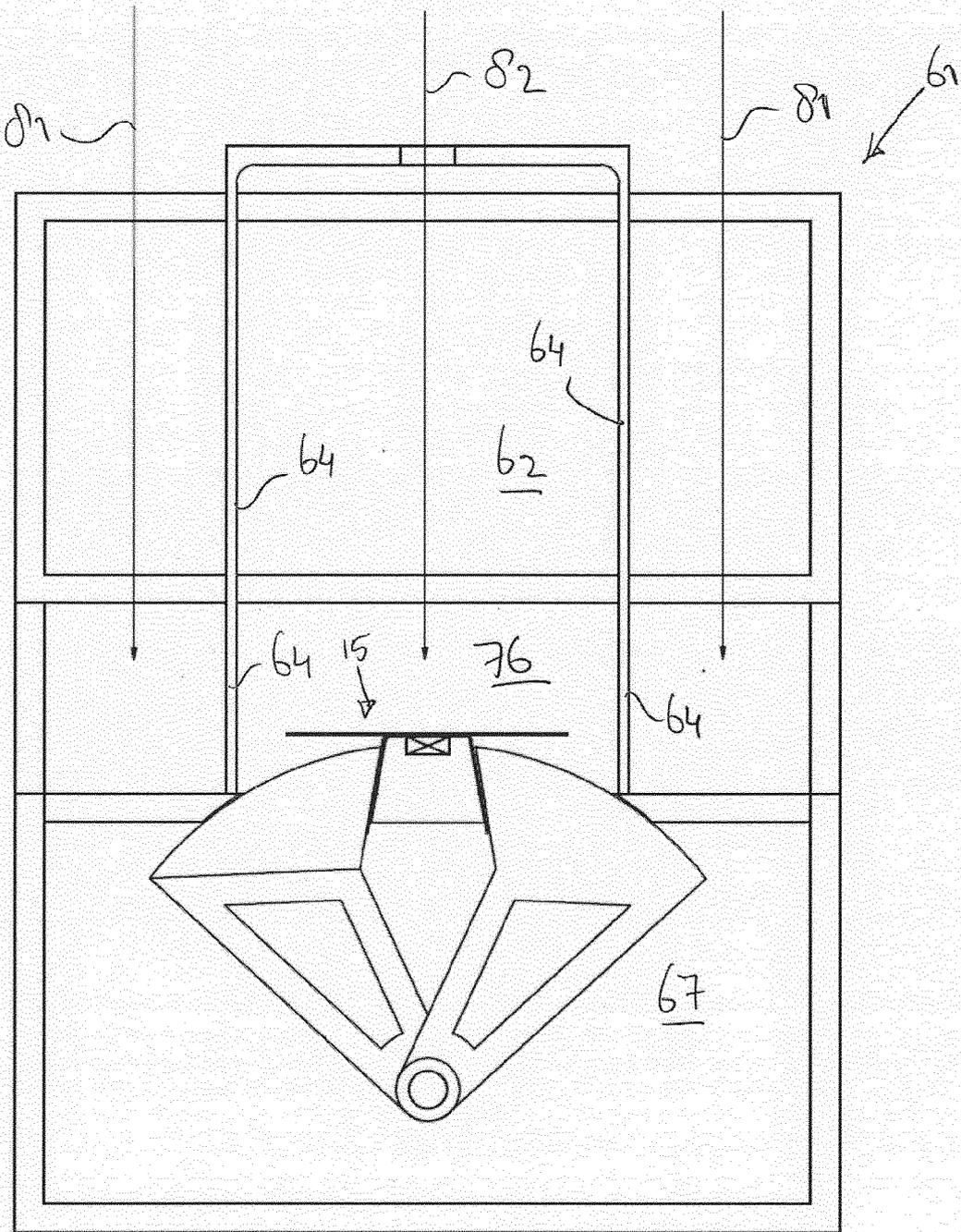


Fig 9d



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Fig 9e

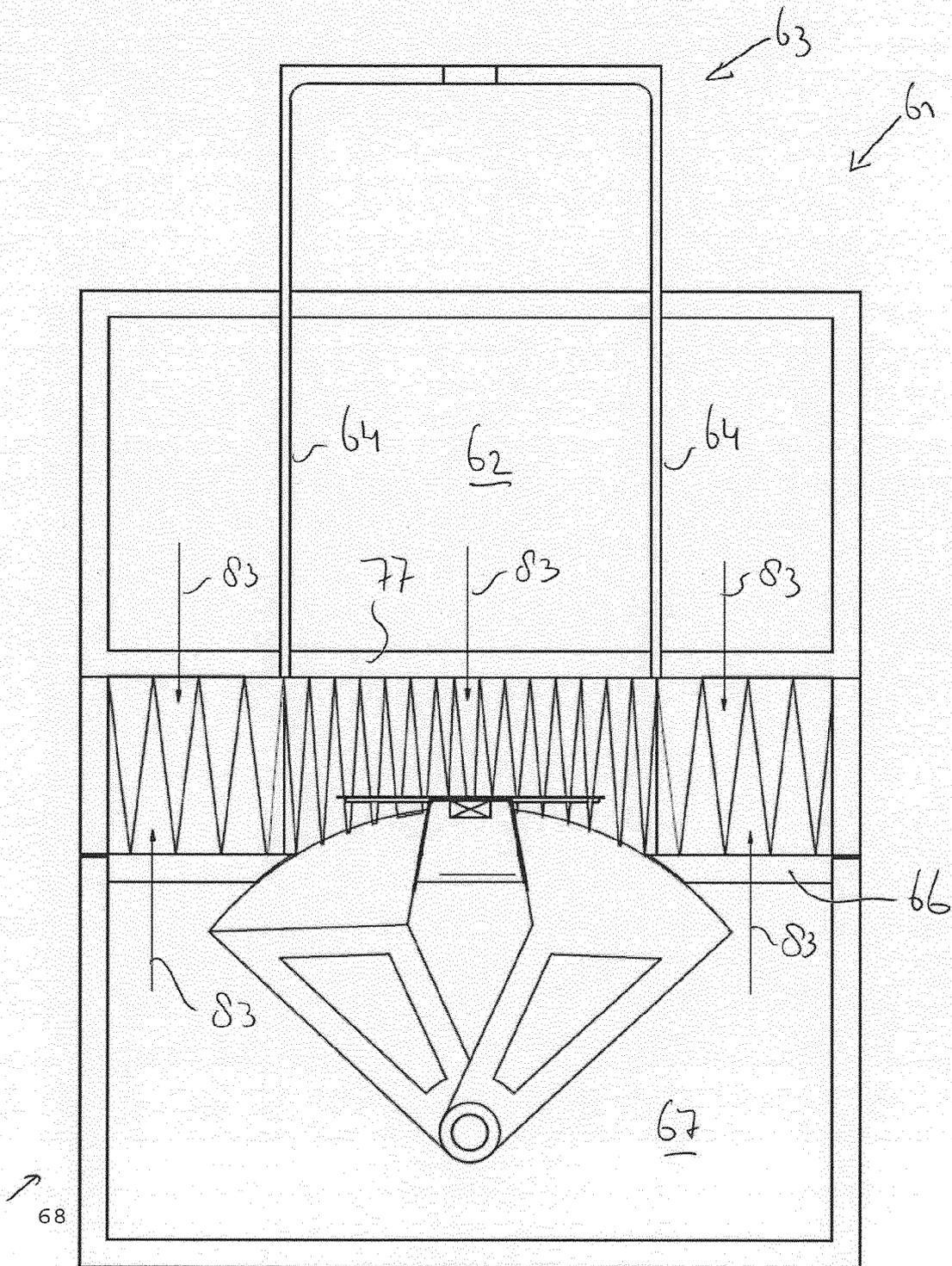
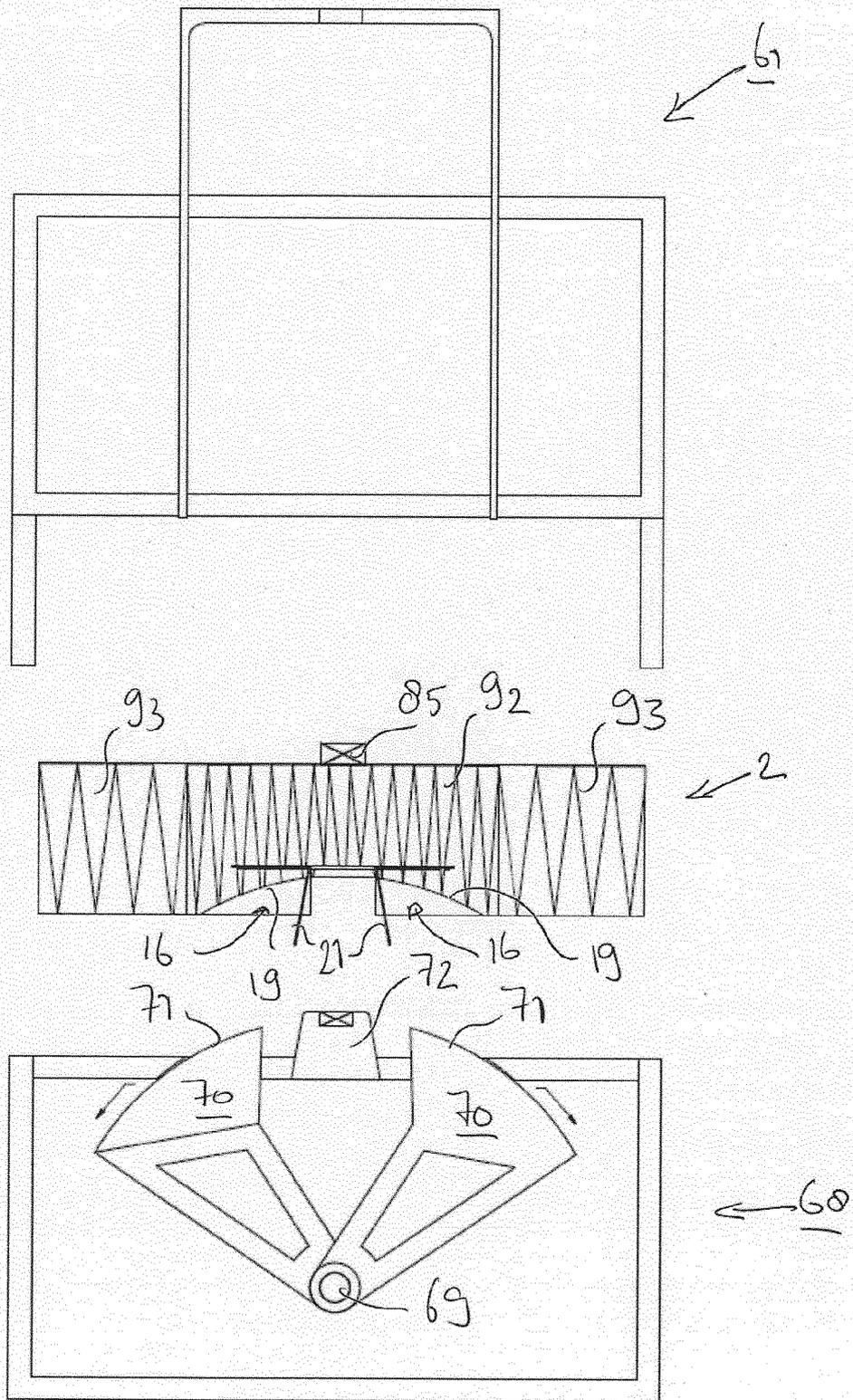


fig 9f





Fig<sub>9h</sub>

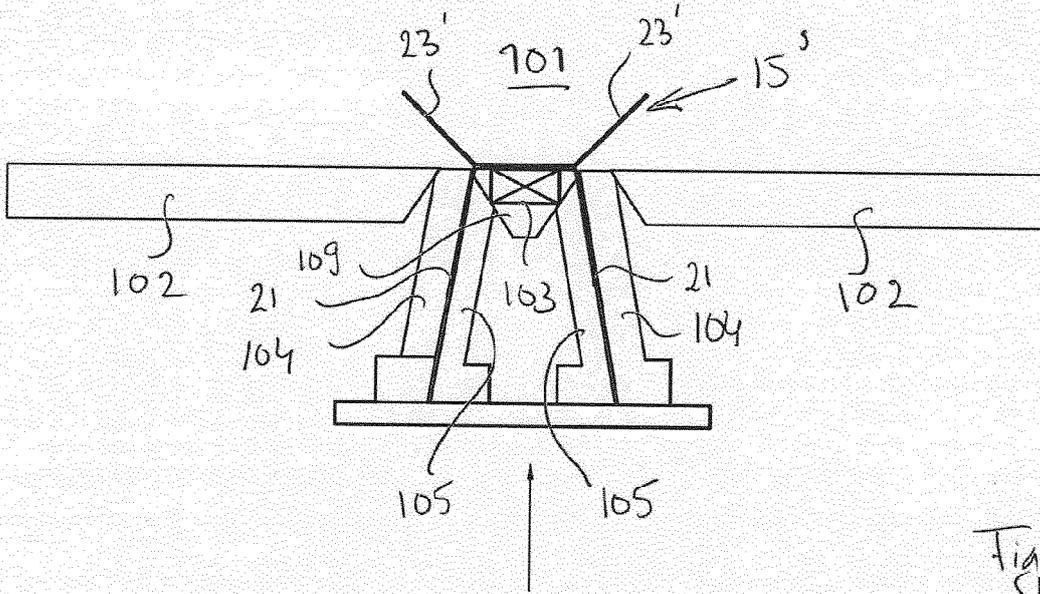


Fig 10a

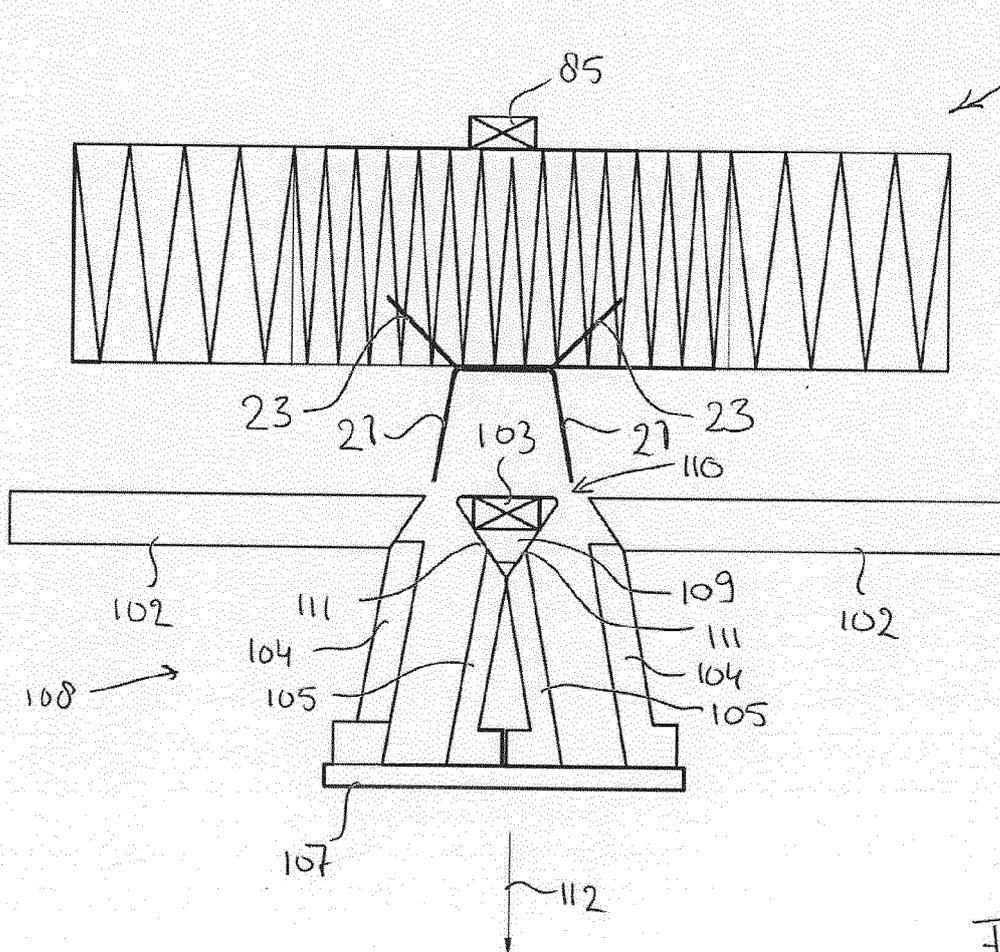


Fig 10b



EUROPEAN SEARCH REPORT

Application Number  
EP 13 18 3025

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	EP 1 983 126 A1 (ROCKWOOL INT [DK]) 22 October 2008 (2008-10-22)	1,6-9	INV. E04F13/075 E04F13/08 E04B1/76 E04F13/24	
Y	* paragraphs [0018], [0023] - [0034]; figures 1-5 *	3-5,11		
X	US 4 333 290 A (KOBBERSTEIN MICHAEL V) 8 June 1982 (1982-06-08)	1-10,12		
Y	* column 2, line 45 - column 4, line 39; figures 1-6 *	11,13		
X	EP 1 160 386 A1 (TRITTENBACH WILLY [CH] PITTSBURGH CORNING SCHWEIZ AG [CH]) 5 December 2001 (2001-12-05)	1,2,6-10		
Y	* paragraph [0018] - paragraph [0028]; figures 1b, 4a-4c *			
Y	DE 33 07 634 A1 (ISOPAG AG [LI]) 22 September 1983 (1983-09-22)	3-5,13		
X	US 2010/300012 A1 (BEAVERS JR JAMES L [US] ET AL) 2 December 2010 (2010-12-02)	6,14,15		TECHNICAL FIELDS SEARCHED (IPC)
A	* paragraph [0010]; figures 7,9, 10a *			E04F B29C E04B
A	EP 0 693 597 A1 (PLASTEDIL SA [CH]) 24 January 1996 (1996-01-24)	1-15		
A	* column 5, line 20 - column 14, line 2; figures 1-20 *			
A	US 5 058 345 A (MARTINEZ MANUEL J [US]) 22 October 1991 (1991-10-22)	1,6,14, 15		
	* column 4, line 31 - column 7, line 2; figures 3-6 *			
	----- -/--			
The present search report has been drawn up for all claims				
Place of search Munich		Date of completion of the search 10 December 2013	Examiner Khera, Daljit	
CATEGORY OF CITED DOCUMENTS		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		
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				

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EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number  
EP 13 18 3025

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 893 248 A (BELIVEAU JEAN-LOUIS [CA]) 13 April 1999 (1999-04-13) * column 2, line 54 - column 5, line 29; figures 1-2C *	6	
A	----- JP S57 134240 A (NIPPON KOKI KK) 19 August 1982 (1982-08-19) * the whole document *	6,15	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 December 2013	Examiner Khera, Daljit
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	

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EPO FORM 1503 03/02 (P04C01)

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

EP 13 18 3025

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  
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10-12-2013

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1983126	A1	22-10-2008	NONE	
-----				
US 4333290	A	08-06-1982	NONE	
-----				
EP 1160386	A1	05-12-2001	AT 333013 T EP 1160386 A1	15-08-2006 05-12-2001
-----				
DE 3307634	A1	22-09-1983	NONE	
-----				
US 2010300012	A1	02-12-2010	US 2010300012 A1 US 2012167507 A1	02-12-2010 05-07-2012
-----				
EP 0693597	A1	24-01-1996	AT 256798 T DE 69433423 D1 DE 69433423 T2 EP 0693597 A1	15-01-2004 29-01-2004 21-10-2004 24-01-1996
-----				
US 5058345	A	22-10-1991	NONE	
-----				
US 5893248	A	13-04-1999	NONE	
-----				
JP S57134240	A	19-08-1982	NONE	
-----				