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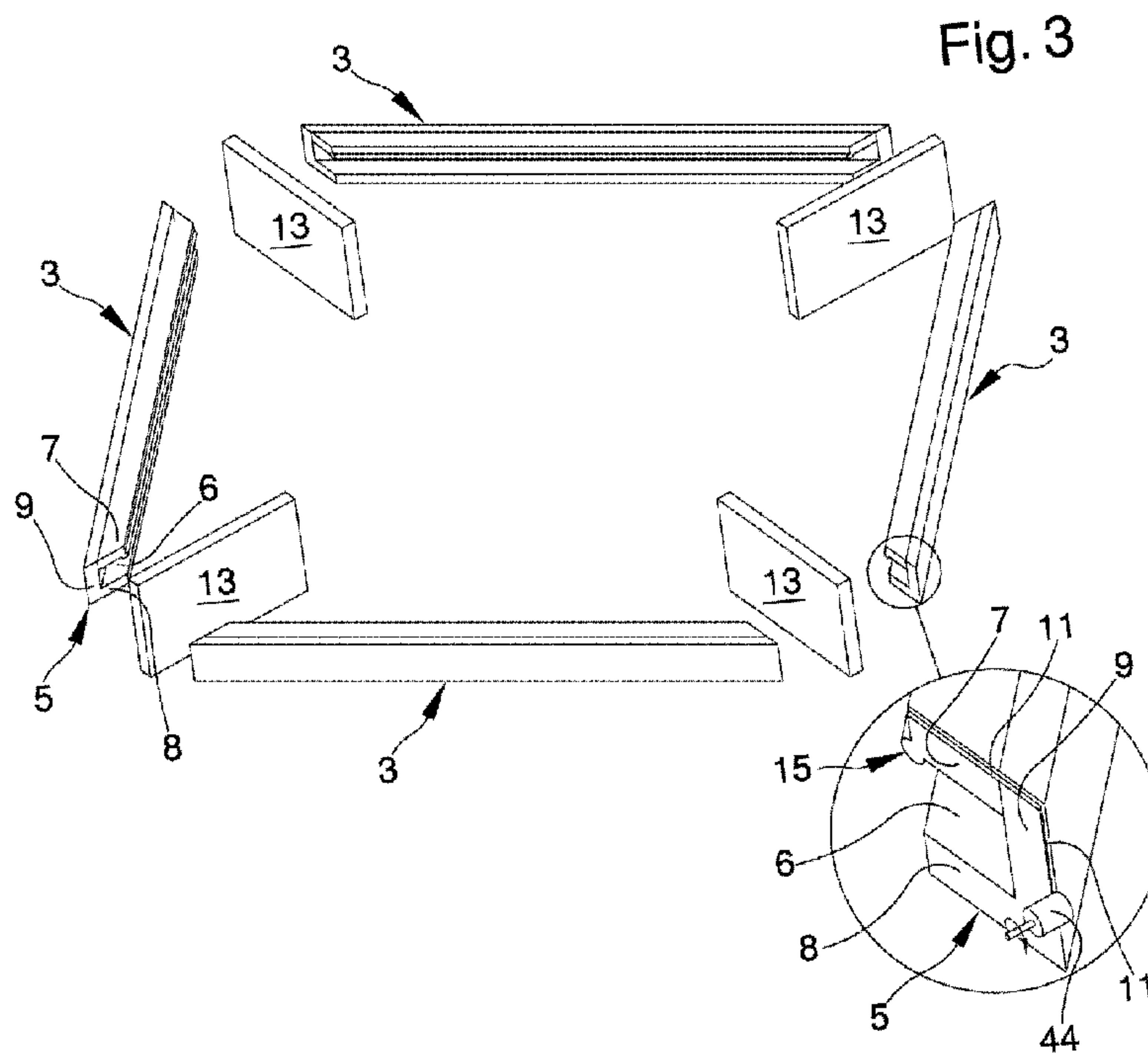
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(54) Titre : PROCÉDE ET SYSTÈME DE FABRICATION DE FENÊTRES/PORTES
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(57) **Abrégé/Abstract:**

A process for the manufacture of windows/ doors, characterized by the fact that it comprises the following steps: • - providing at least one inner panel for windows/doors; • - providing a plurality of plastic profiled elements (3) for windows/ doors, each of the profiled elements (3) comprising at least two areas to seal (5), coupleable to the areas to seal (5) of the other profiled elements (3), and at least one longitudinal slot (6), in which a respective perimeter side of the inner panel is insertable; • - performing a step of mechanical machining by chip removal on at least one of the areas to seal (5); • - heating the areas to seal (5); • - coupling the heated areas to seal (5) to one another by pressing the profiled elements (3) one against the other to maintain the areas to seal (5) in mutual contact and define the frame for windows/doors, the coupling taking place with the inner panel inserted in the longitudinal slots (6) to define a window/door which is composed by the frame and by the inner panel contained in the frame. A system for implementing this process is also disclosed.

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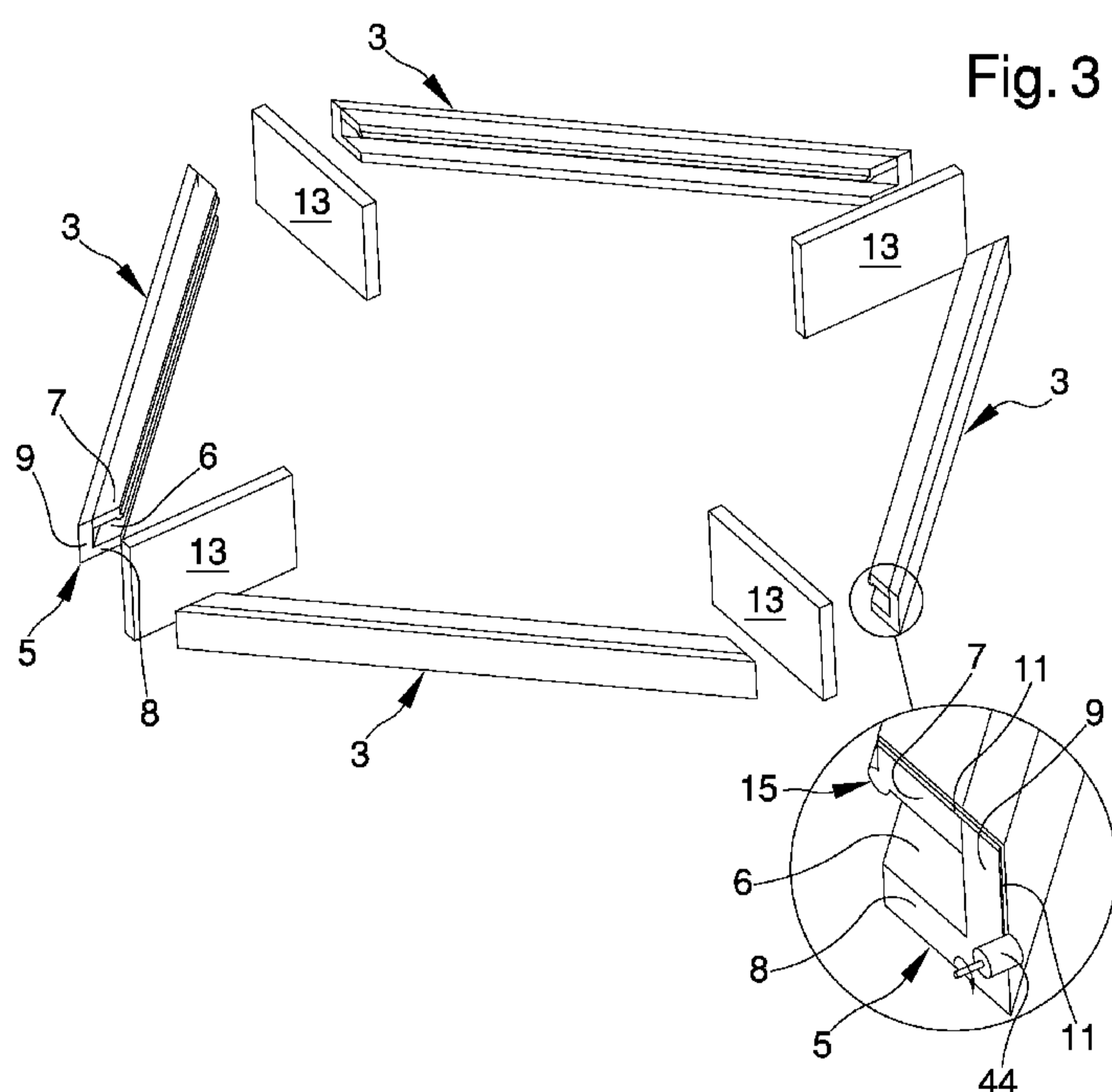
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(54) Title: PROCESS AND SYSTEM FOR THE MANUFACTURE OF WINDOWS/DOORS



(57) Abstract: A process for the manufacture of windows/ doors, characterized by the fact that it comprises the following steps: • - providing at least one inner panel for windows/doors; • - providing a plurality of plastic profiled elements (3) for windows/doors, each of the profiled elements (3) comprising at least two areas to seal (5), coupleable to the areas to seal (5) of the other profiled elements (3), and at least one longitudinal slot (6), in which a respective perimeter side of the inner panel is insertable; • - performing a step of mechanical machining by chip removal on at least one of the areas to seal (5); • - heating the areas to seal (5); • - coupling the heated areas to seal (5) to one another by pressing the profiled elements (3) one against the other to maintain the areas to seal (5) in mutual contact and define the frame for windows/doors, the coupling taking place with the inner panel inserted in the longitudinal slots (6) to define a window/door which is composed by the frame and by the inner panel contained in the frame. A system for implementing this process is also disclosed.

PROCESS AND SYSTEM FOR THE MANUFACTURE OF WINDOWS/DOORS

Technical Field

The present invention relates to a process and a system for the manufacture of
5 windows/doors.

Background Art

In the ambit of the present document by window/door is meant a structure intended to close an opening (window, door, wing etc.) made in an outer or inner wall, in the floor or in the roof of a building.

10 The structure may be either mobile (e.g. the wing of a window) or fixed (that is firmly secured to the wall).

The windows/doors usually consist in an outer frame, made of materials such as aluminum, plastic or other, and in an inner panel, made of glass, plexiglass or other material (either transparent or non-transparent).

15 With specific reference to the field of windows/doors with frames made of plastic, it is emphasized that these frames are manufactured by sealing together a plurality of corresponding profiled elements, preferably made of PVC or other heat-sealable plastic materials.

The sealing of the profiled elements takes place by means of melting of respective
20 head surfaces which is obtained by heating the portions to be connected by means of suitable plates with heating elements, and then by pressing the heated portions the one against the other until their mutual union.

Generally, the heated portions are the head ending parts of the profiled elements, suitably cut at 45° to define, e.g., a right-angled portion of the frame.

25 This methodology is implemented by sealing machines with respective retention members of the profiled elements, movable in mutual approach to bring the heated ending parts to seal in mutual contact.

Other machines are also equipped with finishing systems, able to remove the bead or sealing bead that is formed during melting of the two profiled elements.

30 In fact, at the line of union of the two profiled elements (surfaces cut at 45°), the excess portion of molten material flows out and forms a bead protruding from the visible surface of the profiled elements.

For this reason, in order to give the finished window/door an appreciable aesthetic appearance, the profiled elements, once sealed, undergo a process for the removal of
35 the bead.

The known sealing devices and briefly described above, however, have important drawbacks, mainly related to the formation of the aforementioned sealing bead.

It should in fact be considered that the sealing area of the plastic profiled elements is not entirely homogeneous, and therefore, to make the profiled elements regular, much
5 material is melted with the consequent formation of an abundant bead, and then plenty of scrap material which must be removed.

Furthermore, the finishing processes, suitable for the removal of the bead and the cleaning of the sealing area, significantly affect the overall timing of the window/door processing.

10 It should be noticed, in fact, that for any sealing of the window/door the profiled elements must be subsequently machined.

Furthermore, for the radiused profiled elements the removal of said bead is considerably complicated.

To this is added that the machinery used for the above-mentioned finishing operations
15 turn out to be bulky, complex and particularly expensive.

This entails the need to bear additional costs and processing times also given the presence of additional bulky equipment and tools.

The patent document WO 2013/132406 A1 shows a method and a device which allow obviating the above drawbacks.

20 The system shown in WO 2013/132406 A1, in fact, is equipped with two mobile retention members on which the profiled elements are mounted and allows to seal them without forming any sealing bead, thanks to a prior operation of milling of the areas to seal, adapted to form on the profiled elements a containing compartment for the sealing bead, and to the application of containment pressers, which are juxtaposed
25 to the heated profiled elements during sealing and prevent the leakage of the molten material from the containing compartment.

Some improved sealing methodologies are shown in patent documents WO 2014/122572 A1 and IT 102015000033340.

Once the profiled elements have been sealed together, the frame of the window/door is
30 obtained which is then completed by means of the application of the inner panel, as is schematically illustrated in Figures 1 and 2.

The inner panel A is manually entered by an operator inside the frame B previously sealed (Figure 1).

Subsequently (Figure 2), the operator locks the inner panel A with retaining edges or
35 glazing beads C, which are coupled to the profiled elements D1, D2 of the frame B and

pressed against the inner panel A.

During the fixing of the glazing beads C, the operator also places a seal E between the inner panel A and the glazing beads C.

After completing this job, the glazing beads C are an integral part of the window/frame
5 and the seals E are pressed on the inner panel A to ensure the seal thereof.

The profiled elements D1, D2 of the frame B usually have a cross section of rather complex shape but in which a central portion D1 is always recognizable, intended to laterally surround the inner panel A, and a protruding portion D2, against which the inner panel A rests; in the solution shown in Figures 1 and 2, for example, the cross
10 section of the profiled elements D1, D2 is substantially L-shaped, in which the central portion D1 and the protruding portion D2 are orthogonal to each other.

The glazing beads C are associated with the central portion D1 on the side opposite to the protruding portion D2, so as to enclose in a sandwich-like manner the inner panel A.

15 The application operation of the inner panel A to the frame B, commonly called "glazing", entails nevertheless considerable drawbacks.

First of all, this operation is not very practical and easy and must be carried out manually by specialized personnel.

Added to this is the fact that, to carry out the glazing job, large spaces inside the
20 manufacturing plant of the doors and windows are inconveniently occupied, which could be used otherwise.

The costs for the execution of the glazing operation are therefore very high, not only in terms of labor but also in terms of plant management costs, which inevitably leads to an increase of the sales price of the windows/doors, with the risk of making the
25 products less attractive to customers.

Description of the Invention

The main aim of the present invention is to provide a process and a system for the manufacture of windows and doors that allow obtaining a production system with superior performance and significantly lower costs.

30 A further object of the present invention is to make available a process and a system which greatly simplify the entire manufacturing process of windows and doors.

Not the latest object of the present invention is to provide a process and a system for the manufacture of windows and doors that allow obtaining a position of marked advantage over competitors.

35 Another object of the present invention is to provide a process and a system for the

manufacture of windows and doors that allow to overcome the mentioned drawbacks of the prior art within the ambit of a simple, rational, easy and effective to use as well as affordable solution.

The above mentioned objects are achieved by the present process for the manufacture
5 of doors and windows having the characteristics of claim 1.

The objects described above are also achieved by the present system for the manufacture of doors and windows having the characteristics of claim 16.

Brief Description of the Drawings

Other characteristics and advantages of the present invention will appear better evident
10 from the description of some preferred, but not exclusive, embodiments of a process and of a system for the manufacture of windows and doors, illustrated by way of an indicative but non-limiting example in the accompanying drawings, in which:

Figures 1 and 2 show, in a succession of axonometric, schematic and partial views a process for the manufacture of windows and doors of known type;

15 Figures 3 to 6 show, in a succession of axonometric, schematic and partial views an embodiment of the process according to the invention;

Figures 7 to 10 show, in a succession of axonometric, schematic and partial views an alternative embodiment of the process according to the invention;

Figures 11 to 15 show, in a succession of axonometric, schematic and partial views a
20 further embodiment of the process according to the invention;

Figures 16 to 18 are side, schematic and partial views, that illustrate some variants of the process according to the invention;

Figures 19 and 20 show, in a succession of axonometric, schematic and partial views a further variant of the process according to the invention;

25 Figure 21 is a side view of the system according to the invention;

Figure 22 is a plan view of the system according to the invention;

Figures 23 to 25 show, in a succession of side views on an enlarged scale, the operation of the system according to the invention.

Embodiments of the Invention

30 With particular reference to such figures, globally indicated with 1 is a window/door obtained by the union of at least one inner panel 2 for windows/doors and a plurality of plastic profiled elements 3 for windows/doors.

The inner panel 2 is advantageously made of glass (single or multilayer) but it cannot be ruled out that it can be made of plexiglass or other material, either of a transparent
35 or of a non-transparent type.

The inner panel 2 has a plurality of perimeter sides 4.

Preferably, the inner panel 2 has a substantially rectangular shape and the perimeter sides 4 are four and arranged at 90° to each other; alternative embodiments cannot however be ruled out in which the inner panel 2 is shaped differently (e.g. in a triangle, 5 pentagon, hexagon, and the like).

The profiled elements 3 are made, e.g., of PVC, but also plastic materials of the heat-sealable type different to PVC cannot be ruled out.

Given that the inner panel 2 is rectangular, then the profiled elements 3 are four in number, one for each perimeter side 4; it is easy to understand, however, that in the 10 case of inner triangular panels 2 three profiled elements 3 will be employed, in the case of inner pentagonal panels 2 five profiled elements 3 will be employed, and so on. Each of the profiled elements 3 comprises at least two areas to seal 5, coupleable to the areas to seal 5 of the other profiled elements 3 to define a frame for windows and doors.

15 To allow the union by sealing, the areas to seal 5 of the profiled elements 3 are cut at 45° so as to define a coupling between two consecutive right-angled profiled elements 3.

Each of the profiled elements 3, furthermore, comprises at least one longitudinal slot 6 in which a respective perimeter side 4 of the inner panel 2 is insertable.

20 The profiled elements 3, in fact, comprise at least a first longitudinal portion 7, a second longitudinal portion 8 and a third longitudinal portion 9 mutually arranged substantially in a C pattern, with the first longitudinal portion 7 and the second longitudinal portion 8 which extend from the third longitudinal portion 9 and define the longitudinal slot 6 between them.

25 In the ambit of the present document, by the term "longitudinal direction" of the profiled elements 3 is meant the direction of their length; given that such profiled elements 3 are usually made by extrusion of the plastic material, then the longitudinal direction coincides with the direction of extrusion.

The first longitudinal portion 7, the second longitudinal portion 8 and the third 30 longitudinal portion 9 may be formed in a single monolithic body, i.e. may be extruded through a shaped matrix that directly imparts the C shape to the profiled elements 3.

Alternatively, it is possible to make the longitudinal profiled elements 7, 8, 9 separately from each other and assembling them later; the second longitudinal portion 8 and the third longitudinal portion 9, e.g., can be extruded together to form a single 35 monolithic body substantially L-shaped, while the first longitudinal portion 7 is

extruded separately and is associated with (e.g. by interlocking) the third longitudinal portion 9 after extrusion.

In any case, the process and the system according to the invention provide for the use of profiled elements 3 in which, prior to being sealed, the longitudinal portions 7, 8, 9
5 are arranged substantially in a C and define the longitudinal slot 6; this is a very important difference compared to traditional techniques, in which, on the contrary, the profiled elements are shaped in a L and a glazing bead is applied only after sealing.

The distance between the first longitudinal portion 7 and the second longitudinal portion 8 is set depending on the thickness of the inner panel 2; the insertion of the
10 inner panel 2 in the longitudinal slots 6 takes place substantially snugly, as will be better described in the following pages.

The process according to the invention comprises the following steps:

- providing the inner panel 2;
- providing the plurality of profiled elements 3;
- 15 - performing a step of mechanical machining by chip removal on at least one of the areas to seal 5;
- heating the areas to seal 5;
- coupling the heated areas to seal 5 to one another by pressing the profiled elements 3 one against the other to maintain the areas to seal 5 in mutual contact
20 and define the frame for windows/doors, the step of coupling taking place with the inner panel 2 inserted in the longitudinal slots 6 to define the window/door 1 which is composed by the frame of the profiled elements 3 and by the inner panel 2 contained in the frame of the profiled elements 3.

To perform the coupling between the inner panel 2 and the profiled elements 3, the
25 process according to the invention comprises the steps of:

- placing the inner panel 2 in an insertion configuration in which it is substantially coplanar to the lying plane 10 of the longitudinal slots 6, with the perimeter sides 4 which are arranged facing the longitudinal slots 6; and
- moving the profiled elements 3 from a position of mutual spacing away to a
30 position of mutual approach that is adapted to insert the inner panel 2 in the longitudinal slots 6.

The step of coupling the profiled elements 3 takes place substantially by pressing all the profiled elements at the same time one against the other.

In other words, during coupling, all the areas to seal 5 of the profiled elements 3 are
35 mutually pressed together, with the inner panel 2 positioned in the insertion

configuration and all four corners of the frame of the profiled elements 3 which are joined at 90° at the same time.

The step of performing a mechanical machining by chip removal is carried out before the step of heating, e.g. by means of suitable removal means 44.

5 The removal means 44 are e.g. milling cutters.

Conveniently, the step of performing a mechanical machining by chip removal comprises the step of forming a groove 11 (visible in Figure 3) at at least one of the areas to seal 5 of the profiled elements 3, the step of coupling the areas to seal 5 comprising a sub-step of melting the areas to seal 5 between them to define a sealing
10 bead and a sub-step of making a containing compartment defined by the groove 11, in which the sealing bead is made inside the containing compartment.

The step of forming the groove 11 is preferably implemented by means of an operation by chip removal on a peripheral edge of at least one of the profiled elements 3.

Conveniently, the groove 11 is practicable on the profiled elements 3 in a way similar
15 to what is taught by the patent documents WO 2013/132406 A1, WO 2014/122572 A1 and IT 102015000033340.

The removal means 44, in addition or alternatively to making the groove 11, can advantageously also leveling, entirely or in part, the areas to seal 5.

In the presence of the groove 11, for example, the removal means 44 can level the
20 parts of the areas to seal 5 not occupied by the groove itself.

In this case, the removal means 44 can be made to pass on the substantial totality of the areas to seal 5 at different working depths:

- at the edges of the areas to seal 5, the working depth of the removal means 44 is greater and such as to define the groove 11;
- 25 - at the remaining parts of the areas to seal 5, on the other hand, the working depth of the removal means 44 is less and such as to remove only a small layer of plastic material sufficient to flatten and level the areas to seal 5.

In other words, the removal means 44 are used not only to shape the groove 11 but they are absolutely essential to level the walls and correct any cutting errors.

30 The groove 11 can also be practiced on all the longitudinal portions 7, 8, 9 of the profiled elements 3, or only on some of them.

In a possible embodiment of the invention, e.g., the groove 11 is practiced only on the second longitudinal portion 8 and on the third longitudinal portion 9, while the first longitudinal portion 7 is completely leveled at the same working depth corresponding
35 to the working depth of the groove 11.

This way, the profiled elements 3 are intended to be sealed together by melting and mutual union of the second longitudinal portions 8 and of the third longitudinal portions 9, while the first longitudinal portions 7 are not heated and, during the step of coupling, approach substantially snugly without melting.

- 5 Advantageously, the step of heating takes place by means of heating means 13 which, e.g., consist of at least a sealing element with heated plate having two faces opposing each other on which two of the areas to seal 5 are placeable in contact.

The sealing element with heated plate 13 consists, e.g., of a heating element having a substantially plate-shaped conformation.

- 10 In practice, the areas to seal 5 are heated by approaching the profiled elements 3 from opposite sides and pressing them against the faces of the sealing element with heated plate 13.

Preferably, during the step of heating, a plurality of sealing elements with heated plate 13 are used, one for each corner of the frame of profiled elements 3.

- 15 In a particular embodiment shown in Figures 3 to 6, the step of heating takes place with the inner panel 2 arranged to the outside of the longitudinal slots 6, between the step of heating and that of coupling elapsing a coupling time of less than 2 seconds during which the inner panel 2 is inserted in the longitudinal slots 6.

- In this embodiment, the profiled elements 3 are first placed substantially coplanar, 20 with the areas to seal 5 mutually faced two by two and the longitudinal slots 6 directed facing each other two by two, as shown in Figure 3, while the inner panel 2 is not in the insertion configuration.

- The profiled elements 3 are maintained spaced apart from each other and between the areas to seal 5 are placed the sealing elements with heated plate 13, arranged facing 25 and substantially parallel to the corresponding areas to seal 5 and therefore inclined by 45° with respect to the longitudinal directions of the profiled elements 3.

- The simultaneous approach of the profiled elements 3 to the sealing elements with heated plate 13 brings the areas to seal 5 in contact with the sealing elements with heated plate 13, for their heating; the movement of the profiled elements 3 occurs 30 along directions orthogonal to the profiled elements themselves (Figure 4).

At this point the profiled elements 3 are moved away, the sealing elements with heated plate 13 are removed and the inner panel 2 is placed in the insertion configuration in which it is substantially coplanar to the lying plane 10 of the longitudinal slots 6 (Figure 5).

- 35 The profiled elements 3, which are located in the position of mutual spacing away, are

finally moved to the position of mutual approach; this displacement is adapted, firstly, to insert the inner panel 2 in the longitudinal slots 6 and, ultimately, to juxtapose and press the areas to seal 5 for their coupling (Figure 6).

The instant when the profiled elements 3 are moved away from the sealing elements 5 with heated plate 13 the step of heating ends, while the instant when the heated areas to seal 5 come in contact, the step of coupling, on the contrary, begins.

It follows that, during the coupling time:

- the profiled elements 3 and the sealing elements with heated plate 13 must be moved away;
- 10 - the inner panel 2 should be placed in the insertion configuration;
- the profiled elements 3 must be reapproached to insert the inner panel 2 in the longitudinal slots 6 as far as placing the areas to seal 5 in mutual contact.

Given that the coupling time is less than 2 seconds (but more in detail less than 1 second and preferably equal to about 200 milliseconds), the above operations are
15 performed at high speed to avoid that the heated areas to seal 5 excessively cool before coming in contact, jeopardising the coupling thereof.

To reduce the execution time and the speed of movement of the profiled elements 3, an alternative embodiment shown in Figures 7 to 10 provides that, after the step of mechanical machining by chip removal, the step of heating occurs with the inner panel
20 2 arranged partially inserted inside at least one of the longitudinal slots 6, between the step of heating and that of coupling elapsing a coupling time of less than 2 seconds during which the profiled element 3 corresponding to the at least one of the longitudinal slots 6 moves from a position of partial insertion to a position of fully insertion.

25 Conveniently, during the step of heating the inner panel 2 is arranged partially inserted inside all the longitudinal slots 6 and, in other words, all the profiled elements 3 are placed simultaneously in the position of partial insertion.

The profiled elements 3 are initially placed in a completely similar manner to the embodiment shown in Figure 3, that is they are substantially coplanar, with the areas
30 to seal 5 mutually facing two by two and the longitudinal slots 6 directed facing each other two by two; the inner panel 2, on the other hand, unlike what happened in the previous embodiment, is placed in the insertion configuration.

In the embodiment shown in Figures 7 to 10, the sealing elements with heated plate 13 comprise at least a recess 14 at least partly complementary to the cross section of the
35 inner panel 2 and placeable so as to embrace at least partly the perimeter sides 4 of the

inner panel 2.

In the position shown in Figure 7, all the sealing elements with heated plate 13 are placed so as to embrace partly the perimeter sides 4 of the inner panel 2, and in particular its corners.

- 5 The profiled elements 3 are maintained spaced apart from each other and between the areas to seal 5 are placed the sealing elements with heated plate 13, arranged facing and substantially parallel to the corresponding areas to seal 5 and therefore inclined by 45° with respect to the longitudinal directions of the profiled elements 3.

The contemporary approaching of the profiled elements 3 to the sealing elements with heated plate 13 first brings the profiled elements 3 to the position of the partial
10 insertion, in which in practice the perimeter sides 4 of the inner panel 2 are partially inserted in the longitudinal slots 6, and then pushes the areas to seal 5 in contact with the sealing elements with heated plate 13, for their heating; the movement of the profiled elements 3 is carried out also in this case along directions orthogonal to the
15 profiled elements themselves (Figure 8).

At this point the profiled elements 3 are slightly moved away from the sealing elements with heated plate 13, while remaining fitted around the perimeter sides 4 of the inner panel 2.

The sealing elements with heated plate 13 are therefore moved away from the profiled
20 elements 3 and from the inner panel 2 by making them slide along directions inclined at 45° with respect to the profiled elements 3 and coplanar to the sealing elements with heated plate 13 (Figure 9).

The profiled elements 3, which are still in the position of partial insertion, are finally approached as far as placing them in the position of complete insertion, in which the
25 areas to seal 5 are juxtaposed and are pressed against each other for their coupling (Figure 10).

The instant when the profiled elements 3 are moved away from the sealing elements with heated plate 13 the step of heating ends, while the instant when the heated areas to seal 5 come in contact, the step of coupling, on the contrary, begins.

30 It follows that, during the coupling time, the inner panel 2 is already placed in the insertion configuration and the stroke which the profiled elements 3 must travel is significantly shorter than that which the profiled elements 3 shown in Figures 3 to 6 must travel.

In a further embodiment shown in Figures 11 to 15, instead, after the step of
35 mechanical machining by chip removal it happens that the step of heating takes place

with the inner panel 2 arranged completely inserted inside at least one of the longitudinal slots 6, between the step of heating and the step of coupling elapsing a coupling time of less than 2 seconds during which the profiled element corresponding to the at least one of the longitudinal slots 6 remains substantially stationary with respect to the inner panel 2 and, in other words, it remains in a position of complete insertion.

More in detail, in this case the profiled elements are conveniently divided into a pair of first profiled elements 3a, located on opposite sides with respect to the inner panel 2, and into a pair of second profiled elements 3b, which are also arranged on opposite sides with respect to the inner panel 2; the first profiled elements 3a and the second profiled elements 3b, when considered without distinction from each other, will be generally indicated by the reference number 3.

During the step of heating the inner panel 2 is completely inserted inside the longitudinal slots 6 of the first profiled elements 3a and is partially inserted inside the longitudinal slots 6 of the second profiled elements 3b.

In other words, once arranged on the inner panel 2, the first profiled elements 3a are immediately placed in the position of complete insertion and are no longer moved; the second profiled elements 3b, instead, are placeable first in a position of partial insertion and only subsequently in a position of complete insertion.

The profiled elements 3 are initially placed in a completely similar manner to the embodiment shown in Figure 7, i.e. they are substantially coplanar, with the areas to seal 5 mutually facing each other two by two and the longitudinal slots 6 directed facing each other two by two, while the inner panel 2 is in the insertion configuration.

Even in the embodiment shown in Figures 11 to 15 the sealing elements with heated plate 13 comprise at least a recess 14 at least partly complementary to the cross section of the inner panel 2 and placeable so as to embrace at least partly the perimeter sides 4 of the inner panel 2; in the starting position shown in Figure 11, however, all the sealing elements with heated plate 13 are separated and spaced apart with respect to the inner panel 2.

To seal the profiled elements 3 around the inner panel 2, the first profiled elements 3a are first of all mutually approached by moving them along a direction orthogonal to them as far as they reach the position of complete insertion (Figure 12).

At this point the sealing elements with heated plate 13 are placed against the areas to seal 5 of the first profiled elements 3a and the second profiled elements 3b are approached as far as placing also their areas to seal 5 on the sealing elements with

heated plate 13.

The displacement of the second profiled elements 3b takes place along a direction orthogonal to them and is such as to make them fit on the corresponding perimeter sides 4 as far as they reach the position of partial insertion.

5 The maintenance of the profiled elements 3 against the sealing elements with heated plate 13 allows heating all the areas to seal 5 simultaneously (Figure 13).

At this point the second profiled elements 3b are moved away from the sealing elements with heated plate 13; depending on how long is the moving away stroke, the second profiled elements 3b can be completely pulled out of the inner panel 2 or
10 remain fitted around the perimeter sides 4 of the inner panel 2.

The sealing elements with heated plate 13 are then moved away from the profiled elements 3 and from the inner panel 2 by making them slide, first of all, along a first direction parallel to the first profiled elements 3a, for their moving away from the first profiled elements 3a, and then along a second direction inclined at 45° with respect to
15 the first profiled elements 3a and coplanar to the sealing elements with heated plate 13 (Figure 14).

Once the sealing elements with heated plate 13 have been pulled out, the second profiled elements 3b are finally approached as far as placing them in the position of complete insertion, in which their areas to seal 5 are juxtaposed to the areas to seal 5 of
20 the first profiled elements 3a and are pressed one against the other for their coupling (Figure 15).

In the embodiment shown in Figures 11 to 15 the step of heating ends the instant when the second profiled elements 3b are moved away from the sealing elements with heated plate 13 and the latter are moved away from the first profiled elements 3a; the
25 step of coupling, instead, begins the instant when the heated areas to seal 5 come in contact with each other.

Even in the embodiment shown in Figures 11 to 15, therefore, during the coupling time the inner panel 2 is already placed in the insertion configuration and the stroke that the profiled elements 3 must travel is decidedly shorter than that the profiled
30 elements 3 shown in figures 3 to 6 must travel.

In all the embodiments shown in figures 3 to 15 the profiled elements 3 comprise at least one seal element 15 associated with at least one of the first longitudinal portion 7 and the second longitudinal portion 8.

In particular, the seal element 15, which consists of a sheath of rubber or other similar
35 material, is associated with the first longitudinal portion 7 along one longitudinal edge

of the same.

During the insertion of the inner panel 2 in the longitudinal slots 6, the perimeter sides 4 slide inside the profiled elements 3 and the seal element 15 is such as to allow a sliding by creeping of the same on the surface of the inner panel 2.

- 5 To facilitate the insertion of the inner panel 2 in the longitudinal slots 6, especially in the presence of the seal element 15 on the profiled elements 3 but not only, the process according to the invention can conveniently provide for an additional step that consists in stretching apart the first longitudinal portion 7 and the second longitudinal portion 8, i.e. moving them slightly away with respect to one another.
- 10 The step of stretching apart is performed by means of the application of suction elements 16, such as suction cups or the like, on the surfaces of the first longitudinal portion 7 and/or of the second longitudinal portion 8 external to the longitudinal slot 6, and by means of the application of a force 17 on the suction elements 16 directed in the direction of stretching apart of the first longitudinal portion 7 and of the second
- 15 longitudinal portion 8 (Figure 16).

Alternatively, the step of stretching apart is performed by means of the introduction of stretching apart elements 18 inside the longitudinal slot 6.

- The stretching apart elements 18 are placeable in an active position, in which they push the first longitudinal portion 7 and the second longitudinal portion 8 in a mutual
- 20 moving away direction (Figure 17) and, when the inner panel 2 is inserted in the longitudinal slot 6, they are pushed by the perimeter sides 4 in a passive position, in which they stop to stretch apart the first longitudinal portion 7 and the second longitudinal portion 8.

- The stretching apart elements 18 are no longer removed from the profiled elements 3
- 25 and are intended to remain trapped inside the window/door 1.

Alternatively or in combination to the seal element 15 associated with the profiled elements 3 it is possible to provide a seal element 15 associated with the perimeter sides 4 of the inner panel 2.

- Figure 18 shows an embodiment in which the seal element 15 is precisely associated
- 30 with the inner panel 2 along a lateral flank 19 of the perimeter sides 4 intended to face the third longitudinal portion 9 of the profiled elements 3.

The seal element 15, therefore, remains fully enclosed within the longitudinal slots 6 when the profiled elements 3 are sealed together.

- Figures 19 and 20 show a further variant of the process according to the invention in
- 35 which an additional step is provided that consists in interposing at least one special

seal element 15 between at least one of the profiled elements 3 and at least one of the perimeter sides 4, in which the seal element 15 is shaped as follows.

The seal element 15 comprises at least a first longitudinal band 20 interposable between the first longitudinal portion 7 and the inner panel 2, in which the first longitudinal band 20 has a cross section divided into:

- at least a first base sector 21 adapted to remain attached to the inner panel 2; and
- at least one first sealing sector 22 protruding with respect to the first base sector 21 and having a first sharp edge 22a and a first actuating edge 22b, the first sealing sector 22 being joined to the first base sector 21 in a movable manner between a rest position, in which the first sharp edge 22a is moved away from the inner panel 2, and an operating position, in which the first sharp edge 22a rests on the inner panel 2, the insertion of the inner panel 2 in the longitudinal slots 6 being adapted to bring the first actuating edge 22b in contact with the first longitudinal portion 7 and to move the first sealing sector 22 from the rest position to the operating position.

Advantageously, the seal element 15 also comprises at least a second longitudinal band 23, interposable between the second longitudinal portion 8 and the inner panel 2, and at least a third longitudinal band 24, interposable between the third longitudinal portion 9 and the inner panel 2.

The first longitudinal band 20, the second longitudinal band 23 and the third longitudinal band 24 are arranged substantially in a C pattern and are intended to be fitted to cover the perimeter sides 4 of the inner panel 2 on three surfaces, namely on a part of the two main faces 25 and on the lateral flank 19 of the inner panel 2.

In particular, the width of the third longitudinal band 24 is substantially equal to the thickness of the inner panel 2, so that the seal element 15 wraps the perimeter sides 4 substantially snugly.

Conveniently, the second longitudinal band 23 is substantially identical to the first longitudinal band 20 and, in fact, has a cross section divided into:

- at least a second base sector 26 adapted to remain attached to the inner panel 2; and
- at least a second sealing sector 27 protruding with respect to the second base sector 26 and having a second sharp edge 27a and a second actuating edge 27b, the second sealing sector 27 being joined to the second base sector 26 in a movable manner between a rest position, in which the second sharp edge is moved away from the inner panel 2, and an operating position, in which the second sharp

edge 27a rests on the inner panel 2, the insertion of the inner panel 2 in the longitudinal slots 6 being adapted to bring the second actuating edge 27b in contact with the second longitudinal portion 8 and to move the second sealing sector 27 from the rest position to the operating position.

5 In practice, the first base sector 21 and the second base sector 26 constitute a fixed portion of the seal element 15 because, once fitted on the main faces 25, they can not move with respect to the inner panel 2 by virtue of the C shape of the seal element 15. During the insertion of the inner panel 2 in the longitudinal slots 6, in fact, the first longitudinal portion 7 and the second longitudinal portion 8 slide on the seal element
10 15 without, however, moving it, considering that this displacement is prevented by the presence of the third longitudinal band 24 that holds together the first longitudinal band 20 and the second longitudinal band 23.

The embodiment of the invention shown in the figures 19 and 20 is therefore very advantageous in that it provides for the mounting of the seal element 15 on the inner
15 panel 2 even without the use of adhesive materials such as glue or the like.

Alternative embodiments of the invention cannot however be ruled out in which the first longitudinal band 20 and the second longitudinal band 23 are joined to the inner panel 2 by gluing, in which case the seal element 15 may also be without the third longitudinal band 24.

20 Alternative embodiments of the invention cannot however be ruled out in which the seal element 15 is without both the second longitudinal band 23 and the third longitudinal band 24 and only comprises the first longitudinal band 20 glued to the inner panel 2.

The first sealing sector 22 and the second sealing sector 27 constitute a movable
25 portion of the seal element 15 since they move from the rest position to the operating position at the moment when the inner panel 2 is inserted in the longitudinal slots 6.

For this purpose the first actuating edge 22b and the second actuating edge 27b consist of inclined surfaces intended to come in contact with the corresponding activation surfaces 28, also inclined, on the first longitudinal portion 7 and on the second
30 longitudinal portion 8.

With respect to the lying plane 10 identified by the longitudinal slots 6 upon insertion of the inner panel 2, the surfaces which identify the first actuating edge 22b and the second actuating edge 27b are inclined by 20°-40°, preferably 30°, while the activation surfaces 28 are inclined by 10°-30°, preferably 20°.

35 When the activation surfaces 28 come in contact with the actuating edges 22b, 27b

they push the sealing sectors 22, 27 to move from the rest position to the operating position by bringing the sharp edges 22a, 27a resting on the inner panel 2.

This particular solution allows to ensure the seal of the seal element 15 both against liquid and against dust and dirt, which can in no way penetrate under the seal element 5 15.

For the manufacture of the windows/doors 1 in accordance with the provisions of the previously described process, the present invention also relates to a system 29 intended for this purpose.

The system 29 comprises:

- 10 - a base frame 30 for resting on the ground;
- a plurality of sealing machines 31 mounted on the base frame 30 and each having:
 - at least one pair of retention members 32 adapted to retain the respective profiled element 3;
 - removal means 44 suitable for the mechanical machining by chip removal of 15 at least one of the areas to seal 5;
 - heating means 13 for heating the areas to seal 5;
 - sliding means 33 of the retention members 32 which are adapted to move the profiled elements 3 between a position of mutual spacing away and a position of mutual approach, in which the heated areas to seal 5 are coupleable to one 20 another by pressing the profiled elements 3 one against the other to maintain the areas to seal 5 in mutual contact and to define a frame for windows/doors 1; and
- at least one support assembly 34 for the support of the inner panel 2, which is associated with the base frame 30 and adapted to place the inner panel 2 in an 25 insertion configuration in which it is substantially coplanar to the lying plane 10 of the longitudinal slots 6, the displacement of the profiled elements 3 from the position of mutual spacing away to the position of mutual approach being adapted to insert at least partly the inner panel 2 in the longitudinal slots 6 to define the window/door 1.

30 The sealing machines 31 are advantageously of the type of those shown in patent documents WO 2013/132406 A1, WO 2014/122572 A1 and IT 102015000033340.

The system 29 shown in the figures is intended for the manufacture of windows/doors 1 of rectangular shape and is therefore equipped with four sealing machines 31 adapted to seal the profiled elements 3 at the four corners of the window/door 1.

35 At least one of the sealing machines 31 is mounted on the base frame 30 by

interposition of displacement means, the mutual distance of the sealing machines 31 being adjustable depending on the dimensions of the window/door 1.

Conveniently, one of the sealing machines 31 is mounted on the base frame 30 in a fixed position, while the remaining sealing machines 31 are associated with the
5 displacement means and their position is changeable with respect to the fixed sealing machine 31 depending on the dimensions of the window/door 1.

Alternative embodiments cannot however be ruled out in which all the sealing machines 31 are movable.

The lying plane 10 in which the profiled elements 3 are placed is substantially
10 horizontal and the support assembly 34 comprises lifting and lowering means 35, 36, 37 adapted to bring the inner panel 2, already arranged horizontally, to the height of the lying plane 10.

The lifting and lowering means 35, 36, 37 comprise:

- at least one framework 35 located above the base frame 30 so as to rise above the
15 sealing machines 31; and
- at least one gripping device 36 which is adapted to grasp from above the inner panel 2 and is associated with the framework 35 in a movable manner along at least one vertical direction 43.

The framework 35, for example, is associated with vertical uprights 38 which allow its
20 resting onto the ground.

The gripping device 36, instead, is of the suction type and consists, e.g., in a plurality of suction cups.

Conveniently, the gripping device 36 is associated with a trolley device 39 which is mounted in a sliding manner on the framework 35 and which allows the gripping
25 device itself to be moved not only along the vertical direction 43 but also along two horizontal directions 40, 41 orthogonal to each other, so as to allow the centering of the inner panel 2 with respect to the position of the sealing machines 31.

The trolley device 39 has also the aim of allowing to pick the inner panel 2 from a warehouse 42.

30 In this regard it is noticed that the system 29 comprises at least one warehouse 42 for housing a plurality of inner panels 2, which is placed on the ground next to the base frame 30 and is also overlooked by the framework 35; this way, by sliding along the framework 35 the gripping device 36 can be moved from the warehouse 42 to the proximity of the base frame 30, and vice versa.

35 It is easy to understand, therefore, that the support assembly 34 is adapted to move the

inner panels 2 from the warehouse 42 to the insertion configuration.

To facilitate the movement of the inner panels 2 in the proximity of the sealing machines 31, the lifting and lowering means 35, 36, 37 can comprise at least one resting base 37 for the inner panel 2 being machined.

- 5 In particular, the resting base 37 is substantially located in the proximity of the base frame 30 and is housed in the space delimited by the sealing machines 31, and below the lying plane 10.

The resting base 37 is also liftable and lowerable and can be used to bring the inner panel 2 to the height of the lying plane 10 instead of the gripping device 36.

- 10 In other words, the gripping device 36 can be used for:

- picking the inner panels 2 from the warehouse 42 and taking them directly to the insertion configuration, keeping them hanging from above; or
- picking the inner panels 2 from the warehouse 42 and placing them on the resting base 37, where they remain at a lower height than the height of the lying plane 10

- 15 and are lifted only when appropriate.

The operation of the system 29 is easy to understand from the previous description of the process according to the invention that the system itself is capable of implementing.

- 20 A schematic and simplified version of the operation of the system 29 is shown in Figures 23 to 25, in which the same is used to work on the particular type of profiled elements 3, inner panel 2 and seal element 15 shown in Figures 19 and 20.

- In this case the inner panel 2 reaches the system 29 already fitted with the seal element 15 and, once gripped by the gripping device 36, is brought in the proximity of the sealing machines 31 where the profiled elements 3 have been previously loaded, 25 locked by means of the relative retention members 32 and subjected to the step of mechanical machining by chip removal by means of the removal means 44 (Figure 23).

- The system 29 thus operates automatically to place the inner panel 2 first in the insertion configuration (Figure 24) and subsequently to move the retention members 30 32 along the sliding means 33, by approaching the profiled elements 3 to the inner panel 2 and inserting the perimeter sides 4 in the longitudinal slots 6 together with the seal element 15 (Figure 25).

It has in practice been found that the described invention achieves the intended objects.

- 35 In this regard it is underlined that the particular solution to provide a process and a system with chip removal means and a support assembly according to the present

invention allows to manufacture, in a single work station, ready and finished windows/doors, in which the frame is already sealed around the inner panel and does not need subsequent finishing processes, for the removal of the sealing bead, or "glazing" operations.

- 5 The profiled elements are in fact machined on board of the sealing machines by means of the removal means, to obtain the sealing without bead of the profiled elements that is carried out directly along the perimeter of the inner panel.

CLAIMS

- 1) A process for the manufacture of windows/doors (1), characterized by the fact that it comprises the following steps:
- providing at least one inner panel (2) for windows/doors;
 - 5 - providing a plurality of plastic profiled elements (3) for windows/doors, each of said profiled elements (3) comprising at least two areas to seal (5), coupleable to the areas to seal (5) of the other profiled elements (3), and at least one longitudinal slot (6), in which a respective perimeter side (4) of said inner panel (2) is insertable;
 - 10 - performing a step of mechanical machining by chip removal on at least one of said areas to seal (5);
 - heating said areas to seal (5);
 - coupling said heated areas to seal (5) to one another by pressing said profiled elements (3) one against the other to maintain said areas to seal (5) in mutual contact and define the frame for windows/doors, said coupling taking place with
15 said inner panel (2) inserted in said longitudinal slots (6) to define a window/door (1) which is composed by said frame and by said inner panel (2) contained in said frame.
- 2) Process according to claim 1, characterized by the fact that it comprises the steps
20 of:
- placing said inner panel (2) in an insertion configuration in which it is substantially coplanar to the lying plane (10) of said longitudinal slots (6); and
 - moving said profiled elements (3) from a position of mutual spacing away to a position of mutual approach, said moving being adapted to insert said inner panel
25 (2) in said longitudinal slots (6).
- 3) Process according to one or more of the preceding claims, characterized by the fact that said coupling takes place substantially by pressing all said profiled elements (3) at the same time one against the other.
- 4) Process according to one or more of the preceding claims, characterized by the
30 fact that said step of mechanical machining by chip removal comprises the step of forming a groove (11) at at least one of said areas to seal (5) of the profiled elements (3), said step of coupling the areas to seal (5) comprising a sub-step of melting the areas to seal (5) between them to define a sealing bead and a sub-step of making a containing compartment defined by said groove (11), in which said sealing bead is
35 made inside said containing compartment.

- 5) Process according to claim 4, characterized by the fact that said step of forming a groove (11) is implemented by means of an operation by chip removal on a peripheral edge of at least one of said profiled elements (3).
- 6) Process according to one or more of the preceding claims, characterized by the fact that said step of heating takes place with said inner panel (2) arranged to the outside of said longitudinal slots (6), between said heating and said coupling elapsing a coupling time of less than 2 seconds during which said inner panel (2) is inserted in said longitudinal slots (6).
- 7) Process according to one or more of the preceding claims, characterized by the fact that said heating occurs with said inner panel (2) arranged partially inserted inside at least one of said longitudinal slots (6), between said heating and said coupling elapsing a coupling time of less than 2 seconds during which the profiled element (3) corresponding to said at least one of said longitudinal slots (6) moves from a position of partial insertion to a position of fully insertion.
- 8) Process according to one or more of the preceding claims, characterized by the fact that said heating takes place with said inner panel (2) arranged completely inserted inside at least one of said longitudinal slots (6), between said heating and said coupling elapsing a coupling time of less than 2 seconds during which the profiled element (3) corresponding to said at least one of said longitudinal slots (6) remains substantially stationary with respect to said inner panel (2).
- 9) Process according to one or more of the preceding claims, characterized by the fact that said profiled elements (3) comprise at least a first longitudinal portion (7), a second longitudinal portion (8) and a third longitudinal portion (9) mutually arranged substantially in a C pattern, with said first longitudinal portion (7) and said second longitudinal portion (8) which extend from said third longitudinal portion (9) and define said longitudinal slot (6) between them.
- 10) Process according to claim 9, characterized by the fact that it comprises the step of stretching apart said first longitudinal portion (7) and said second longitudinal portion (8) to facilitate the insertion of said inner panel (2) in said longitudinal slots (6).
- 11) Process according to claim 9 or 10, characterized by the fact that said profiled elements (3) comprise at least one seal element (15) associated with at least one of said first longitudinal portion (7) and said second longitudinal portion (8).
- 12) Process according to one or more of the preceding claims, characterized by the fact that said inner panel (2) comprises at least a seal element (15) associated with said perimeter sides (4).

13) Process according to one or more of the preceding claims, characterized by the fact that it comprises the interposing of at least one seal element (15) between at least one of said profiled elements (3) and at least one of said perimeter sides (4) of the inner panel (2), said seal element (15) comprising at least a first longitudinal band (20) interposable between said first longitudinal portion (7) and said inner panel (2), in which said first longitudinal band (20) has a cross section divided into:

- at least a first base sector (21) adapted to remain attached to said inner panel (2); and
- at least a first sealing sector (22) protruding with respect to said first base sector (21) and having a first sharp edge (22a) and a first actuating edge (22b), said first sealing sector (22) being joined to said first base sector (21) in a movable manner between a rest position, in which said first sharp edge (22a) is moved away from said inner panel (2), and an operating position, in which said first sharp edge (22a) rests on said inner panel (2), the insertion of said inner panel (2) in said longitudinal slots (6) being adapted to bring said first actuating edge (22b) in contact with said first longitudinal portion (7) and to move said first sealing sector (22) from said rest position to said operating position.

14) Process according to one or more of the preceding claims, characterized by the fact that said seal element (15) comprises at least a second longitudinal band (23) interposable between said second longitudinal portion (8) and said inner panel (2) and at least a third longitudinal band (24) interposable between said third longitudinal portion (9) and said inner panel (2), said first longitudinal band (20), said second longitudinal band (23) and said third longitudinal band (24) being arranged substantially in a C pattern.

15) Process according to one or more of the preceding claims, characterized by the fact that said second longitudinal band (23) has a cross section divided into:

- at least a second base sector (26) adapted to remain attached to said inner panel (2); and
- at least a second sealing sector (27) protruding with respect to said second base sector (26) and having a second sharp edge (27a) and a second actuating edge (27b), said second sealing sector (27) being joined to said second base sector (26) in a movable manner between a rest position, in which said second sharp edge (27a) is moved away from said inner panel (2), and an operating position, in which said second sharp edge (27a) rests on said inner panel (2), the insertion of said inner panel (2) in said longitudinal slots (6) being adapted to bring said

second actuating edge (27b) in contact with said second longitudinal portion (8) and to move said second sealing sector (27) from said rest position to said operating position.

16) System (29) for the manufacture of windows/doors (1), comprising:

- 5 - a base frame (30);
- a plurality of sealing machines (31) mounted on said base frame (30) and each having:
- 10 - at least one pair of retention members (32), adapted to retain respective plastic profiled elements (3) for windows/doors, each of said profiled elements (3) comprising at least two areas to seal (5), coupleable to the areas to seal (5) of the other profiled elements (3), and at least one longitudinal slot (6), in which a respective perimeter side (4) of an inner panel (2) for windows/doors is insertable;
- removal means (44) suitable for the mechanical machining by chip removal
- 15 of at least one of said areas to seal (5);
- heating means (13) for heating said areas to seal (5);
- sliding means (33) of said retention members (32) which are adapted to move said profiled elements (3) between a position of mutual spacing away and a position of mutual approach, in which said heated areas to seal (5) are
- 20 coupleable to one another by pressing said profiled elements (3) one against the other to maintain said areas to seal (5) in mutual contact and to define a frame for windows/doors;

characterized by the fact that it comprises at least one support assembly (34) for the support of said inner panel (2), which is associated with said base frame (30) and

25 adapted to place said inner panel (2) in an insertion configuration in which it is substantially coplanar to the lying plane (10) of said longitudinal slots (6), the displacement of said profiled elements (3) from said position of mutual spacing away to said position of mutual approach being adapted to insert at least partly said inner panel (2) in said longitudinal slots (6) to define a window/door (1) in which said inner

30 panel (2) is contained in said frame.

17) System (29) according to claim 16, characterized by the fact that said lying plane (10) is substantially horizontal and said support assembly (34) comprises lifting and lowering means (35, 36, 37) adapted to bring said inner panel (2) to the height of said lying plane (10).

35 18) System (29) according to claim 17, characterized by the fact that said lifting and

lowering means (35, 36, 37) comprise:

- at least one framework (35) located above said base frame (30); and
- at least one gripping device (36) which is adapted to grasp from above said inner panel (2) and is associated with said framework (35) in a movable manner along
5 at least one vertical direction (43).

19) System (29) according to claim 17 or 18, characterized by the fact that said lifting and lowering means (35, 36, 37) comprise at least one resting base (37) for said inner panel (2) which is located substantially in the proximity of said base frame (30) and is liftable and lowerable with respect to said base frame (30).

10 20) System (29) according to one or more of claims 16 to 19, characterized by the fact that it comprises at least one warehouse (42) for housing a plurality of said inner panels (2), said support assembly (34) being adapted to move said inner panels (2) from said warehouse (42) to said insertion configuration.

15 21) System (29) according to one or more of claims 16 to 20, characterized by the fact that at least one of said sealing machines (31) is mounted on said base frame (30) by interposition of displacement means, the mutual distance of said sealing machines (31) being adjustable depending on the dimensions of said window/door (1).

22) System (29) according to one or more of claims 16 to 21, characterized by the fact that said heating means (13) comprise at least a sealing element with heated plate
20 having two faces opposing each other on which two of said areas to seal (5) are placeable in contact.

23) System (29) according to claim 22, characterized by the fact that said sealing element with heated plate (13) comprises at least a recess (14) at least partly complementary to the cross section of said inner panel (2) and placeable so as to
25 embrace at least partly said perimeter sides (4).

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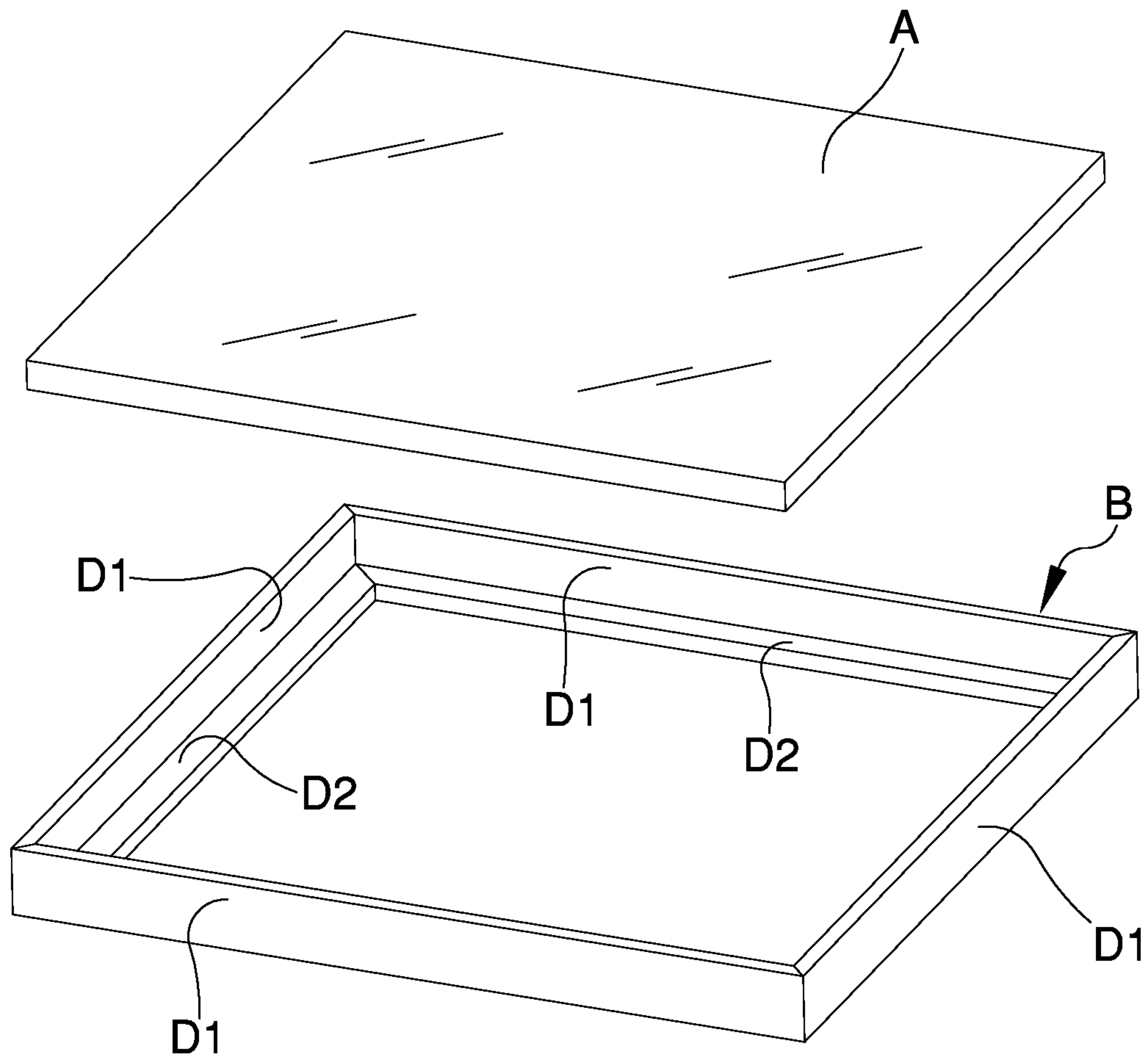


Fig. 1

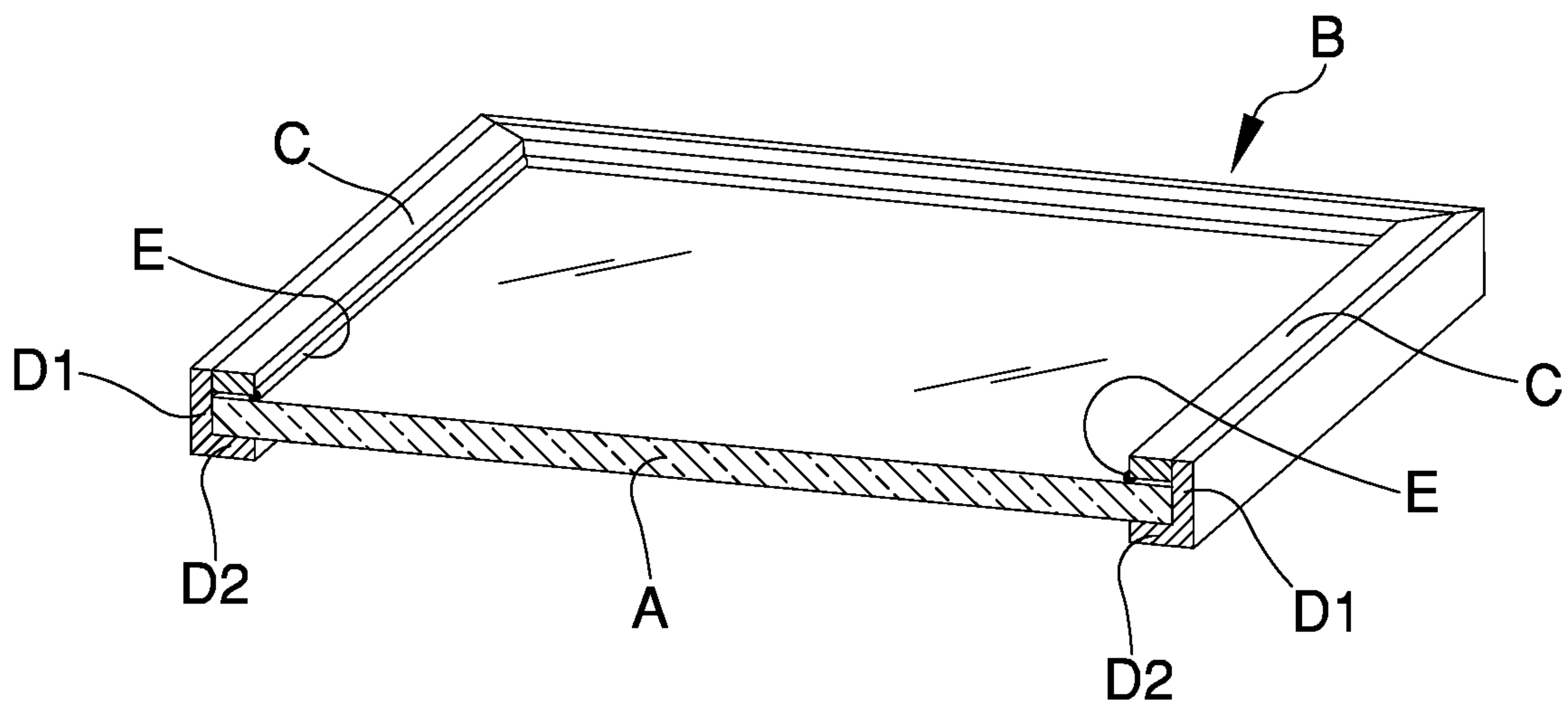


Fig. 2

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Fig. 3

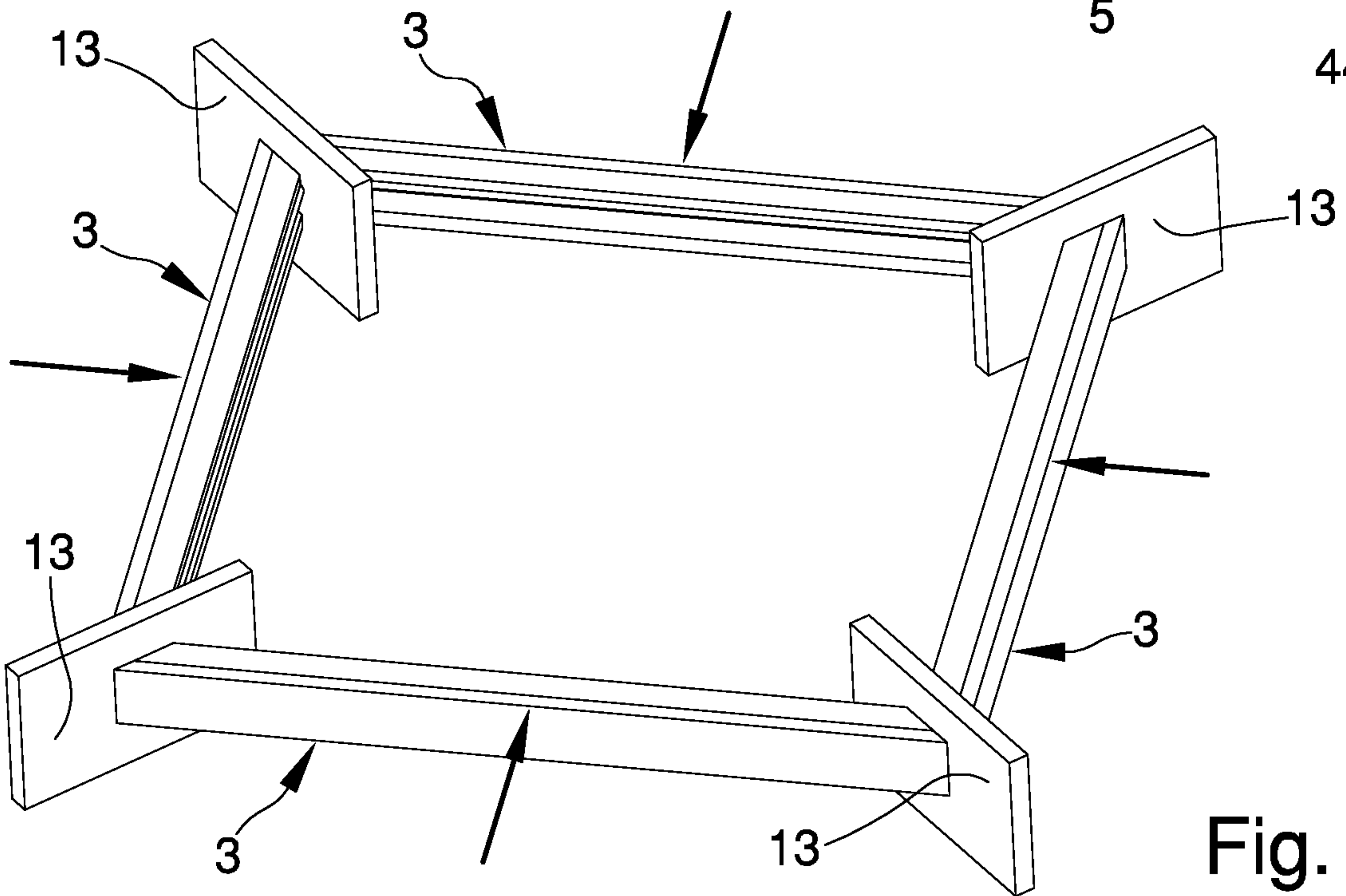
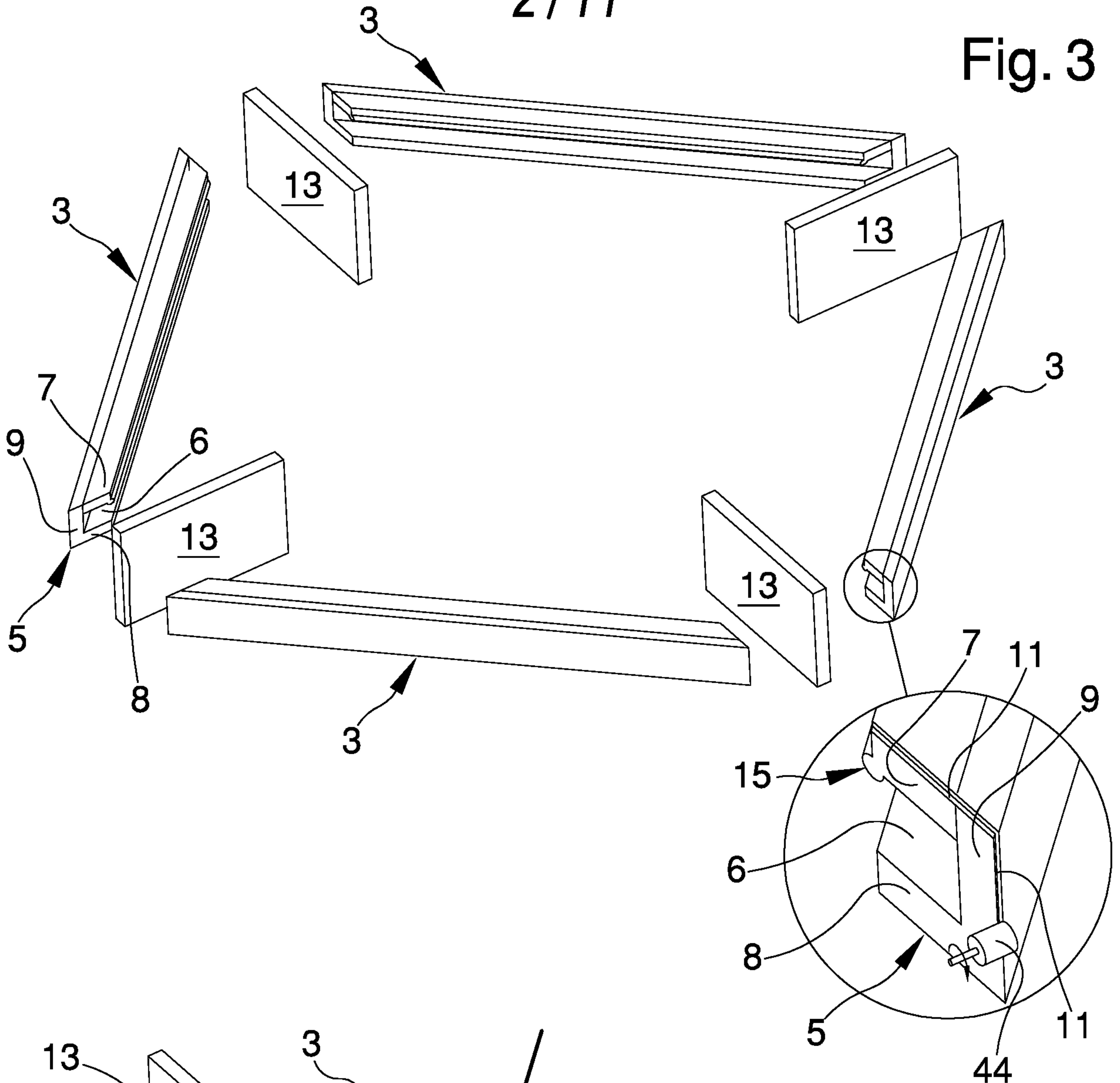


Fig. 4

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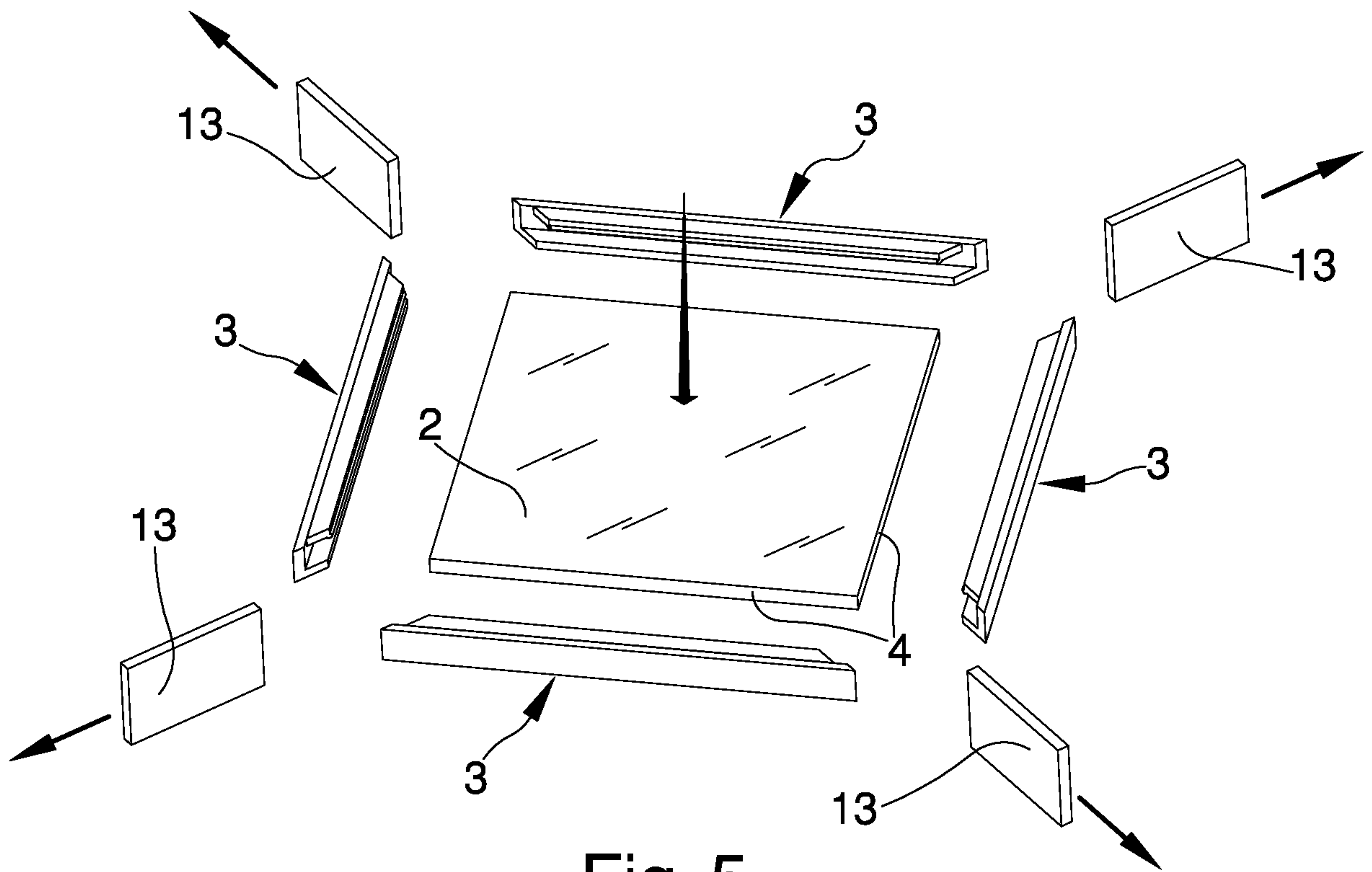


Fig. 5

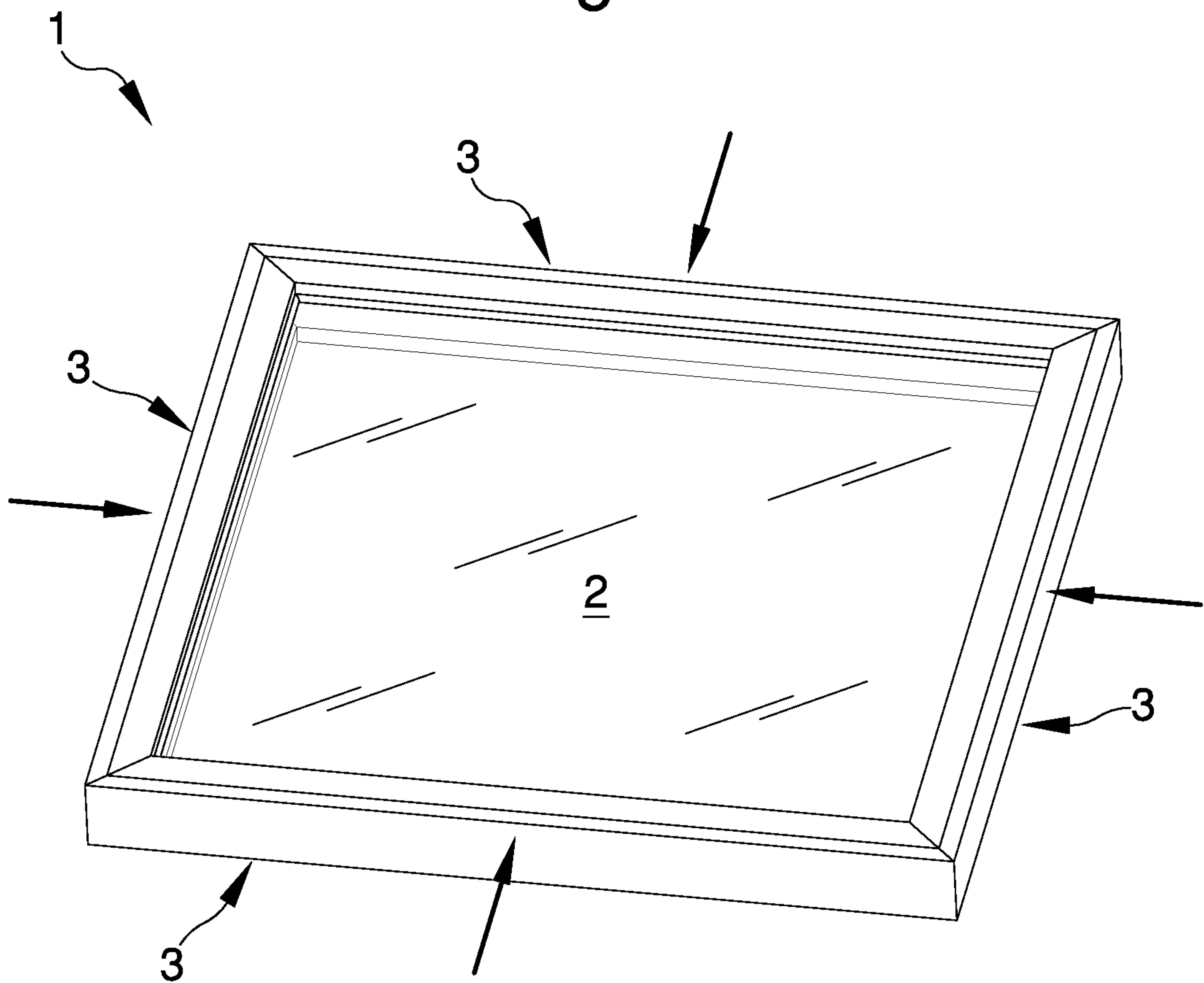


Fig. 6

Fig. 7

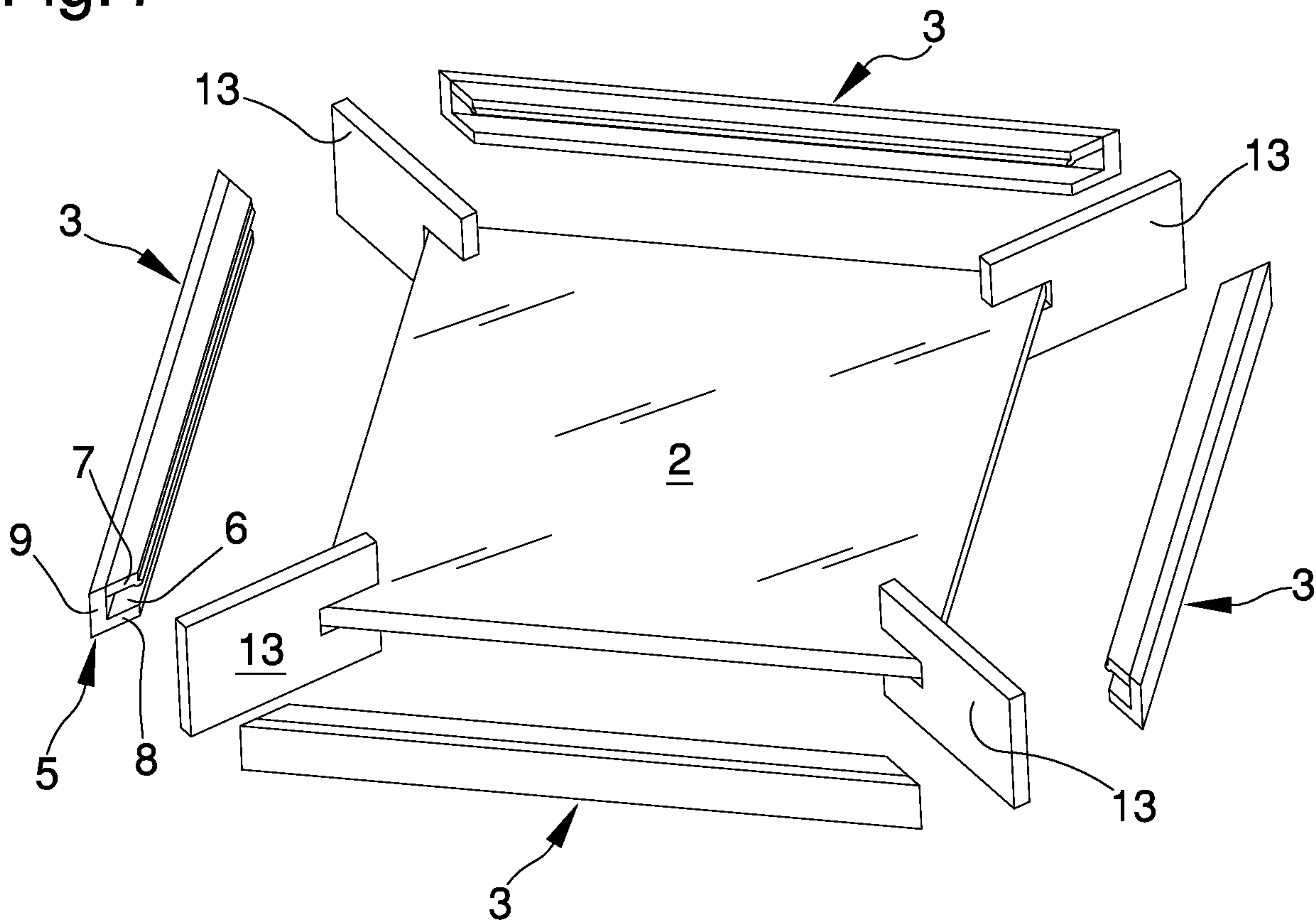
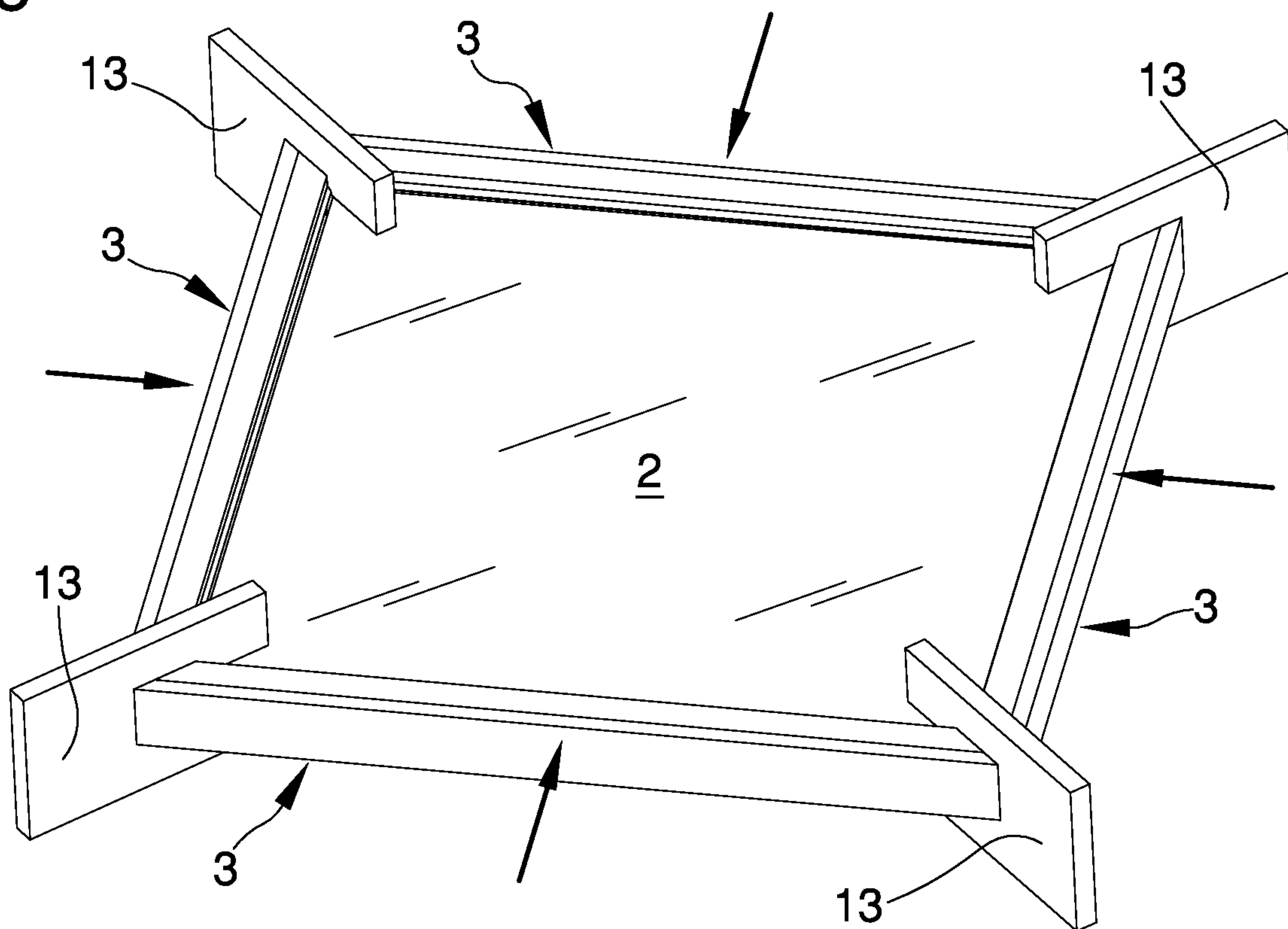


Fig. 8



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Fig. 9

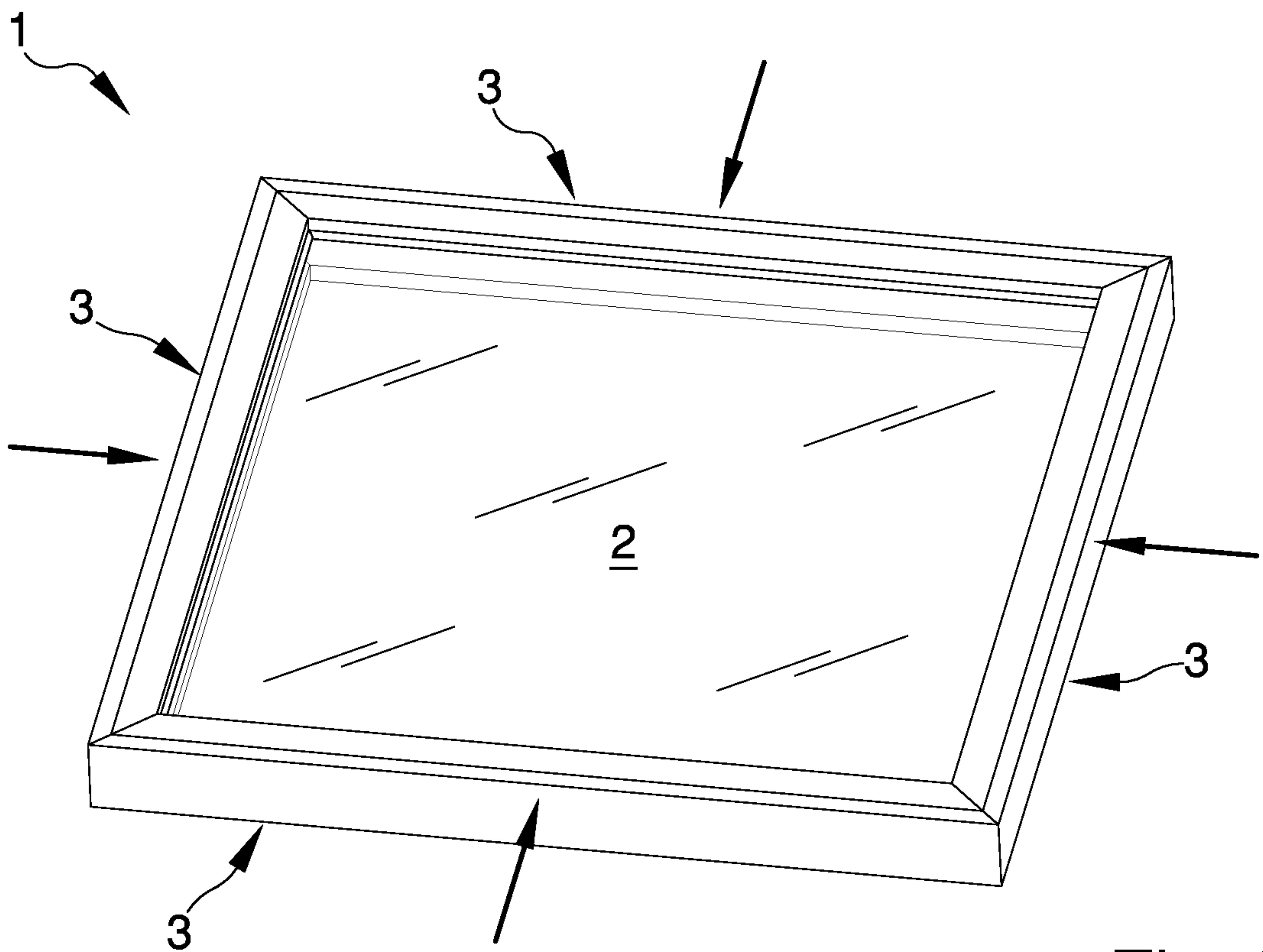
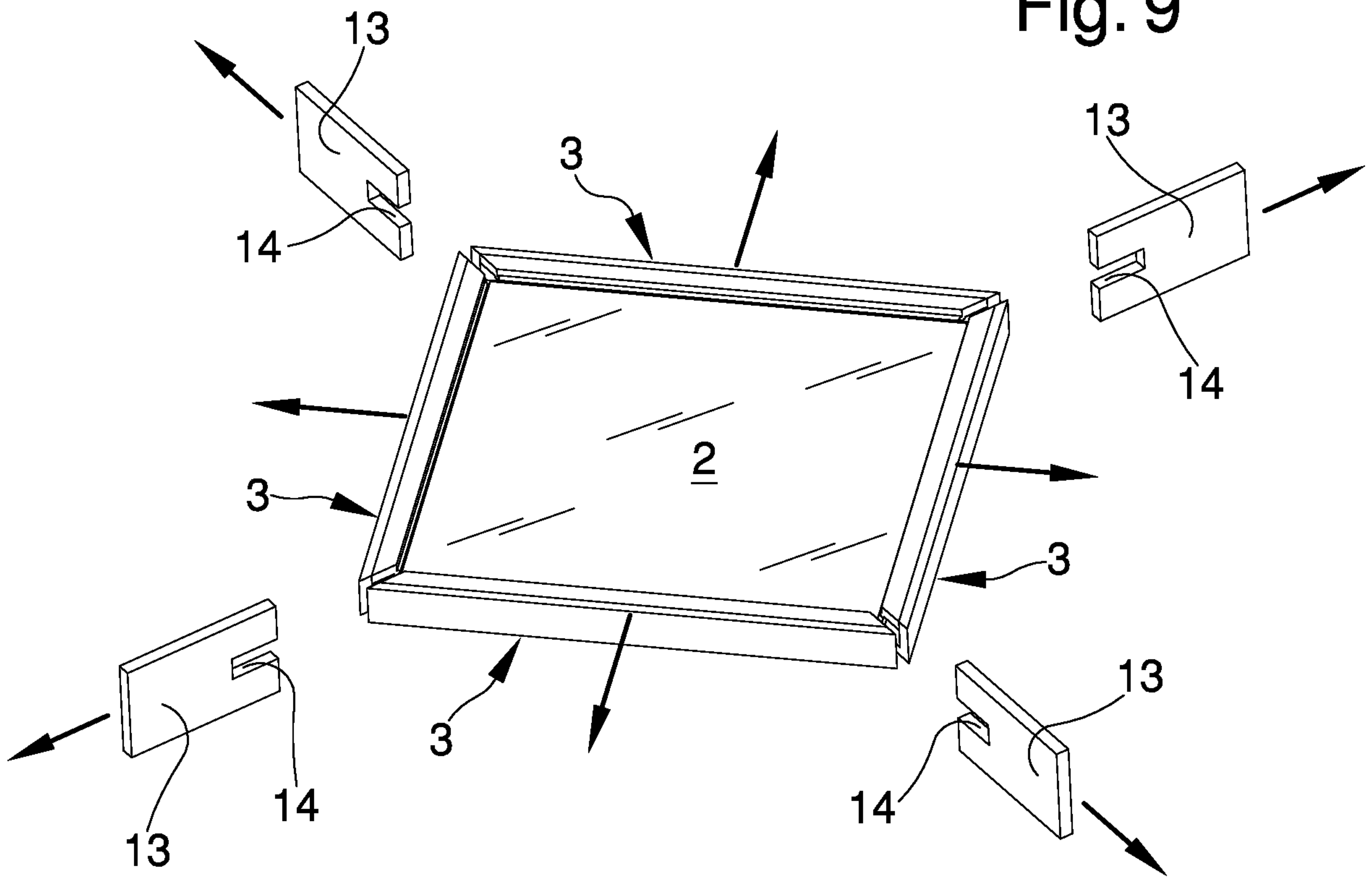


Fig. 10

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Fig. 11

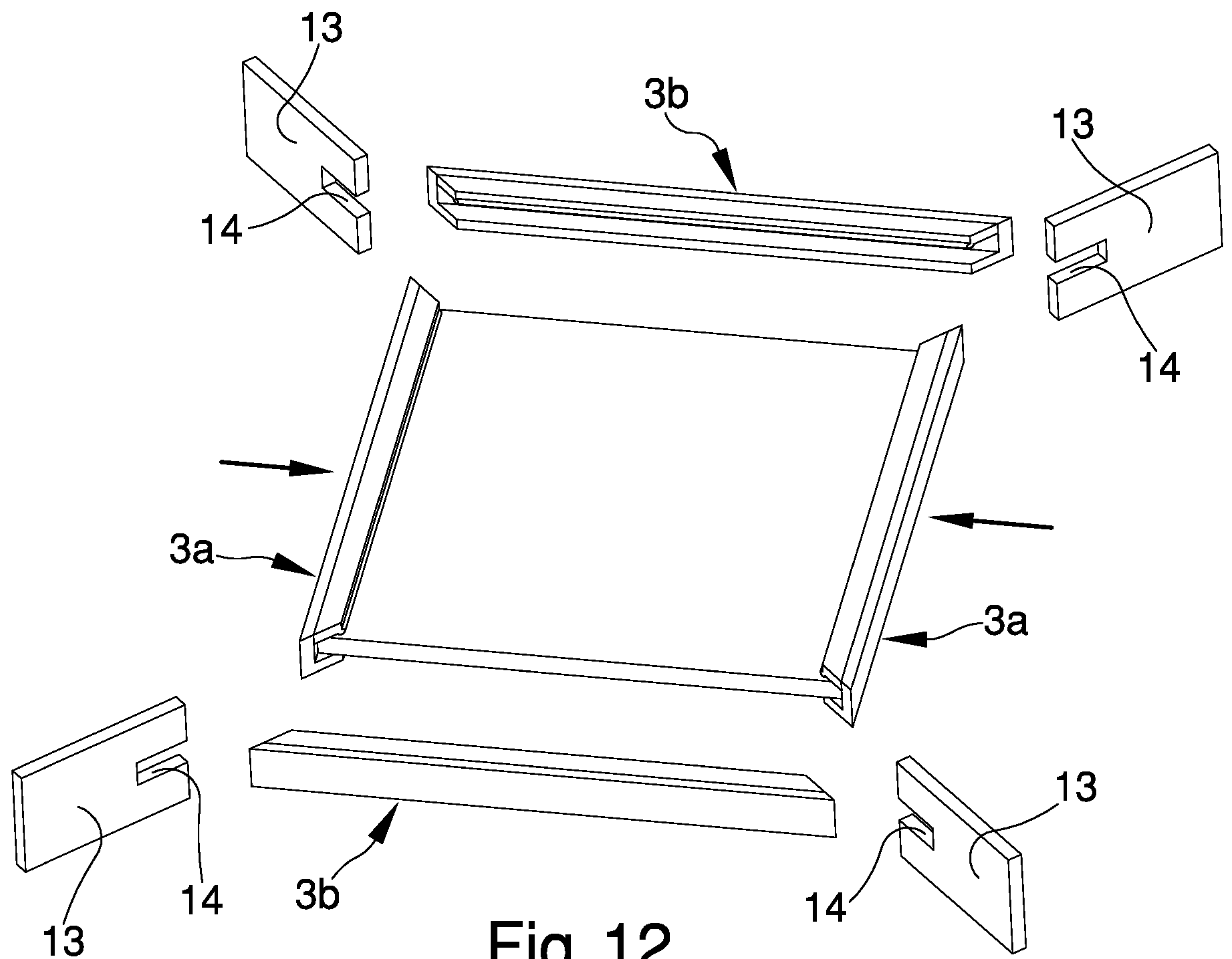
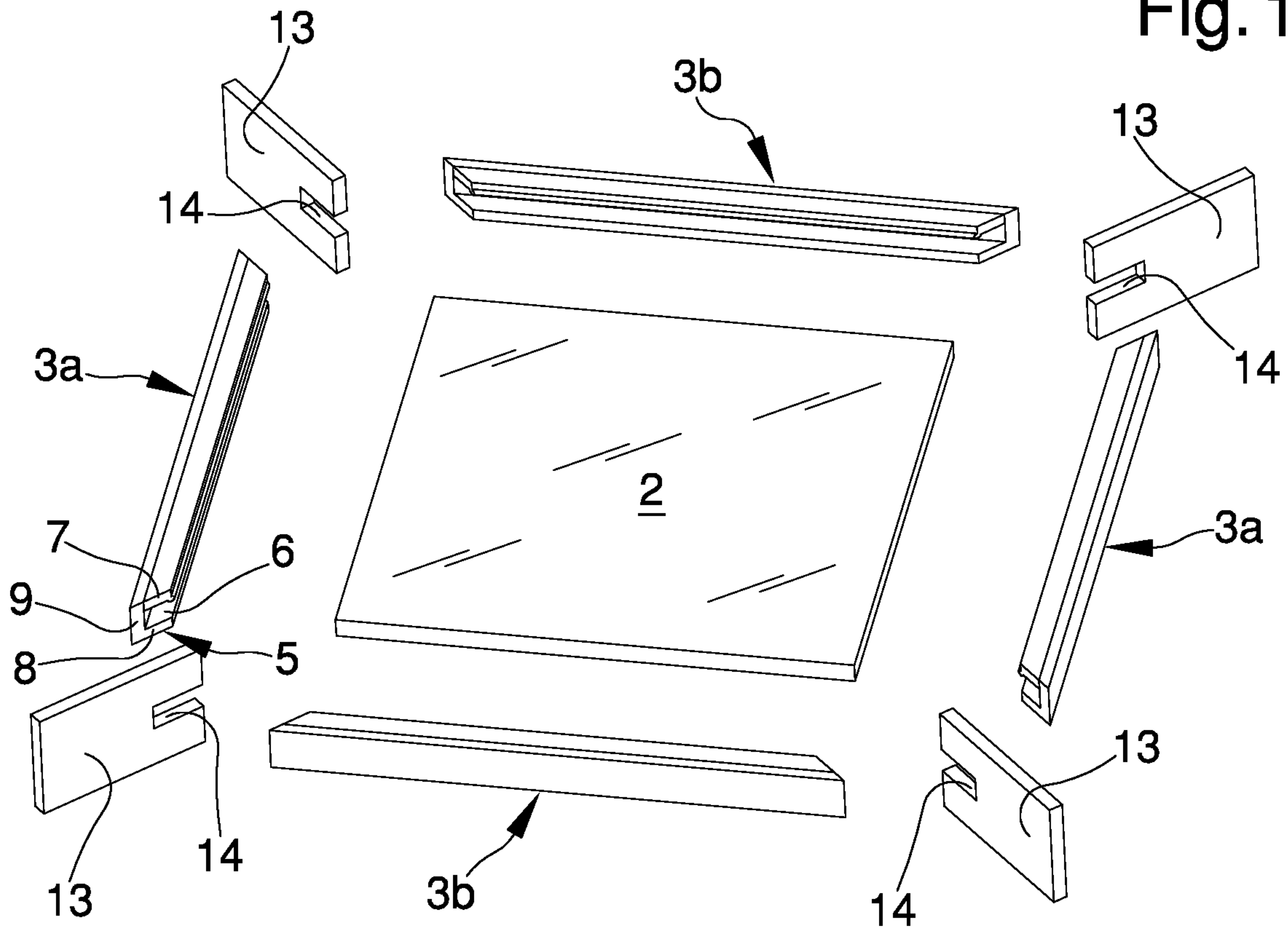
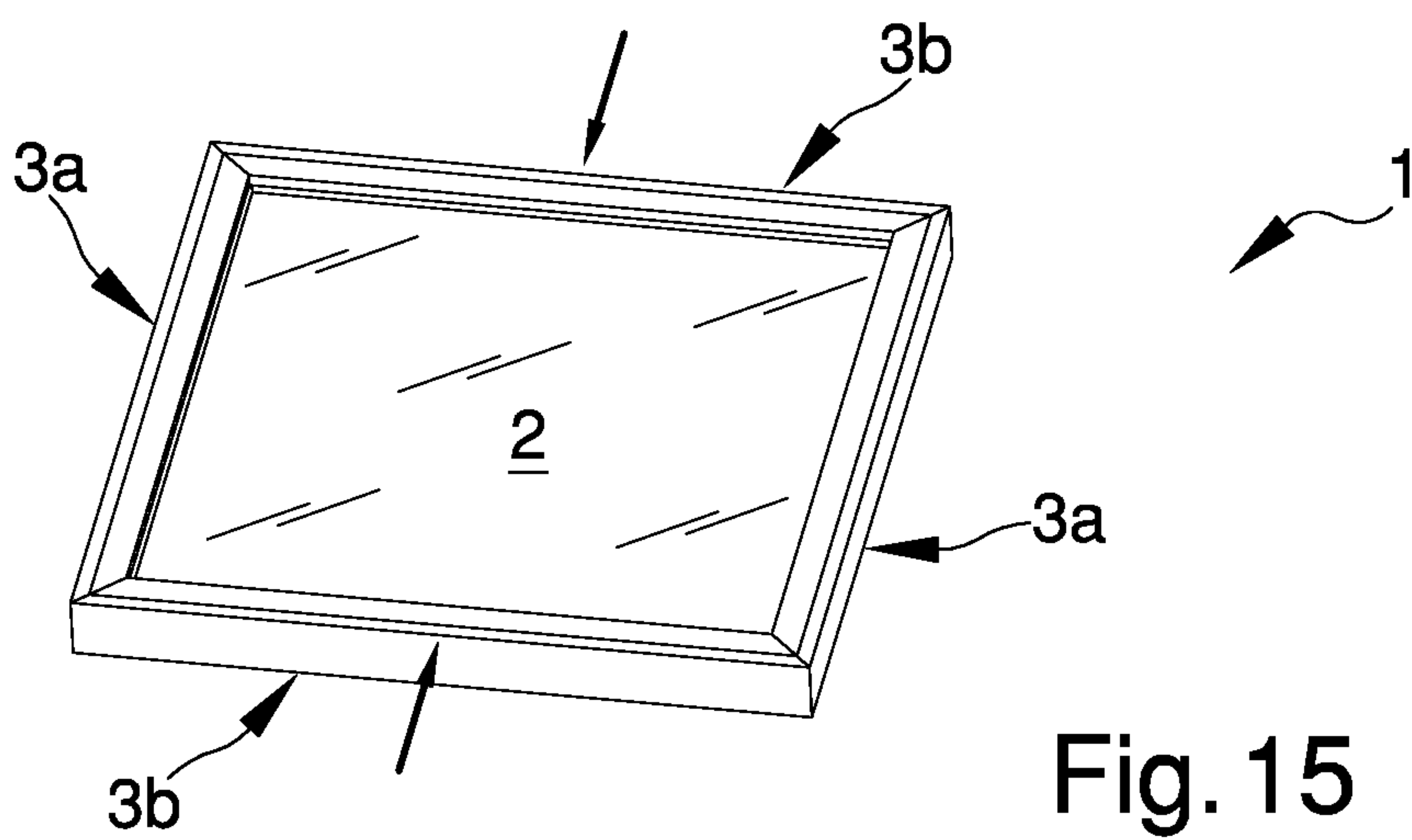
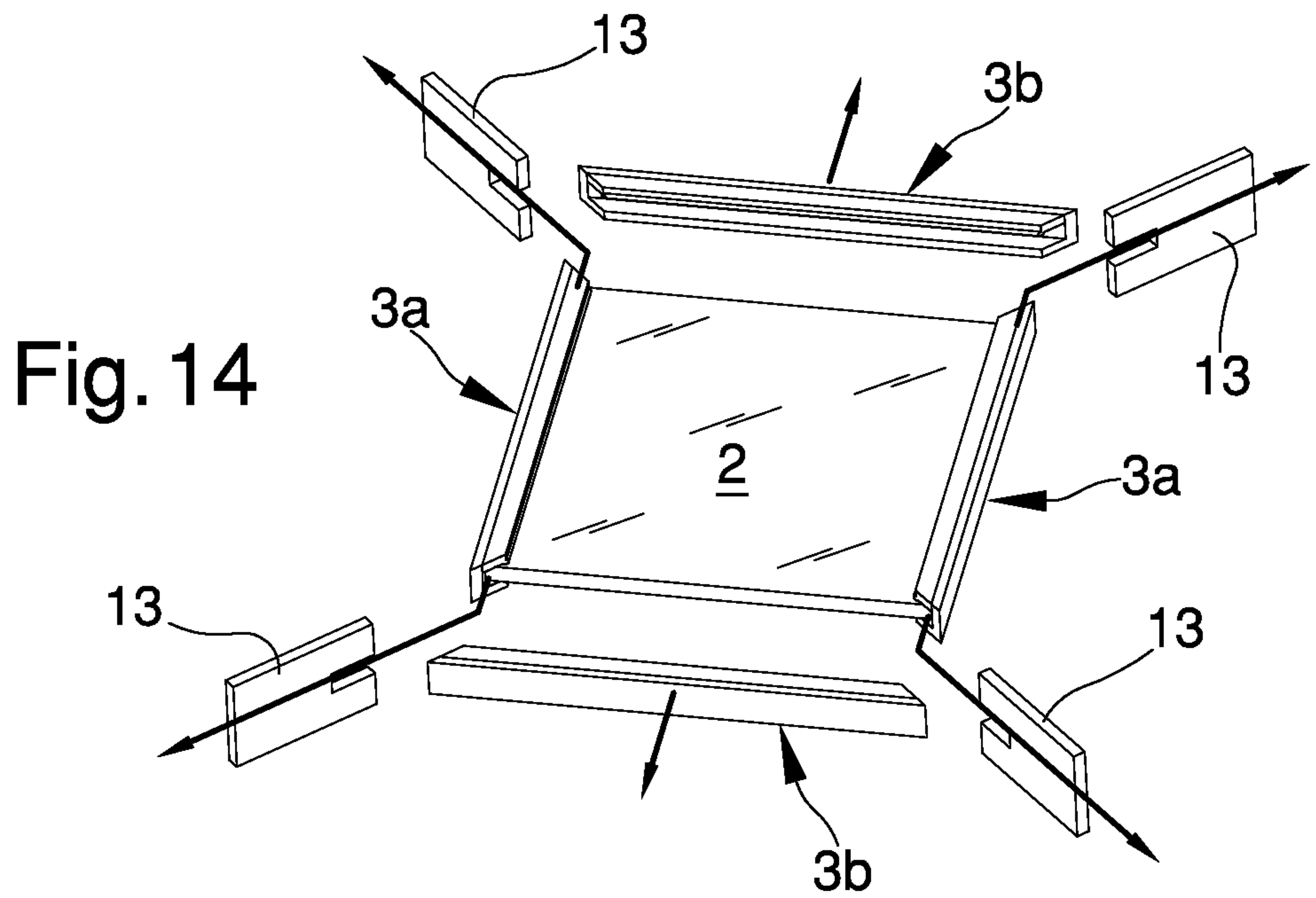
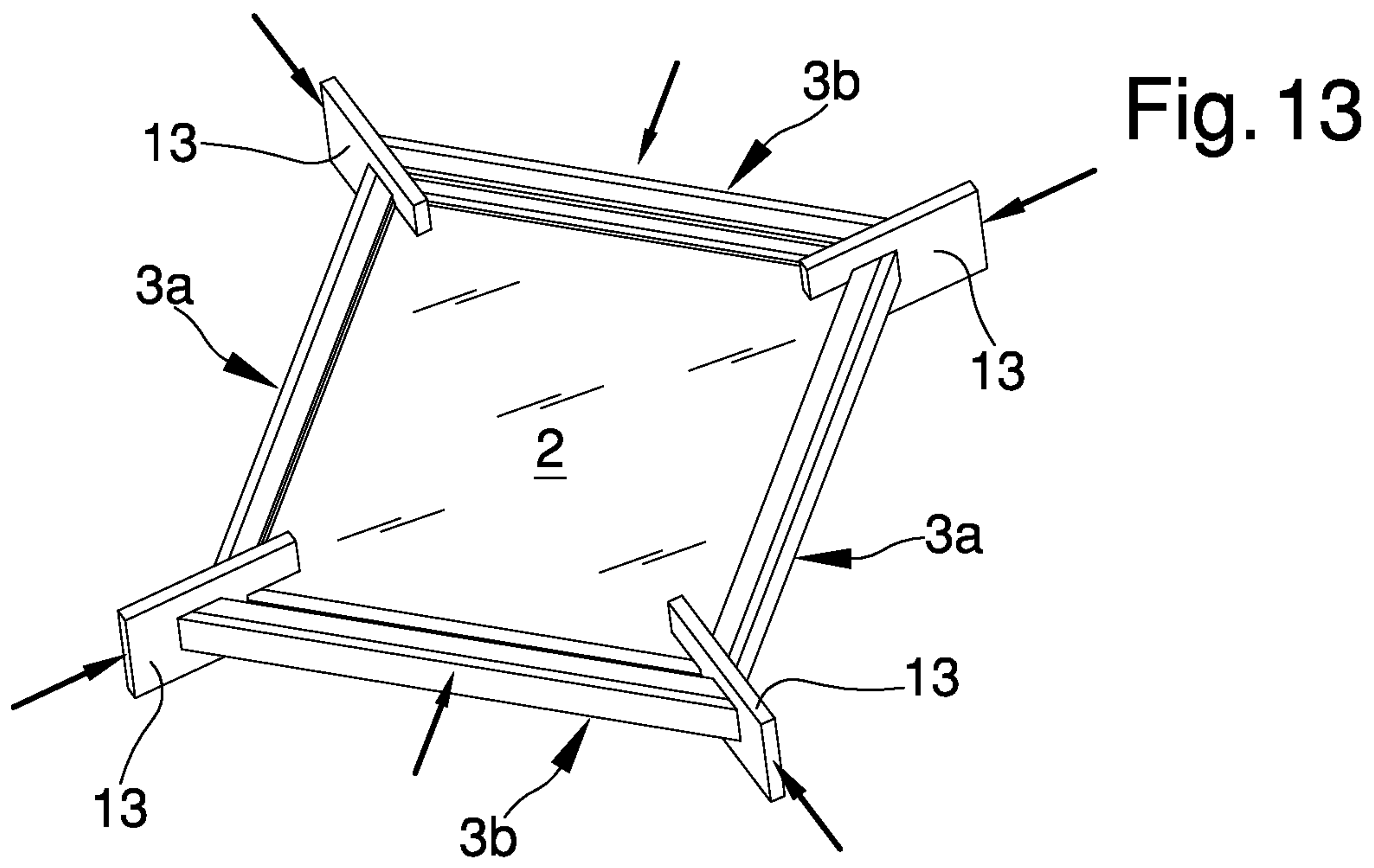


Fig. 12

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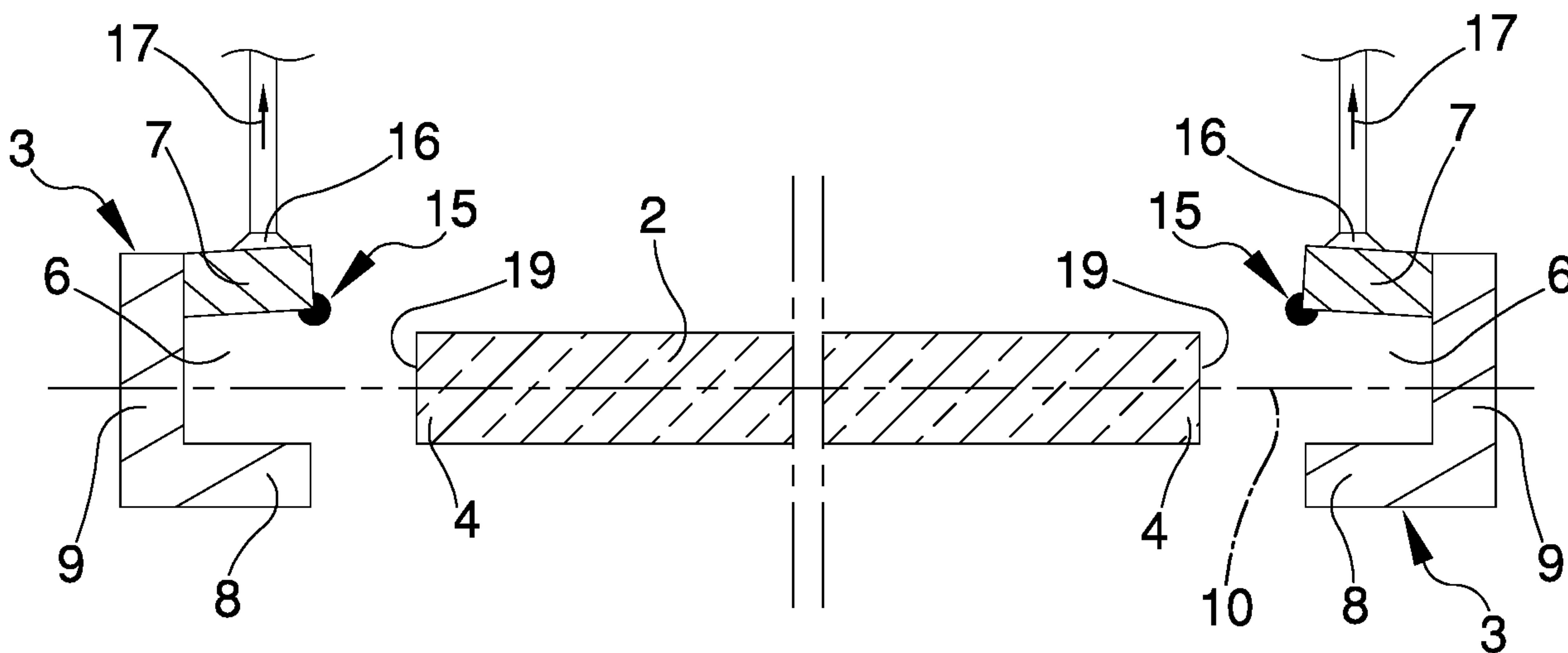


Fig. 16

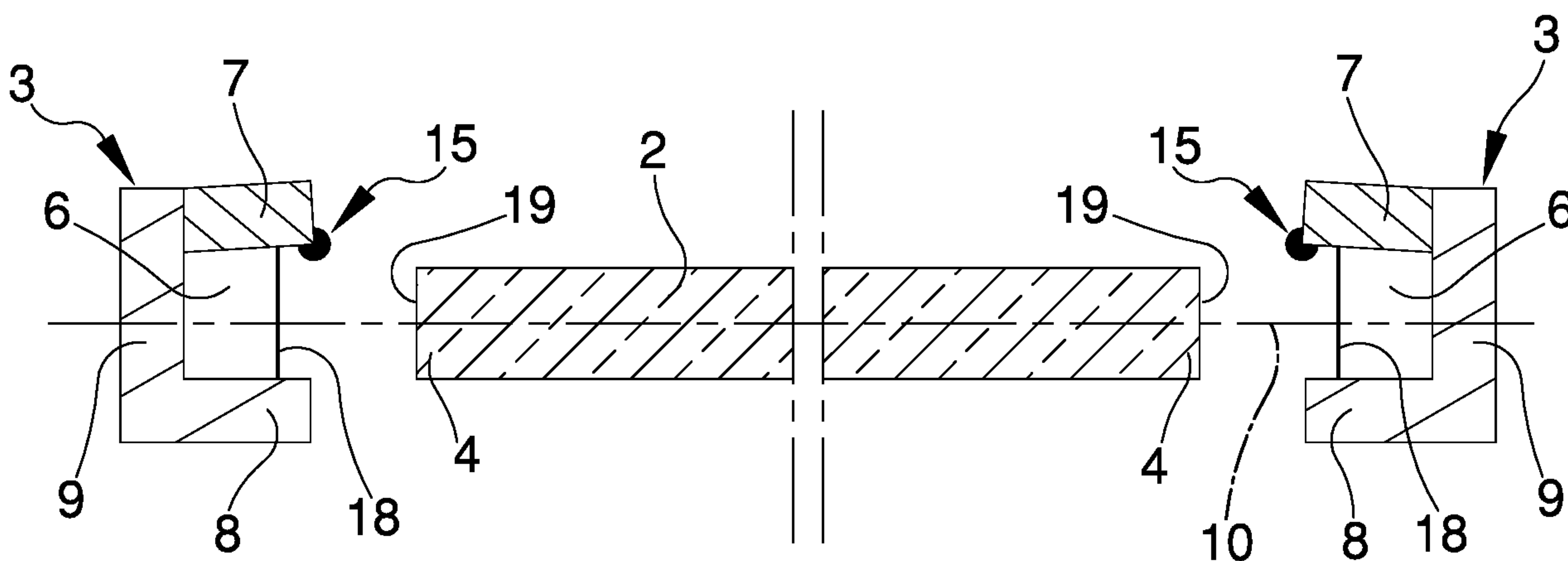


Fig. 17

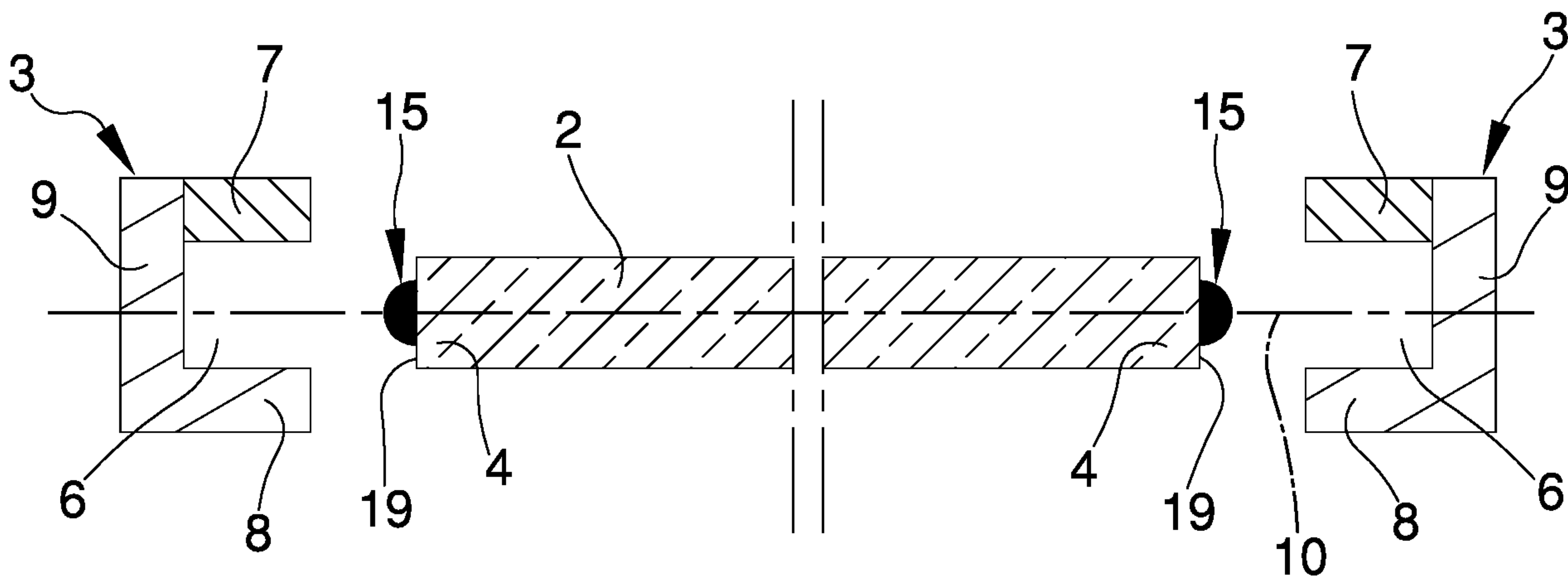


Fig. 18

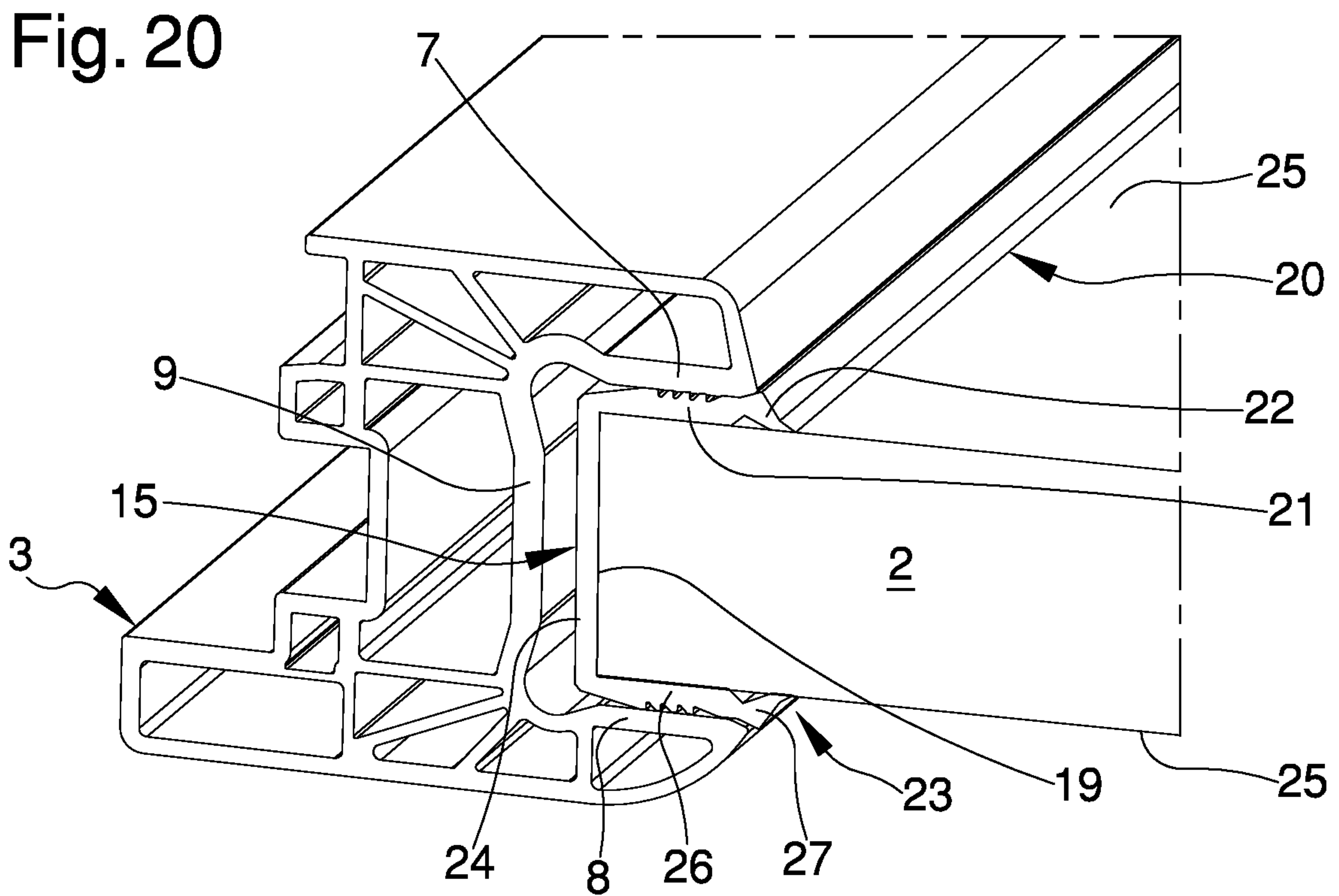
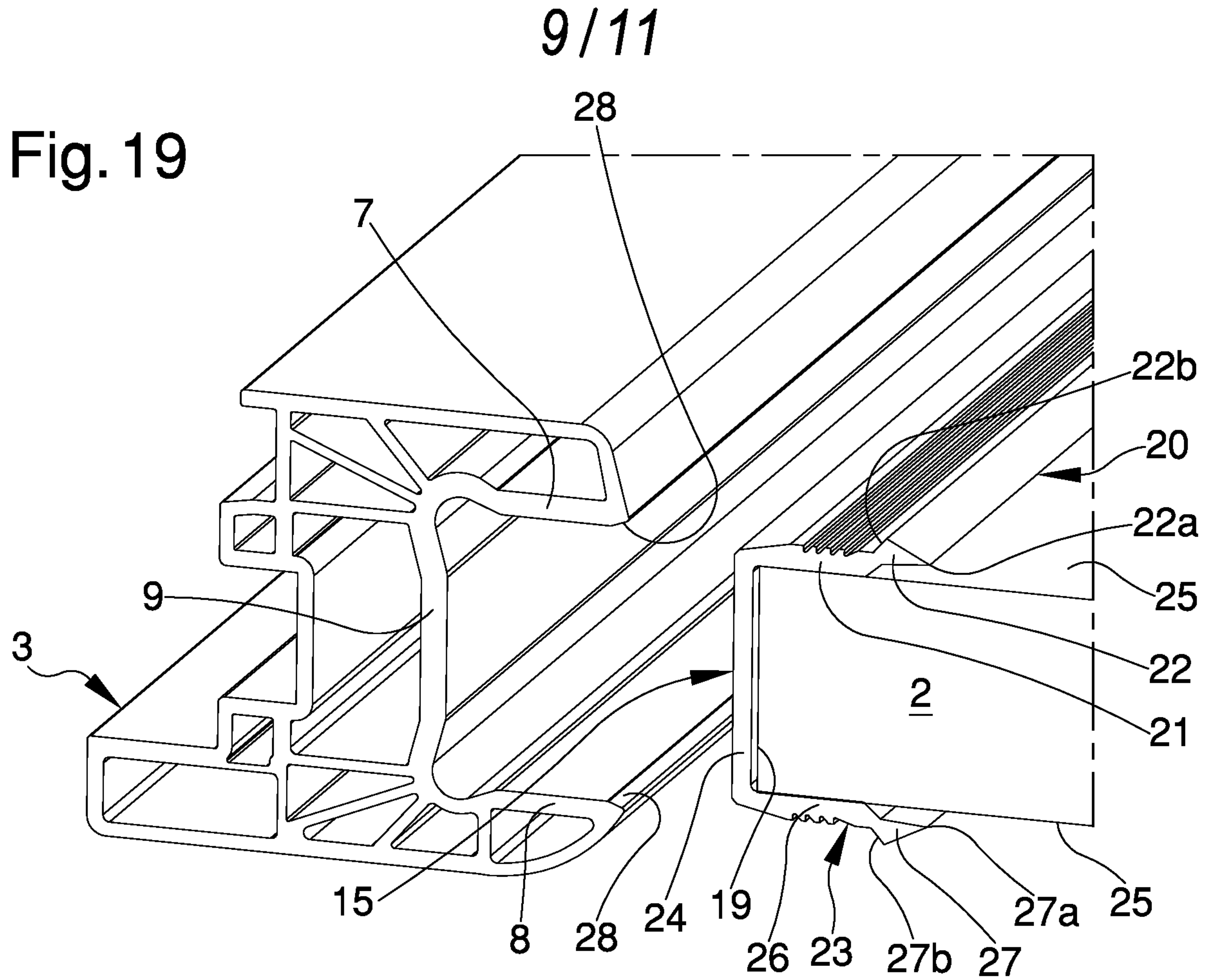


Fig. 21

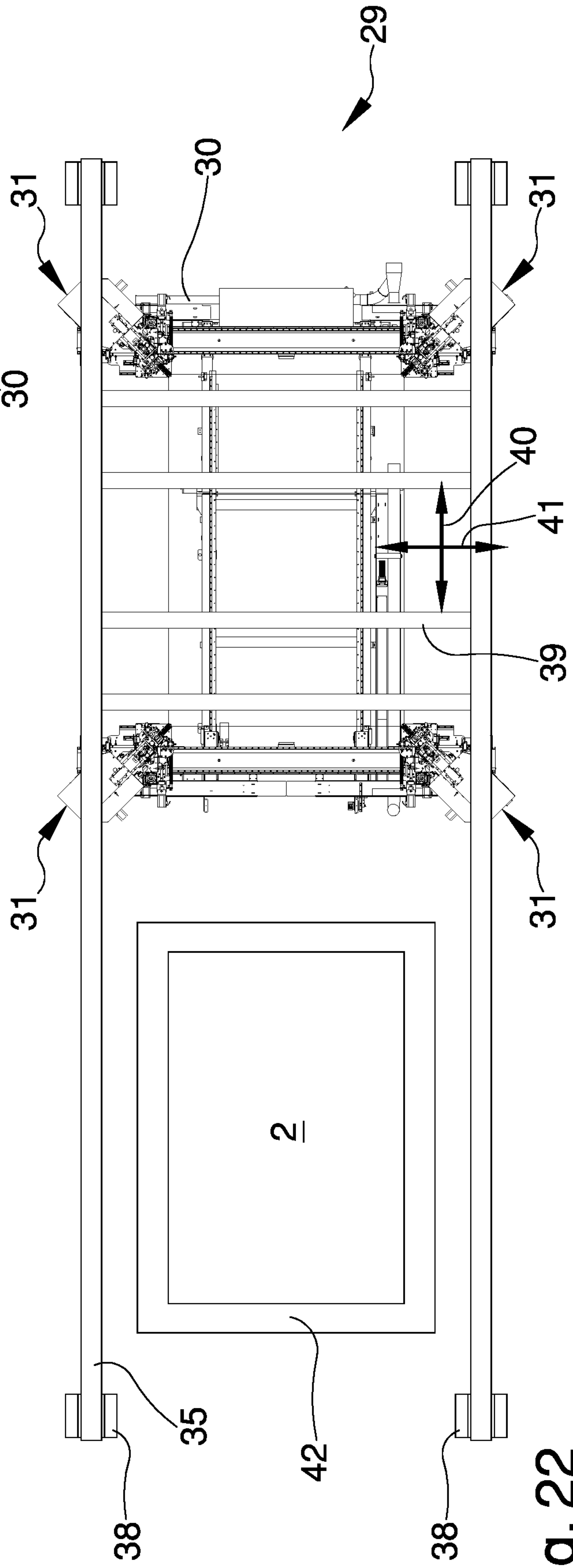
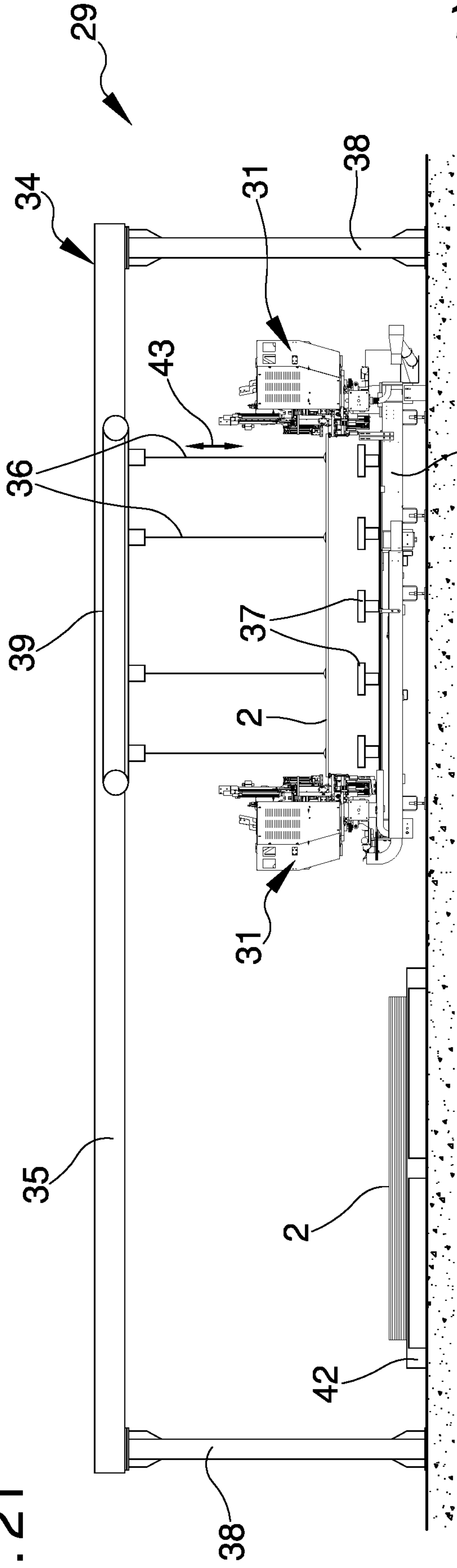


Fig. 22

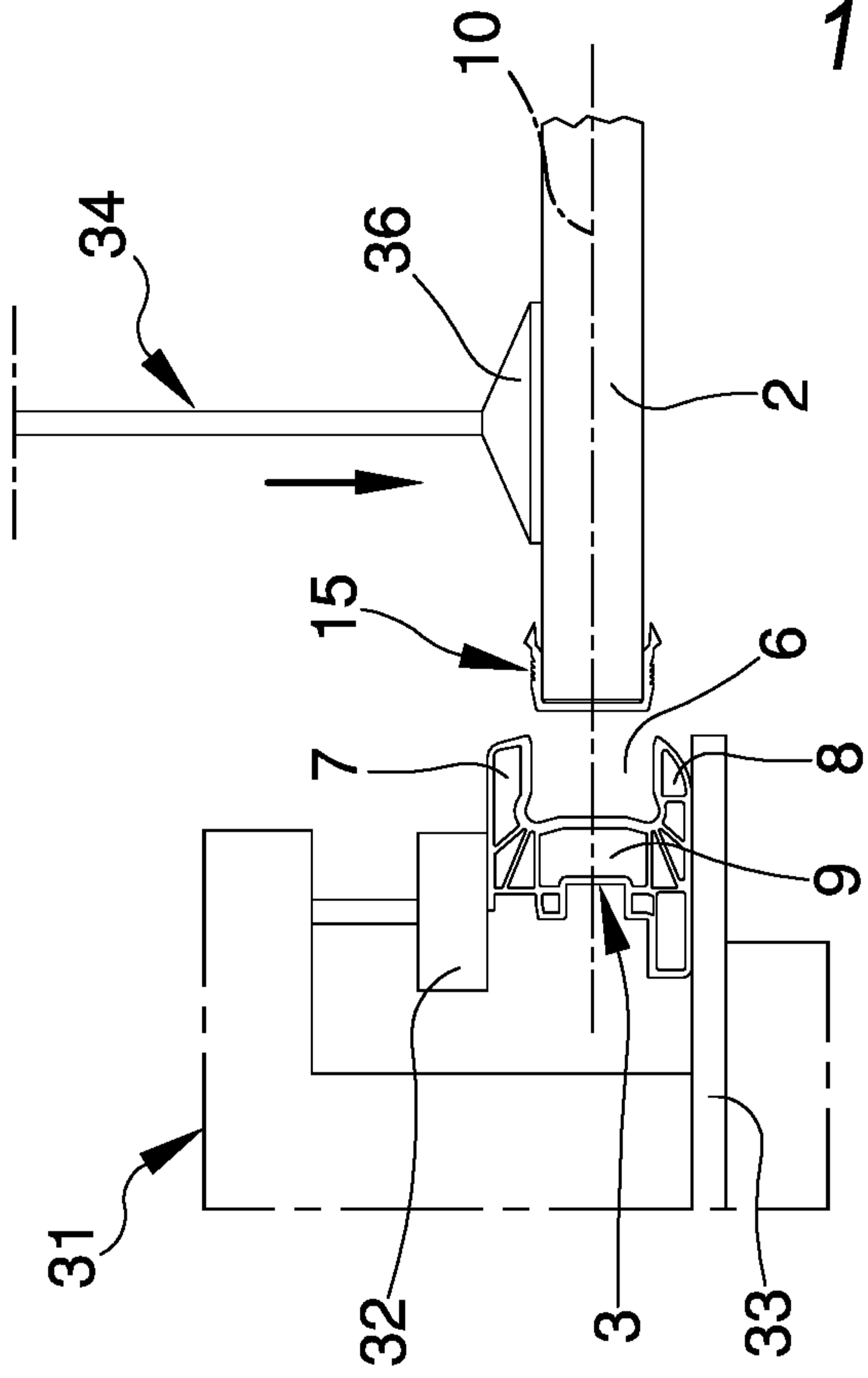


Fig. 24

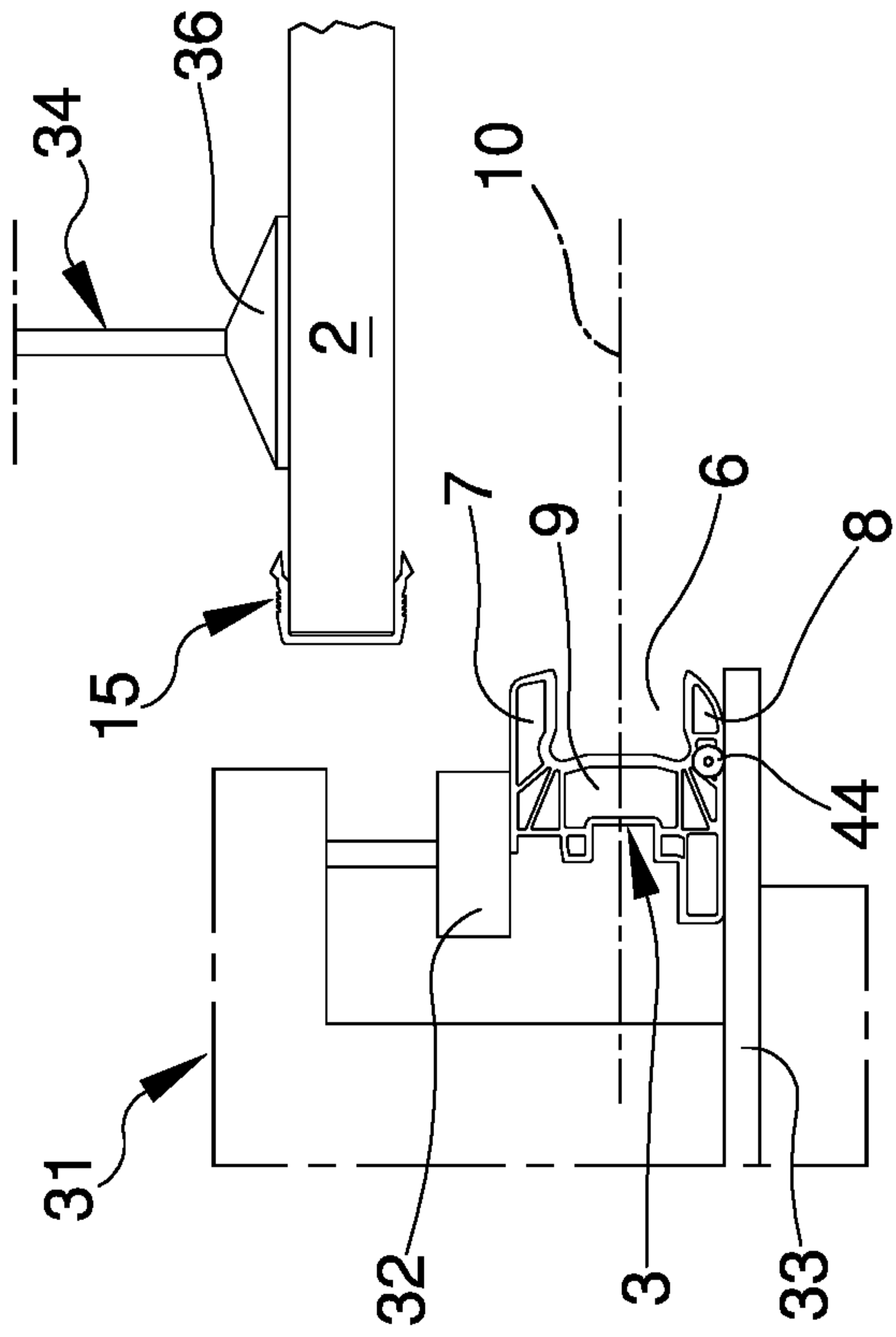


Fig. 23

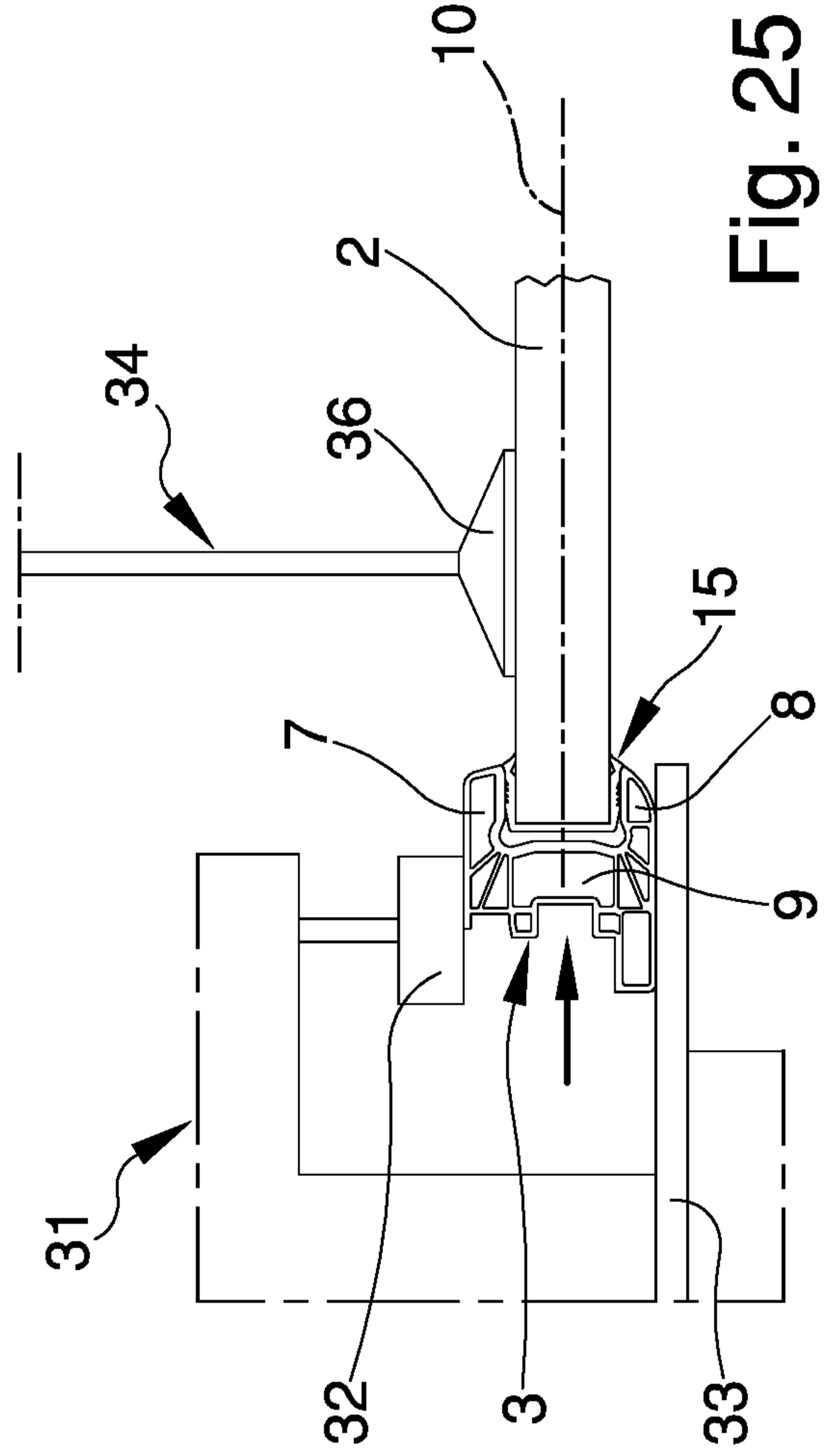


Fig. 25

Fig. 3

