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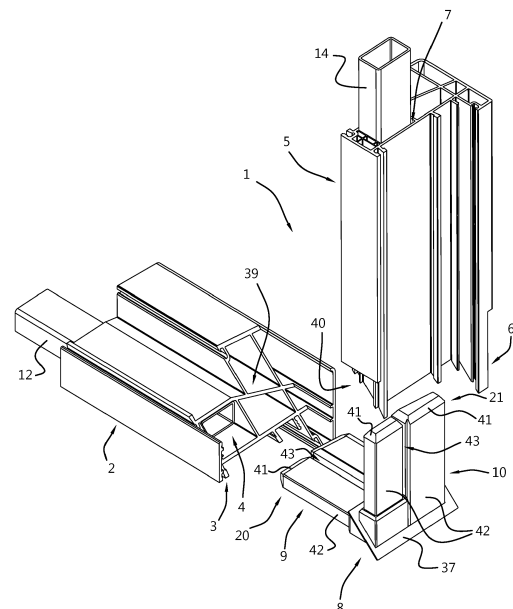
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(54) **CONNECTION CONSTRUCTION COMPRISING WELD-FREE CONNECTED POLYMER-BASED HOLLOW CHAMBER PROFILES**

(57) The invention relates to a connection construction (1) comprising a first polymer-based profile (2) having a first end part (3) and a first hollow chamber (4) that is accessible via the first end part, a second polymer-based profile (5) having a second end part (6) and a second hollow chamber (7) that is accessible via the second end part. The first profile and the second profile are connected in a weld-free way using a connecting device (8) that comprises a first connecting member (9) that is form-fittingly arranged inside at least a part of the first hollow chamber and a second connecting member (10) that is form-fittingly arranged inside at least a part of the second hollow chamber. The connecting device is fully accommodated within said connection construction.

The invention also relates to a method for fabricating a connection construction and a polymer-based hollow chamber frame (38) comprising the same.

Fig. 1A



Description

FIELD OF THE INVENTION

[0001] The present invention relates to a connection construction comprising weld-free connected polymer-based hollow chamber profiles and a polymer-based hollow chamber frame comprising at least one such connection construction. The connection construction and the frame can be used in at least one of polymer-based windows and doors. The invention further relates to a method for fabricating the connection construction.

BACKGROUND OF THE INVENTION

[0002] Polymer-based hollow chamber windows and doors are well-known alternatives for windows and doors comprising at least one of wood and metal. On the one hand they require less maintenance and on the other hand they are lighter than windows and doors of comparable dimensions that comprise at least one of wood and metal. Moreover, polymer-based hollow chamber profiles can be connected in such a way that the polymer-based windows and doors in which they are applied optically resemble wooden windows and doors. Methods for achieving this so-called wood-look connection of polymer-based hollow chamber profiles for windows and doors is described in for example the European patent applications EP 1 726 768, EP 1 605 129 and EP 2 236 723. A disadvantage of the fabrication methods described in the aforementioned documents is that they involve welding of end parts of hollow chamber profiles in for example a corner region of a polymer-based window or door. Fabrication of polymer-based windows and doors in such a way not only adds to the complexity of the fabrication process, also assembly of the polymer-based windows and doors at the site where they are to be installed is at least complicated if not prohibited at all. In addition, a flexible adjustment of the polymer-based windows or doors is not possible. Moreover, the involvement of welding the hollow chamber profiles provides restrictions regarding the dimensions of the polymer-based windows and doors that can be fabricated.

[0003] Consequently, there is a need to provide polymer-based hollow chamber windows and doors that have an improved construction. Moreover, there is a need to provide a process for fabricating the polymer-based hollow chamber windows and doors having such an improved construction.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide a connection construction that pre-empts or at least reduces at least one of the abovementioned and/or other disadvantages associated with polymer-based hollow chamber windows and doors known in the art.

[0005] It is also an object of the present invention to

provide a polymer-based hollow chamber frame for use in at least one of polymer-based windows and doors that comprises at least one connection construction according to the invention.

[0006] Another object of the present invention is to provide a method for fabricating a connection construction comprising weld-free connected polymer-based hollow chamber profiles for use in at least one of polymer-based windows and doors according to the invention.

[0007] Aspects of the present invention are set out in the accompanying independent and dependent claims. Features from the dependent claims may be combined with features from the independent claim as appropriate and not merely as explicitly set out in the claims.

[0008] At least one of the abovementioned objects is achieved by a connection construction comprising weld-free connected polymer-based hollow chamber profiles for use in at least one of polymer-based windows and doors, comprising:

- a first polymer-based profile having a first end part and at least a first hollow chamber that is accessible via the first end part;
- a second polymer-based profile having a second end part and at least a second hollow chamber that is accessible via the second end part, the first end part and the second end part being arranged to connect the first hollow chamber and the second hollow chamber to each other;
- a connecting device comprising:
 - a first connecting member that is form-fittingly arranged inside at least a part of the first hollow chamber that is located adjacent to the first end part of said first profile; and
 - a second connecting member that is form-fittingly arranged inside at least a part of the second hollow chamber that is located adjacent to the second end part of said second profile, wherein the connecting device is fully accommodated within said first profile and said second profile.

[0009] In this way the first polymer-based profile and the second polymer-based profile can be interconnected in a weld-free way using a connecting device that is invisible from the outside as it is completely accommodated with the connection construction. As the first polymer-based profile and the second polymer-based profile do not need to be interconnected using welding, the connection construction according to the invention reduces the complexity of the fabrication of polymer-based windows and doors comprising at least one such connection construction as less process steps are required for assembling them. A further advantage of not needing to weld the polymer-based profiles is that the profiles can be cut or milled on the net dimensions without having to take melt loss into account. In addition, the assembly of polymer-based windows and doors that comprise at least

one connection construction according to the invention at the site where they are to be installed is less complicated as less tooling is required. Moreover, a flexible adjustment of polymer-based windows or doors that comprise at least one connection construction according to the invention is enabled. If required, the polymer-based first profile and the polymer-based second profile can be adjusted and interconnected on site by form-fittingly arranging the first connecting member of the connecting device inside at least a part of the first hollow chamber of the first polymer-based profile that is located adjacent to the first end part of said first profile and by arranging the second connecting member of the connecting device inside at least a part of the second hollow chamber of the second polymer-based profile that is located adjacent to the second end part of said second profile. After assembling the connection construction according to the invention in the way described above, the connecting device is fully accommodated within the first polymer-based profile and the second polymer-based profile.

[0010] Due to the form-fitting arrangement of the first connecting member and the second connecting member inside at least a part of the first hollow chamber of the first polymer-based profile and the second hollow chamber of the second polymer-based profile respectively, the weld-free interconnected hollow chamber profiles yield a robust and stable connection construction. Consequently, in connection constructions according to the invention profiles can be applied that have larger or smaller lengths than the lengths of profiles that can be applied in polymer-based windows and doors known in the art that are fabricated using welding of the polymer-based profiles.

[0011] Hence, the connection construction according to the invention enables an improved instruction and fabrication of polymer-based hollow chamber windows and doors.

[0012] In an embodiment of the connection construction according to the invention, at least a part of the first hollow chamber of said first profile is provided with at least one of a first stiffening zone and a first tubular stiffening element, the first connecting member being form-fittingly arranged in at least a part of at least one of the first stiffening zone and the first tubular stiffening element. By providing at least one of a first stiffening zone and a first tubular stiffening element in at least a part of the first hollow chamber of the first polymer-based profile, said first profile is reinforced. Hence, the length of the first polymer-based profile can be larger than the length of such a profile that is not provided with at least one of a stiffening zone and a tubular stiffening element. As a consequence, the connection construction in which said first reinforced profile is applied is reinforced and the frame in which the reinforced connection construction is applied, is reinforced.

[0013] The first polymer-based profile can be provided with a first stiffening zone either in a part of the first hollow chamber or along the entire length of the first hollow

chamber. Alternatively, the first polymer-based profile can be provided with a first tubular stiffening element either in a part of the first hollow chamber or along the entire length of the first hollow chamber. Alternatively, the first polymer-based profile can be provided with a first stiffening zone in a part of the first hollow chamber and a first tubular stiffening element in another part of the first hollow chamber. It is noted that reinforced hollow chamber profiles comprising a first stiffening zone might be more expensive than hollow chamber profiles that are reinforced only using a first tubular stiffening element.

[0014] Furthermore, according to this exemplary embodiment of the connection construction, the first connecting member of the connecting device is form-fittingly arranged in at least a part of at least one of the first stiffening zone and the first tubular stiffening element. Hence, the first connecting member is one of associated with and directly connected to at least one of the first stiffening zone and the first tubular stiffening element. In this way, the first connecting member is firmly and reliably attached to the first polymer-based profile.

[0015] In an embodiment of the connection construction according to the invention, at least one of the first stiffening zone and the first tubular stiffening element comprises at least one of metal, a metal-reinforced polymer composition, a fiber-reinforced polymer composition, wood and carbon.

[0016] In an embodiment of the connection construction according to the invention, at least a part of the second hollow chamber of said second profile is provided with at least one of a second stiffening zone and a second tubular stiffening element, the second connecting member being form-fittingly arranged in at least a part of at least one of the second stiffening zone and the second tubular stiffening element. By providing at least one of a second stiffening zone and a second tubular stiffening element in at least a part of the second hollow chamber of the second polymer-based profile, said second profile is reinforced. Hence, the length of the second polymer-based profile can be larger than the length of such a profile that is not provided with at least one of a stiffening zone and a tubular stiffening element. As a consequence, the connection construction in which said second reinforced profile is applied is reinforced and the frame in which the reinforced connection construction is applied, is reinforced.

[0017] The second polymer-based profile can be provided with a second stiffening zone either in a part of the second hollow chamber or along the entire length of the second hollow chamber. Alternatively, the second polymer-based profile can be provided with a second tubular stiffening element either in a part of the second hollow chamber or along the entire length of the second hollow chamber. Alternatively, the second polymer-based profile can be provided with a second stiffening zone in a part of the second hollow chamber and a second tubular stiffening element in another part of the second hollow chamber. It is noted that reinforced hollow chamber pro-

files comprising a second stiffening zone might be more expensive than hollow chamber profiles that are reinforced only using a second tubular stiffening element.

[0018] Furthermore, according to this exemplary embodiment of the connection construction, the second connecting member of the connecting device is form-fittingly arranged in at least a part of at least one of the second stiffening zone and the second tubular stiffening element. Hence, the second connecting member is one of associated with and directly connected to at least one of the second stiffening zone and the second tubular stiffening element. In this way, the second connecting member is firmly and reliably attached to the second polymer-based profile.

[0019] In an embodiment of the connection construction according to the invention, at least one of the second stiffening zone and the second tubular stiffening element comprises at least one of metal, a metal-reinforced polymer composition, a fiber-reinforced polymer composition, wood and carbon.

[0020] In an embodiment of the connection construction according to the invention, a set of alignment elements is provided that are configured and arranged to align said first profile and said second profile with respect to each other, at least two alignment elements of the set of alignment elements being arranged transversely with respect to each other. In this way an effective and robust alignment of the first profile and the second profile with respect to each other is achieved. The alignment elements of the set of alignment elements can for example be screws or any other suitable element or combination of elements that the person skilled in the art can conceive and apply in practice.

[0021] In an embodiment of the connection construction according to the invention, a first alignment element of the at least two alignment elements of the set of alignment elements is configured and arranged to extend through a first through hole in said first profile and to be releasably accommodated within said second profile, a second alignment element of the at least two alignment elements of the set of alignment elements being configured and arranged to extend through a second through hole in said second profile and to be releasably accommodated within said first profile. In this way the first alignment element and the second alignment element are not visible from the outside except for their respective end parts that are arranged in the first through hole and the second through hole respectively. The person skilled in the art will appreciate that the respective end parts of the first and second alignment elements can be hidden from the eye by performing at least one post-processing step. In that case, the first and second alignment elements are completely not visible from the outside.

[0022] In an embodiment of the connection construction according to the invention, the alignment elements of the set of alignment elements are configured and arranged to be releasably accommodated within the connecting device. The alignment elements can be arranged

to at least one of pass through through holes that are provided in the respective first and second connecting members of the connecting device and be releasably connected in respective cavities that are provided within the respective first and second connecting members of the connecting device. In this way, at least one of the first connecting member and the second connecting member of the connecting device can be additionally secured to at least one of the first profile and the second profile of the connection construction.

[0023] In an embodiment of the connection construction according to the invention, one of a slidable connection assembly and a snap-fit connection assembly is provided that is configured and arranged to detachably associate a first end portion of the first connecting member and a second end portion of the second connecting member with each other. The slidable connection assembly can comprise two parts of a dove tail connection. The first part of the dove tail connection can be arranged at the first end portion of the first connecting member and the second part of the dove tail connection can be arranged at the second end portion of the second connecting member. By associating the first part and the second part of the dove tail connection, the connecting device of the connection construction can be assembled in a detachable way. The person skilled in the art will appreciate that in an analogous way a first part of a snap-fit connection assembly, for example a hook, can be arranged at the first end portion of the first connecting member and a second part of a snap-fit connection assembly, for example a hole adapted for receiving the hook, can be arranged at the second end portion of the second connecting member. Moreover, the person skilled in the art can conceive any suitable connection assembly and apply it in practice.

[0024] In an embodiment of the connection construction according to the invention, the first connecting member has a first end portion and is provided with a first cavity that is accessible via the first end portion and the second connecting member has a second end portion and is provided with a second cavity that is accessible via the second end portion, the first end portion and the second end portion being detachably associated with each other, wherein a first reinforcement device is provided that has a first part and a second part that are one of fixedly connected to each other and detachably associated with each other, the first part of the first reinforcement device being arranged inside the first cavity of the first end portion of the first connecting member and the second part of the first reinforcement device being arranged inside the second cavity of the second end portion of the second connecting member. The first reinforcement device is completely accommodated within the connecting device. In this way the first reinforcement device increases the strength and stability of the connecting device without being visible from the outside of the connecting device. Furthermore, in an exemplary embodiment of the invention the first end portion of the first connecting

member and the second end portion of the second connecting member are in a supporting contact with each other.

[0025] In an embodiment of the connection construction according to the invention, the first connecting member and the second connecting member are fixedly connected to each other. In this way a connecting device out of one piece is provided that does not need to be assembled. This further reduces the complexity of the fabrication and the assembly of the connection construction. Furthermore, at least one of the first connecting member and the second connecting member are at least one of at least partially massive, at least partially hollow and at least partially reinforced with at least one rib.

[0026] In an embodiment of the connection construction according to the invention, a second reinforcement device is provided that comprises a first element and a second element that are one of fixedly connected to each other and detachably associated with each other, the first element of the second reinforcement device being associated with a first outer surface of the first connecting member and the second element of the second reinforcement device being associated with a second outer surface of the second connecting member, the first outer surface and the second outer surface being arranged to connect to each other. Depending on the requirements of the connection construction it is possible to apply the second reinforcement device to the connecting device. However, in this case the advantage that the reinforcement device is not visible from the outside of the connecting device is not achieved. The person skilled in the art will appreciate that the second reinforcement device can be arranged to each of the outer surfaces of the connecting device that are arranged to connect to each other. In the case the first connecting member and the second connecting member of the connecting device are arranged at a predetermined angle with respect to each other, the second reinforcement device could be arranged in at least one of the so-called "inner corner" and the so-called "outer corner" of the connecting device. Moreover, the person skilled in the art will appreciate that the second reinforcement device can be applied to any kind of connecting device, i.e. to connecting devices comprising detachably associated first and second connecting members and to connecting devices out of one piece comprising fixedly connected first and second connecting members.

[0027] In an embodiment of the connection construction according to the invention, a third reinforcement device is provided that comprises a first structure and a second structure that are one of fixedly connected with each other and detachably associated with each other, the first structure of the third reinforcement device being connected to a first outer surface of said first profile and the second structure of the third reinforcement device being connected to a second outer surface of said second profile, the first outer surface of said first profile and the second outer surface of said second profile being ar-

ranged to connect to each other. In this way the strength and stability of the connection construction can further be improved. The person skilled in the art will appreciate that depending on the requirements for the connection construction, the third reinforcement device can be used together with at least one of the first reinforcement device and the second reinforcement device that are associated with the connecting device.

[0028] In an embodiment of the connection construction according to the invention, said first profile and said second profile are arranged with respect to each other at a predetermined angle in a range between 0° and 180°. In this way a connection construction can be provided for any kind of frame comprising polymer-based hollow chamber profiles. The person skilled in the art will appreciate that the first end part of the first polymer-based profile can be provided with a first miter region and the second end part of the second polymer-based profile can be provided with a second miter region, wherein the first miter region and the second miter region are configured and arranged to achieve the first profile and the second profile to be interconnected at an angle of for example 90°. The first miter region and the second miter region can have any suitable pair of angles to achieve this, for example 45°/45°, 40°/50°, 30°/60°.

[0029] Furthermore, the skilled person will appreciate that the first miter region and the second miter region need not be visible from the outside of the connection construction. The first miter region and the second miter region are not visible from the outside when they are connected using the so-called wood look connection mentioned above.

[0030] Moreover, the person skilled in the art will appreciate that the first profile and the second profile can have one of equal and different cross section contours.

[0031] In an embodiment of the connection construction according to the invention, at least one sealing element is provided to seal at least the first hollow chamber of said first profile and the second hollow chamber of said second profile. In this way, a connection construction can be provided that is fluid tight. The at least one sealing element can be arranged as a separate element around the connecting device and between the first profile and the second profile to seal both the first hollow chamber and the second hollow chamber at the same time after assembly of the connection construction. However, the at least one sealing element can also be integrated with one of the first profile, the second profile and the connecting device to achieve this effect.

[0032] According to another aspect of the present invention, a polymer-based hollow chamber frame for use in at least one of polymer-based windows and doors is provided comprising at least one connection construction according to the invention. The person skilled in the art will appreciate that such frames benefit from the above-mentioned advantages provided by the connection construction according to the invention.

[0033] According to another aspect of the present in-

vention, a method is provided for fabricating a connection construction comprising weld-free connected polymer-based hollow chamber profiles for use in at least one of polymer-based windows and doors. The method comprising:

- providing a first polymer-based profile having a first end part and at least a first hollow chamber that is accessible via the first end part;
- providing a second polymer-based profile having a second end part and at least a second hollow chamber that is accessible via the second end part;
- providing a connecting device that comprises a first connecting member that is configured to be form-fittingly arranged inside at least a part of the first hollow chamber that is located adjacent to the first end part of said first profile and a second connecting member that is configured to be form-fittingly arranged inside at least a part of the second hollow chamber that is located adjacent to the second end part of said second profile; and
- establishing a first form-fitting connection between the first connecting member and said first profile by inserting the first connecting member into at least a part of the first hollow chamber via the first end part and a second form-fitting connection between the second connecting member and said second profile by inserting the second connecting member into at least a part of the second hollow chamber via the second end part, wherein the connecting device is fully accommodated within said first profile and said second profile upon assembling the connection construction.

[0034] In an embodiment of the method according to the invention, the method comprises:

- providing at least a part of the first hollow chamber of said first profile with at least one of a first stiffening zone and a first tubular stiffening element;
- form-fittingly arranging the first connecting member in at least a part of at least one of the first stiffening zone and the first tubular stiffening element.

[0035] In an embodiment of the method according to the invention, the method comprises:

- providing at least a part of the second hollow chamber of said second profile with at least one of a second stiffening zone and a second tubular stiffening element;
- form-fittingly arranging the second connecting member in at least a part of at least one of the second stiffening zone and the second tubular stiffening element.

[0036] In an embodiment of the method according to the invention, the method comprises:

- providing a set of alignment elements that are configured and arranged to align said first profile and said second profile with respect to each other;
- arranging at least two alignment elements of the set of alignment elements transversely with respect to each other, wherein a first alignment element of the at least two alignment elements of the set of alignment elements is inserted through a first through hole in said first profile and releasably accommodated within said second profile, a second alignment element of the at least two alignment elements of the set of alignment elements being inserted through a second through hole in said second profile and releasably accommodated within said first profile.

[0037] In an embodiment of the method according to the invention, the method comprises releasably accommodating the alignment elements of the set of alignment elements within the connecting device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] Further features and advantages of the invention will become apparent from the description of the invention by way of exemplary and non-limiting embodiments of a connection construction according to the invention and a polymer-based hollow chamber frame for use in at least one of polymer-based windows and doors that comprises at least one connection construction according to the invention.

[0039] The person skilled in the art will appreciate that the described embodiments of the connection construction and the polymer-based hollow chamber frame are exemplary in nature only and not to be construed as limiting the scope of protection in any way. The person skilled in the art will realize that alternatives and equivalent embodiments of the connection construction and the polymer-based hollow chamber frame can be conceived and reduced to practice without departing from the scope of protection of the present invention.

[0040] Reference will be made to the figures on the accompanying drawing sheets. The figures are schematic in nature and therefore not necessarily drawn to scale. Furthermore, equal reference numerals denote equal or similar parts. On the attached drawing sheets,

figure 1A shows a schematic exploded view of a first exemplary, non-limiting embodiment of a connection construction according to the invention;
figure 1B shows a schematic partially exploded view of the first embodiment of the connection construction shown in figure 1A;
figure 1C shows a schematic perspective view of the first embodiment of the connection construction shown in figure 1A upon assembly;
figure 1D shows a schematic perspective view of the first embodiment of the connection construction shown in figure 1A after assembly;

figure 2A shows a schematic perspective view of a first exemplary, non-limiting embodiment of a connecting device of the connection construction shown in figures 1A and 1B;

figure 2B shows a schematic perspective view of a second exemplary, non-limiting embodiment of a connecting device of the connection construction according to the invention;

figure 3A shows a schematic side view of a third exemplary, non-limiting embodiment of a connecting device of the connection construction according to the invention;

figure 3B shows a schematic side view of a fourth exemplary, non-limiting embodiment of a connecting device of the connection construction according to the invention;

figure 3C shows a schematic side view of a fifth exemplary, non-limiting embodiment of a connecting device of the connection construction according to the invention;

figure 4A shows a schematic side view of a sixth exemplary, non-limiting embodiment of a connecting device of the connection construction according to the invention;

figure 4B shows a schematic side view of a seventh exemplary, non-limiting embodiment of a connecting device of the connection construction according to the invention;

figure 4C shows a schematic side view of an eighth exemplary, non-limiting embodiment of a connecting device of the connection construction according to the invention;

figure 5A shows a schematic side view of a ninth exemplary, non-limiting embodiment of a connecting device of the connection construction according to the invention;

figure 5B shows a schematic front view of the ninth exemplary, non-limiting embodiment of the connecting device of the connection construction shown in figure 5A;

figure 5C shows another schematic side view of the ninth exemplary, non-limiting embodiment of the connecting device of the connection construction shown in figures 5A and 5B;

figure 5D shows a schematic side view of a tenth exemplary, non-limiting embodiment of a connecting device of the connection construction according to the invention;

figure 6 shows a schematic side view of a second exemplary, non-limiting embodiment of the connection construction according to the invention; and

figure 7 shows a schematic layout of a first exemplary, non-limiting embodiment of a polymer-based hollow chamber frame for use in at least one of polymer-based windows and doors comprising connection constructions according to the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0041] Figure 1A shows a schematic exploded view of a first exemplary, non-limiting embodiment of a connection construction 1 according to the invention. The connection construction comprises a first polymer-based profile 2 that has a first end part 3 and a first hollow chamber 4 that is accessible via the first end part. The connection construction further comprises a second polymer-based profile 5 that has a second end part 6 and at least a second hollow chamber 7 that is accessible via the second end part. After assembly of the connection construction 1, the first end part 3 and the second end part 6 are arranged to connect the first hollow chamber 4 and the second hollow chamber 7 to each other.

[0042] Furthermore, figure 1A shows that the connection construction 1 comprises a connecting device 8. According to a first exemplary, non-limiting embodiment of the connecting device 8 shown in figures 1A and 2A the connecting device 8 has a first connecting member 9 and a second connecting member 10 that are fixedly connected to each other. Moreover, according to this first embodiment of the connecting device 8, both the first connecting member 9 and the second connecting member 10 comprise two so-called legs 42 that are separated by a slit 43. The slit 43 allows each one of the legs of for example the first connecting member 9 to be inserted into a respective hollow chamber of the first profile 2. This can be seen in figure 1B. The same applies to the legs 42 of the second connecting member 10. The person skilled in the art will appreciate that after assembly of the connection construction 1, the first connecting member 9 is form-fittingly arranged inside a part of the first hollow chamber 4 that is located adjacent to the first end part 3 of the first profile 2, and the second connecting member 10 is form-fittingly arranged inside a part of the second hollow chamber 7 that is located adjacent to the second end part 6 of the second profile 5. As can be seen in figure 1C, upon assembly of the connection construction 1, the connecting device 8 is fully accommodated within the first profile 2 and the second profile 5, i.e. the connecting device 8 is not visible from the outside of the connection construction 1. The person skilled in the art will appreciate that the connecting device 8 can comprise at least one of a metal, a metal-reinforced polymer composition, a fiber-reinforced polymer composition, nylon, wood and carbon. The connecting device 8 can be fabricated via any suitable fabrication technique including 3D printing, extrusion and injection molding.

[0043] Figures 1A and 1B show that the connection construction 1 comprises a sealing element 37 that is configured and arranged to seal both the first hollow chamber 4 of said first profile 2 and the second hollow chamber 7 of said second profile 5 after assembly of the connection construction 1. In this way, the connection construction is fluid tight. The sealing element 37 is arranged as a separate element around the connecting device 8 and between the first profile 2 and the second

profile 5 to seal both the first hollow chamber 4 and the second hollow chamber 7 at the same time after assembly of the connection construction 1. However, according to another exemplary embodiment of the connection construction 1, the sealing element 37 can also be integrated with one of the first profile 2, the second profile 5 and the connecting device 8 to achieve this effect.

[0044] According to the first, exemplary embodiment of the connection construction 1 shown in figures 1C and 1D, the first profile 2 and the second profile 5 are arranged with respect to each other at a predetermined angle of 90°. The person skilled in the art will appreciate that the predetermined angle between the first and the second profiles can be chosen in a range between 0° and 180°. In this way a connection construction can be provided for any kind of frame comprising polymer-based hollow chamber profiles.

[0045] As can be seen in figure 1A, the first end part 3 of the first polymer-based profile 2 has been provided with a first miter region 39 and the second end part 6 of the second polymer-based profile 5 has been provided with a second miter region 40. In this particular embodiment, the first miter region and the second miter region have a pair of angles equal to 45°/45°. As described above, the person skilled in the art will appreciate that other suitable pairs of angles can be envisaged. Moreover, figure 1C shows that the first miter region 39 and the second miter region 40 are not visible from the outside of the connection construction 1 as the first profile 2 and the second profile 5 are connected using the so-called wood look connection mentioned above. In addition, the person skilled in the art will appreciate that the first profile 2 and the second profile 5 can have one of equal and different cross section contours.

[0046] Figure 1A shows that the connection construction 1 comprises a first tubular stiffening element 12 and a second tubular stiffening element 14. The first tubular stiffening element 12 is arranged in a part of the first hollow chamber 4 of the first profile 2 that is located adjacent to the first end part 3 of the first profile 2. Analogously, the second tubular stiffening element 14 is arranged in a part of the second hollow chamber 7 of the second profile 5 that is located adjacent to the second end part 6 of the second profile 5. Moreover, after assembly of the first exemplary, non-limiting embodiment of the connection construction 1, the first connecting member 9 is form-fittingly arranged in a part of the first tubular stiffening element 12 and the second connecting member 10 is form-fittingly arranged in a part of the second tubular stiffening element 14. The respective first end portion 20 of the first connecting member 9 and the second end portion 21 of the second connecting member 10 are provided with milling surfaces 41 to enable an easier insertion of one of the legs 42 of the first connecting member 9 and one of the legs 42 of the second connecting member 10 into respectively the first tubular stiffening element 12 of the first profile 2 and the second tubular stiffening element 14 of the second profile 5. The first

connecting member 9 and the second connecting member 10 have a length of at least 60 mm.

[0047] The first connecting member 9 and the second connecting member 10 can additionally be connected with respectively the first tubular stiffening element 12 and the second tubular stiffening element 14 using at least one of mechanical connecting means, such as screws, and adhesive connecting means, such as glue or sealant. The person skilled in the art will appreciate that many different arrangements of tubular stiffening elements and connecting members can be envisaged. The person skilled in the art will appreciate that the tubular stiffening elements can comprise at least one of metal, a metal-reinforced polymer composition, a fiber-reinforced polymer composition, wood and carbon.

[0048] As described above, it is even possible to provide the hollow chamber of the respective profiles with at least one stiffening zone. In that case not tubular stiffening element would be required. However, it is also possible to combine a stiffening zone and tubular stiffening elements depending on the requirements of the application of the connection construction. The person skilled in the art will appreciate that at least one of the stiffening zones and the tubular stiffening elements can comprise at least one of metal, a metal-reinforced polymer composition, a fiber-reinforced polymer composition, wood and carbon.

[0049] Figure 1C shows a schematic perspective view of the connection construction 1 shown in figure 1A upon assembly. A set of alignment elements 15 is provided that are configured and arranged to align the first profile 2 and the second profile 5 with respect to each other. A first alignment element 15a and a second alignment element 15b are arranged transversely with respect to each other. The first alignment element 15a can extend through a first through hole 16 in the first profile 2 and can be releasably accommodated within the second profile 5. The second alignment element 15b can extend through a second through hole 17 in the second profile 5 and can be releasably accommodated within the first profile 2. The alignment elements enable an effective and robust alignment of the first profile 2 and the second profile 5 with respect to each other. The alignment elements shown in figure 1C are screws. The person skilled in the art will appreciate that any other suitable element or combination of elements can be used. The person skilled in the art will appreciate that the respective end parts of the alignment elements 15 can be hidden from the eye by performing at least one post-processing step. In that case, the alignment elements 15 are completely not visible from the outside. In addition, the person skilled in the art will appreciate that according to another exemplary, non-limiting embodiment of the connection construction no alignment elements 15 are required. As described above, the first connecting member 9 and the second connecting member 10 can be connected with respectively the first tubular stiffening element 12 and the second tubular stiffening element 14 using adhesive con-

necting means, such as glue or sealant. Moreover, the person skilled in the art will appreciate that it is also conceivable that according to yet another exemplary, non-limiting embodiment of the connection construction alignment elements are used in combination with adhesive connecting means, e.g. glue or sealant.

[0050] Figure 2B shows a schematic perspective view of a second exemplary, non-limiting embodiment of a connecting device 8 of the connection construction 1 according to which embodiment both the first connecting member 9 and the second connecting member 10 comprise one so-called leg 42. The respective first end portion 20 of the first connecting member 9 and the second end portion 21 of the second connecting member 10 are provided with milling surfaces 41 to enable an easier insertion of the leg 42 of the first connecting member 9 and the leg 42 of the second connecting member 10 into respectively the first tubular stiffening element 12 of the first profile 2 and the second tubular stiffening element 14 of the second profile 5. The person skilled in the art will appreciate that the number of so-called legs of the first connecting member 9 and of the second connecting member 10 depends on the actual design of respectively the first hollow chamber profile 2, the second hollow chamber profile 5, the first tubular stiffening element 12 and the second tubular stiffening element 14 if applied.

[0051] Figure 3A shows a schematic side view of a third exemplary, non-limiting embodiment of a connecting device 8 of the connection construction 1 according to the invention. A slidable connection assembly 18 is provided that is configured and arranged to detachably associate the first end portion 20 of the first connecting member 9 and the second end portion 21 of the second connecting member 10 with each other. As shown in figure 2A, the slidable connection assembly 18 comprises two parts of a dove tail connection.

[0052] Figure 3B shows a schematic side view of a fourth exemplary, non-limiting embodiment of a connecting device 8 of the connection construction 1 according to the invention. It can be seen that a differently configured slidable connection assembly 18 is provided between the first end portion 20 of the first connecting member 9 and the second end portion 21 of the second connecting member 10.

[0053] Figure 3C shows a schematic side view of a fifth exemplary, non-limiting embodiment of a connecting device 8 of the connection construction 1 according to the invention. In this case a snap-fit connection assembly 19 is provided. It can be seen that a first part of the snap-fit connection assembly is arranged at the first end portion 20 of the first connecting member 9 and a second part of the snap-fit connection assembly is arranged at the second end portion 21 of the second connecting member 10. Moreover, it is appreciated that the person skilled in the art can conceive any suitable connection assembly and apply it in practice.

[0054] Figure 4A shows a schematic side view of a sixth exemplary, non-limiting embodiment of a connect-

ing device 8 of the connection construction 1 according to the invention. The first connecting member 9 is provided with a first cavity 22 that is accessible via the first end portion 20. The second connecting member 10 is provided with a second cavity 23 that is accessible via the second end portion 21. A first reinforcement device 24 is provided that has a first part 25 and a second part 26 that are fixedly connected to each other. The first part 25 of the first reinforcement device 24 is pushed inside the first cavity 22 of the first end portion 20 of the first connecting member 9 and the second part 26 of the first reinforcement device 24 is pushed inside the second cavity 23 of the second end portion 21 of the second connecting member 10. The person skilled in the art will appreciate that when the first end portion 20 and the second end portion 21 are detachably associated in a supporting contact with each other, the first reinforcement device 24 is completely accommodated within the connecting device 8. In this way the first reinforcement device 24 increases the strength and stability of the connecting device 8 without being visible from the outside of the connecting device 8.

[0055] Figure 4B shows a schematic side view of a seventh exemplary, non-limiting embodiment of a connecting device 8 of the connection construction 1 according to the invention. It can be seen that the first part 25 and the second part 26 of the first reinforcement device 24 are detachably associated with each other via a slidable connection assembly 18. In an analogous way as described in relation to figure 4A, the first part 25 of the first reinforcement device 24 is pushed inside the first cavity 22 of the first end portion 20 of the first connecting member 9 and the second part 26 of the first reinforcement device 24 is pushed inside the second cavity 23 of the second end portion 21 of the second connecting member 10. When the first end portion 20 and the second end portion 21 are detachably associated in a supporting contact with each other, the first reinforcement device 24 is completely accommodated within the connecting device 8.

[0056] Figure 4C shows a schematic side view of an eighth exemplary, non-limiting embodiment of a connecting device 8 of the connection construction 1 according to the invention. The connecting device 8 comprises a first reinforcement device 24 as shown in figure 4A. In addition, the connecting device 8 is provided with a second reinforcement device 27 that will be further described in relation to figures 5A to 5D.

[0057] Figure 5A shows a schematic side view of a ninth exemplary, non-limiting embodiment of a connecting device 8 of the connection construction 1 according to the invention. A second reinforcement device 27 is provided that comprises a first element 28 and a second element 29 that are fixedly connected to each other. Although not explicitly shown, the person skilled in the art will appreciate that the first element 28 and the second element 29 of the second reinforcement device 27 can be detachably associated with each other via any suitable

connection assembly, e.g. a slidable connection assembly or a snap-fit connection assembly.

[0058] Figure 5A shows that the first element 28 of the second reinforcement device 27 is associated with a first outer surface 30 of the first connecting member 9 and the second element 29 of the second reinforcement device 27 is associated with a second outer surface 31 of the second connecting member 10. The first outer surface 30 and the second outer 31 surface being arranged to connect to each other. Depending on the requirements of the connection construction 1 it is possible to apply the second reinforcement device 27 to the connecting device 8. As can be seen in figure 5A, the second reinforcement device 27 is arranged at the so-called "outer corner" of the connecting device 8. Moreover, the person skilled in the art will appreciate that the second reinforcement device 27 can be applied to any kind of connecting device, i.e. to connecting devices comprising detachably associated first and second connecting members and to connecting devices out of one piece comprising fixedly connected first and second connecting members.

[0059] Figure 5B shows a schematic front view of the ninth exemplary, non-limiting embodiment of the connecting device 8 of the connection construction shown in figure 5A. It can be seen that two second reinforcement devices 27 are provided. The first elements 28 of the two second reinforcement devices 27 are connected with the legs 42 of the first connecting member 9. The second elements 29 of the two second reinforcement devices 27 are connected with the legs 42 of the second connecting member 10.

[0060] Figure 5C shows another schematic side view of the ninth exemplary, non-limiting embodiment of the connecting device 8 of the connection construction shown in figures 5A and 5B.

[0061] Figure 5D shows a schematic side view of a tenth exemplary, non-limiting embodiment of a connecting device 8 of the connection construction 1 according to the invention. According to this embodiment, the second reinforcement device 27 is arranged in the so-called "inner corner" of the connecting device 8. Although not explicitly shown, it is also possible to apply the second reinforcement device 27 to both the "inner corner" and the "outer corner" of the connecting device 8.

[0062] Figure 6 shows a schematic side view of a second exemplary, non-limiting embodiment of the connection construction 1 according to the invention. A third reinforcement device 32 is provided that comprises a first structure 33 and a second structure 34 that are fixedly connected with each other. The first structure 33 of the third reinforcement device 32 is connected to a first outer surface 35 of the first profile 2 and the second structure 34 of the third reinforcement device 32 is connected to a second outer surface 36 of the second profile 5. The first outer surface 35 of the first profile 2 and the second outer surface 36 of the second profile 5 are arranged to connect to each other. In this way the strength and stability of the connection construction 1 can further be im-

proved.

[0063] Although not explicitly shown, the person skilled in the art will appreciate that the first structure 33 and the second structure 34 of the third reinforcement device 32 can be detachably associated with each other via any suitable connection assembly, e.g. a slidable connection assembly or a snap-fit connection assembly.

[0064] Moreover, the person skilled in the art will appreciate that depending on the requirements for the connection construction 1, the third reinforcement device 32 can be used together with at least one of the first reinforcement device 24 and the second reinforcement device 25.

[0065] Figure 7 shows a schematic layout of a first exemplary, non-limiting embodiment of a polymer-based hollow chamber frame 38 for use in at least one of polymer-based windows and doors comprising connection constructions 1 according to the invention. As described above, the polymer-based hollow chamber profiles of the frame 38 are connected in a weld-free way. The person skilled in the art will appreciate that any number of connection constructions 1 according to the invention can be applied depending on the requirements of the frame.

[0066] The present invention can be summarized as relating to a connection construction 1 comprising a first polymer-based profile 2 having a first end part 3 and a first hollow chamber 4 that is accessible via the first end part, a second polymer-based profile 5 having a second end part 6 and a second hollow chamber 7 that is accessible via the second end part. The first profile and the second profile are connected in a weld-free way using a connecting device 8 that comprises a first connecting member 9 that is form-fittingly arranged inside at least a part of the first hollow chamber and a second connecting member 10 that is form-fittingly arranged inside at least a part of the second hollow chamber. The connecting device is fully accommodated within said connection construction. The invention also relates to a method for fabricating a connection construction and a polymer-based hollow chamber frame 38 comprising the same.

[0067] It will be clear to a person skilled in the art that the scope of the present invention is not limited to the examples discussed in the foregoing but that several amendments and modifications thereof are possible without deviating from the scope of the present invention as defined by the attached claims. In particular, combinations of specific features of various aspects of the invention may be made. An aspect of the invention may be further advantageously enhanced by adding a feature that was described in relation to another aspect of the invention. While the present invention has been illustrated and described in detail in the figures and the description, such illustration and description are to be considered illustrative or exemplary only, and not restrictive.

[0068] The present invention is not limited to the disclosed embodiments. Variations to the disclosed embodiments can be understood and effected by a person skilled in the art in practicing the claimed invention, from

a study of the figures, the description and the attached claims. In the claims, the word "comprising" does not exclude other steps or elements, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. Any reference numerals in the claims should not be construed as limiting the scope of the present invention.

REFERENCE NUMERALS

[0069]

1	connection construction	15
2	first polymer-based profile	
3	first end part of the first profile	
4	first hollow chamber of the first profile	
5	second polymer-based profile	
6	second end part of the second profile	20
7	second hollow chamber of the second profile	
8	connecting device	
9	first connecting member of the connecting device	
10	second connecting member of the connecting device	25
11	first stiffening zone	
12	first tubular stiffening element	
13	second stiffening zone	
14	second tubular stiffening element	30
15	set of alignment elements	
15a, 15b	two transversely arranged alignment elements	
16	first through hole	
17	second through hole	35
18	slidable connection assembly	
19	snap-fit connection assembly	
20	first end portion of the first connecting member	
21	second end portion of the second connecting member	40
22	first cavity of the first end portion of the first connecting member	
23	second cavity of the second end portion of the second connecting member	45
24	first reinforcement device	
25	first part of the first reinforcement device	
26	second part of the first reinforcement device	
27	second reinforcement device	
28	first element of the second reinforcement device	50
29	second element of the second reinforcement device	
30	first outer surface of the first connecting member	55
31	second outer surface of the second connecting member	
32	third reinforcement device	

33	first structure of the third reinforcement device
34	second structure of the third reinforcement device
5 35	first outer surface of the first profile
36	second outer surface of the second profile
37	sealing element
38	polymer-based hollow chamber frame
39	first miter region
10 40	second miter region
41	milling surfaces
42	legs of the first and the second connecting members
43	slit between two legs of the first and second connecting members

Claims

1. A connection construction (1) comprising weld-free connected polymer-based hollow chamber profiles for use in at least one of polymer-based windows and doors, comprising:
 - a first polymer-based profile (2) having a first end part (3) and at least a first hollow chamber (4) that is accessible via the first end part;
 - a second polymer-based profile (5) having a second end part (6) and at least a second hollow chamber (7) that is accessible via the second end part, the first end part and the second end part being arranged to connect the first hollow chamber and the second hollow chamber to each other;
 - a connecting device (8) comprising:
 - a first connecting member (9) that is form-fittingly arranged inside at least a part of the first hollow chamber (4) that is located adjacent to the first end part (3) of said first profile (2); and
 - a second connecting member (10) that is form-fittingly arranged inside at least a part of the second hollow chamber (7) that is located adjacent to the second end part (6) of said second profile (5),
 wherein the connecting device (8) is fully accommodated within said first profile (2) and said second profile (5).
2. The connection construction (1) according to claim 1, wherein at least a part of the first hollow chamber (4) of said first profile (2) is provided with at least one of a first stiffening zone (11) and a first tubular stiffening element (12), the first connecting member (9) being form-fittingly arranged in at least a part of at least one of the first stiffening zone (11) and the first tubular stiffening element (12).

3. The connection construction (1) according to claim 2, wherein at least one of the first stiffening zone (11) and the first tubular stiffening element (12) comprises at least one of metal, a metal-reinforced polymer composition, a fiber-reinforced polymer composition, wood and carbon. 5
4. The connection construction (1) according to any one of the preceding claims, wherein at least a part of the second hollow chamber (7) of said second profile (5) is provided with at least one of a second stiffening zone (13) and a second tubular stiffening element (14), the second connecting member (10) being form-fittingly arranged in at least a part of at least one of the second stiffening zone (13) and the second tubular stiffening element (14). 10 15
5. The connection construction (1) according to claim 4, wherein at least one of the second stiffening zone (13) and the second tubular stiffening element (14) comprises at least one of metal, a metal-reinforced polymer composition, a fiber-reinforced polymer composition, wood and carbon. 20
6. The connection construction (1) according to any one of the preceding claims, wherein a set of alignment elements (15) is provided that are configured and arranged to align said first profile (2) and said second profile (5) with respect to each other, at least two alignment elements (15a, 15b) of the set of alignment elements being arranged transversely with respect to each other. 25 30
7. The connection construction (1) according to claim 6, wherein a first alignment element (15a) of the at least two alignment elements of the set of alignment elements is configured and arranged to extend through a first through hole (16) in said first profile (2) and to be releasably accommodated within said second profile (5), a second alignment element (15b) of the at least two alignment elements of the set of alignment elements being configured and arranged to extend through a second through hole (17) in said second profile (5) and to be releasably accommodated within said first profile (2). 35 40
8. The connection construction (1) according to claim 6 or 7, wherein the alignment elements (15a, 15b) of the set of alignment elements are configured and arranged to be releasably accommodated within the connecting device (8). 45 50
9. The connection construction (1) according to any one of the preceding claims, wherein one of a slidable connection assembly (18) and a snap-fit connection assembly (19) is provided that is configured and arranged to detachably associate a first end portion (20) of the first connecting member (9) and a second end portion (21) of the second connecting member (10) with each other. 55
10. The connection construction (1) according to any one of the claims 1 to 8, wherein the first connecting member (9) has a first end portion (20) and is provided with a first cavity (22) that is accessible via the first end portion (20) and the second connecting member (10) has a second end portion (21) and is provided with a second cavity (23) that is accessible via the second end portion (21), the first end portion (20) and the second end portion (21) being detachably associated with each other, wherein a first reinforcement device (24) is provided that has a first part (25) and a second part (26) that are one of fixedly connected to each other and detachably associated with each other, the first part (25) of the first reinforcement device (24) being arranged inside the first cavity (22) of the first end portion (20) of the first connecting member (9) and the second part (26) of the first reinforcement device (24) being arranged inside the second cavity (23) of the second end portion (21) of the second connecting member (10).
11. The connection construction (1) according to any one of the claims 1 to 8, wherein the first connecting member (9) and the second connecting member (10) are fixedly connected to each other.
12. The connection construction (1) according to any one of the preceding claims, wherein a second reinforcement device (27) is provided that comprises a first element (28) and a second element (29) that are one of fixedly connected to each other and detachably associated with each other, the first element (28) of the second reinforcement device (27) being associated with a first outer surface (30) of the first connecting member (9) and the second element (29) of the second reinforcement device (27) being associated with a second outer surface (31) of the second connecting member (10), the first outer surface (30) and the second outer (31) surface being arranged to connect to each other.
13. The connection construction (1) according to any one of the preceding claims, wherein a third reinforcement device (32) is provided that comprises a first structure (33) and a second structure (34) that are one of fixedly connected with each other and detachably associated with each other, the first structure (33) of the third reinforcement device (32) being connected to a first outer surface (35) of said first profile (2) and the second structure (34) of the third reinforcement device (32) being connected to a second outer surface (36) of said second profile (5), the first outer surface (35) of said first profile (2) and the second outer surface (36) of said second profile (5) being arranged to connect to each other.

14. The connection construction (1) according to any one of the preceding claims, wherein said first profile (2) and said second profile (5) are arranged with respect to each other at a predetermined angle in a range between 0° and 180°, and wherein at least one sealing element (37) is provided to seal at least the first hollow chamber (4) of said first profile (2) and the second hollow chamber (7) of said second profile (5).
15. A polymer-based hollow chamber frame (38) for use in at least one of polymer-based windows and doors comprising at least one connection construction (1) according to any one of the preceding claims.

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Fig. 1A

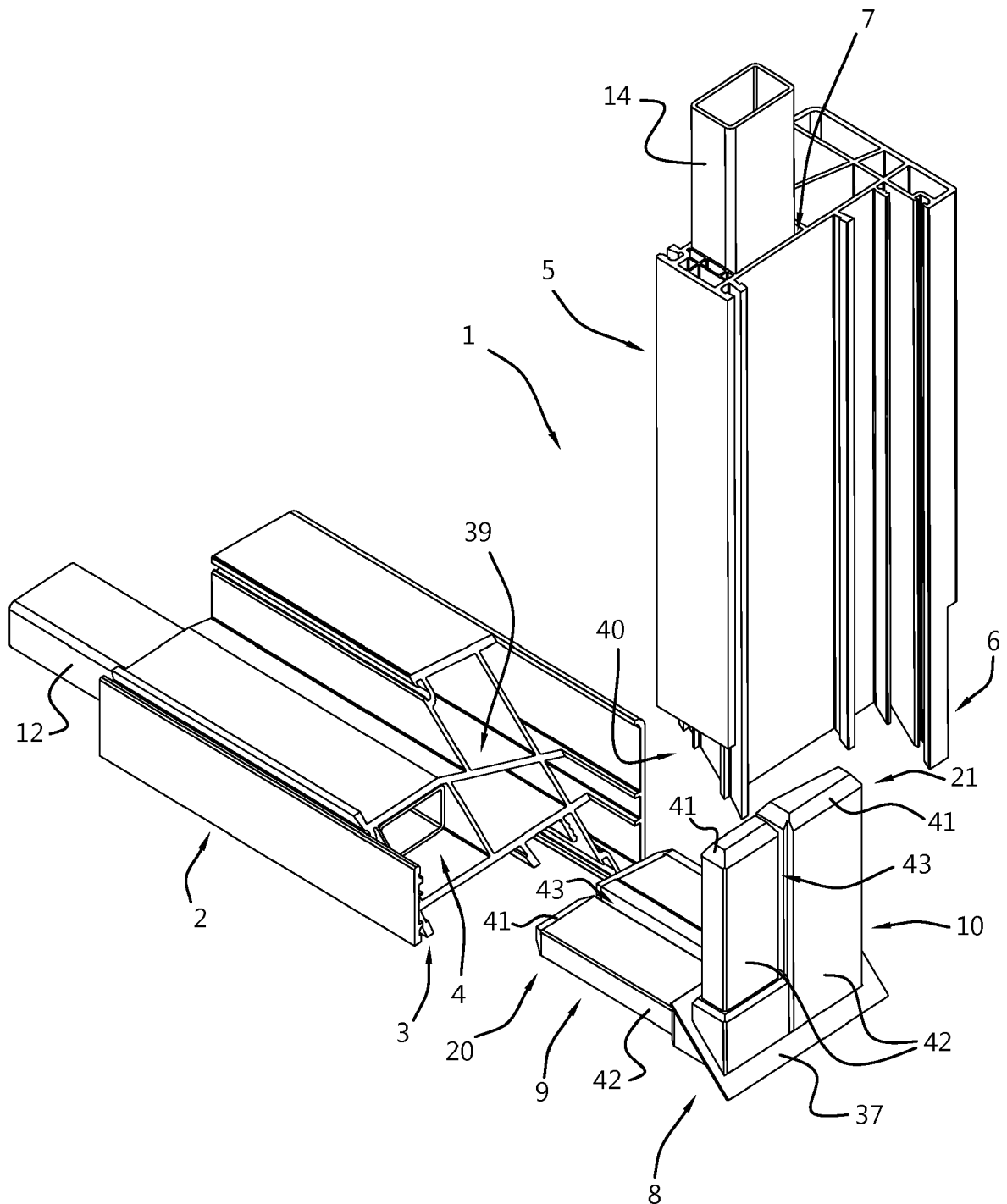


Fig. 1B

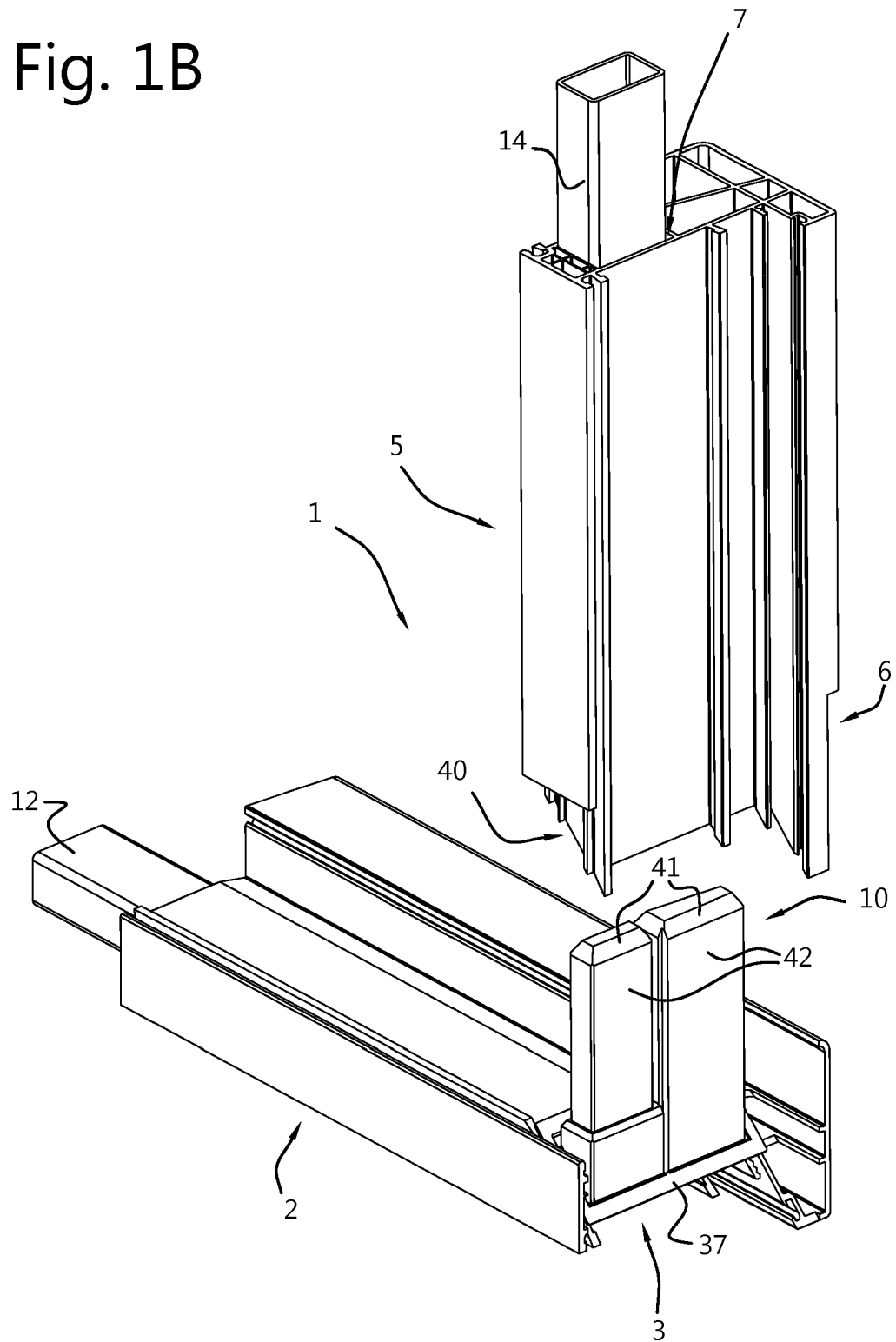


Fig. 1C

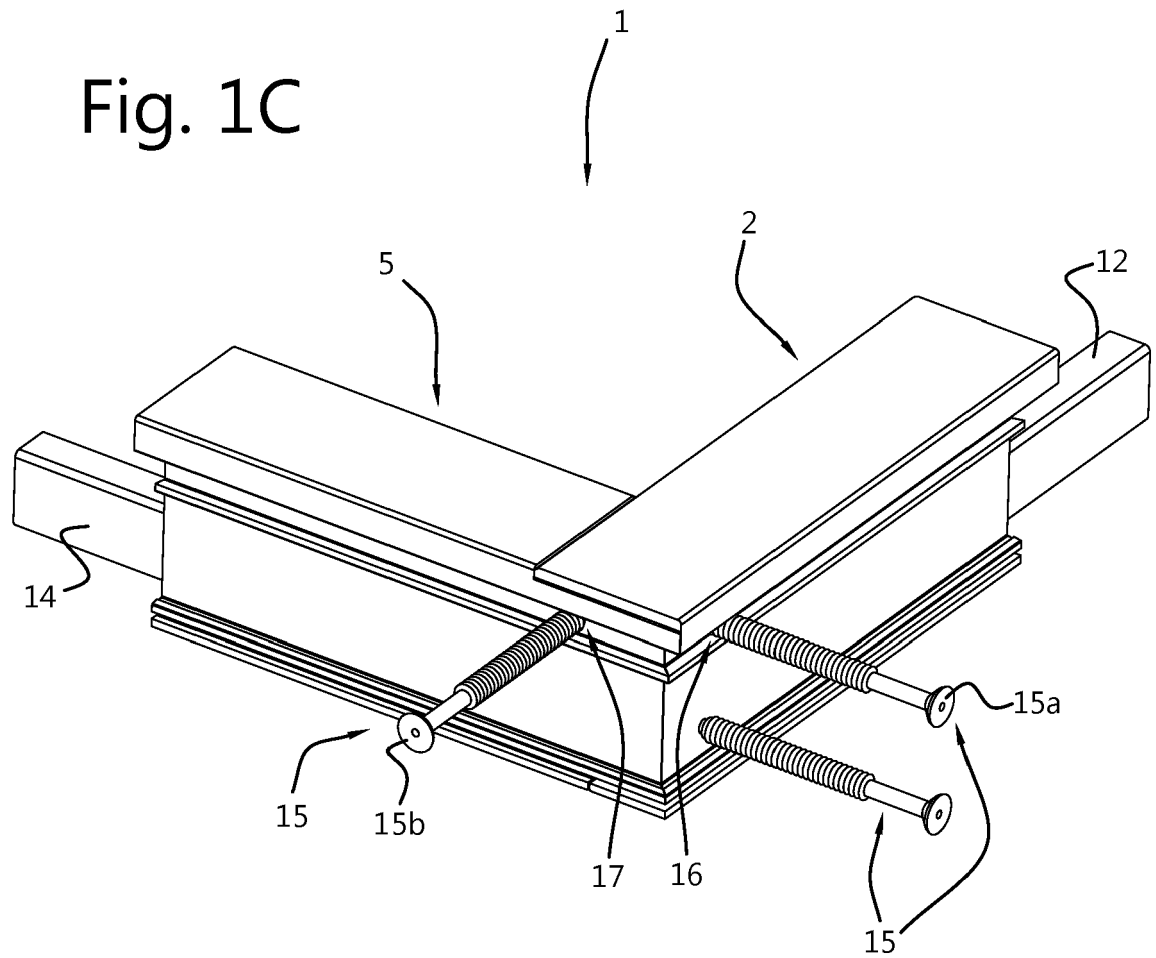


Fig. 1D

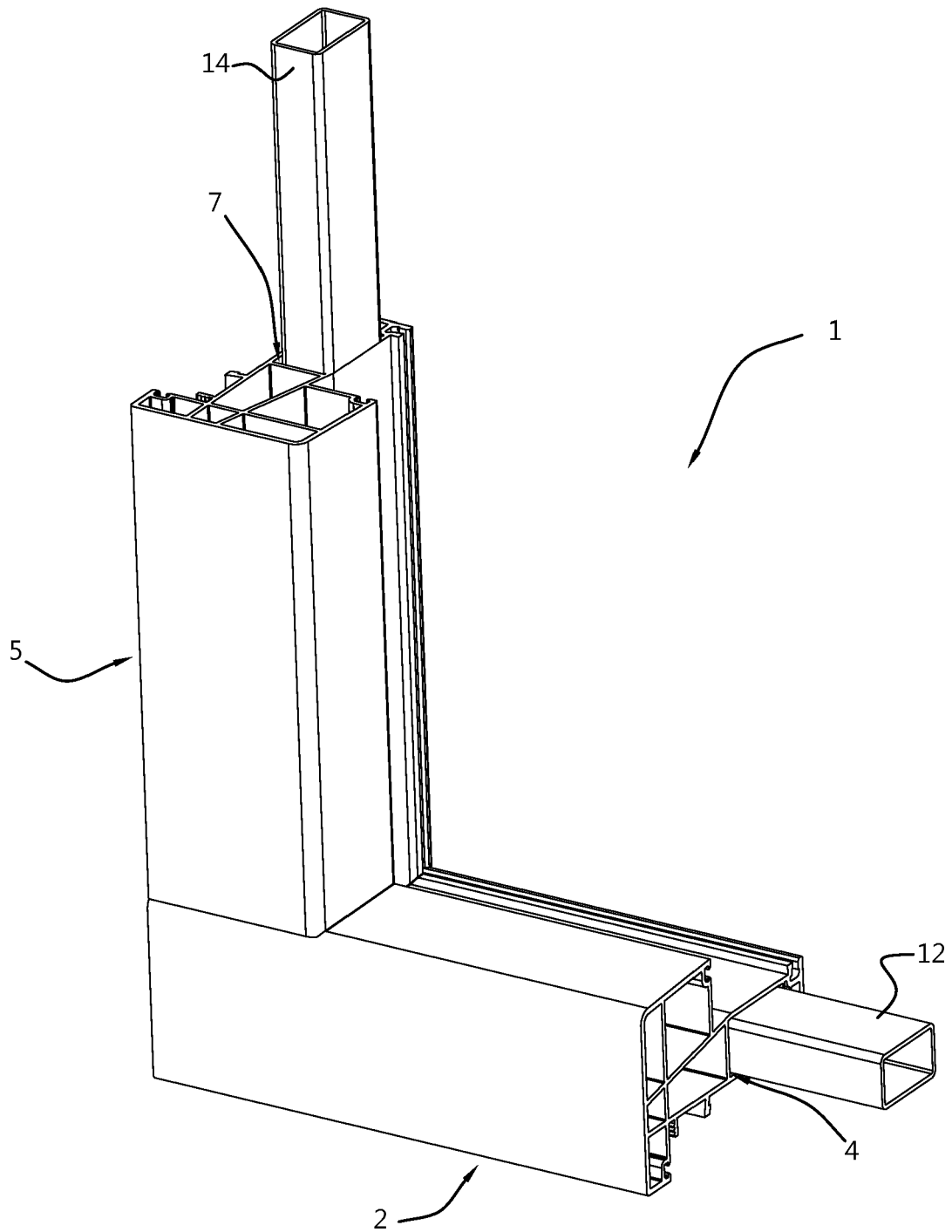


Fig. 2A

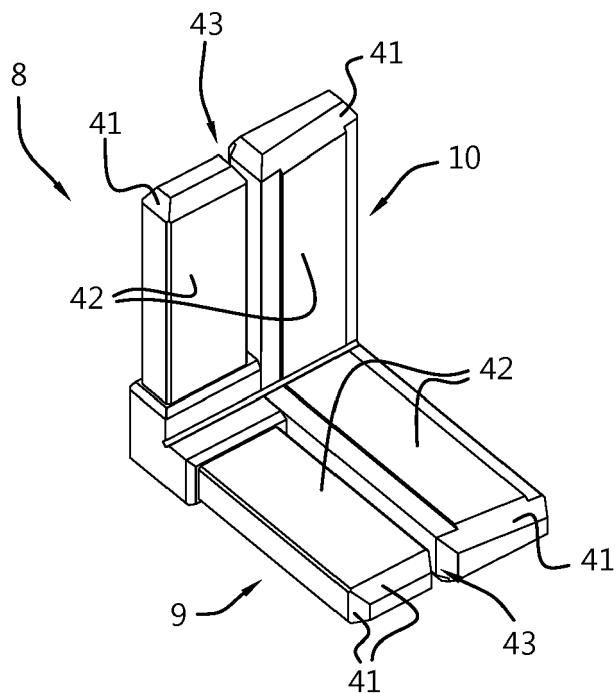


Fig. 2B

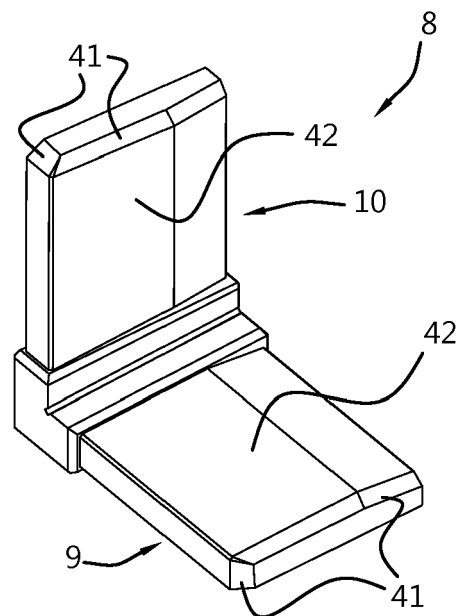


Fig. 3A

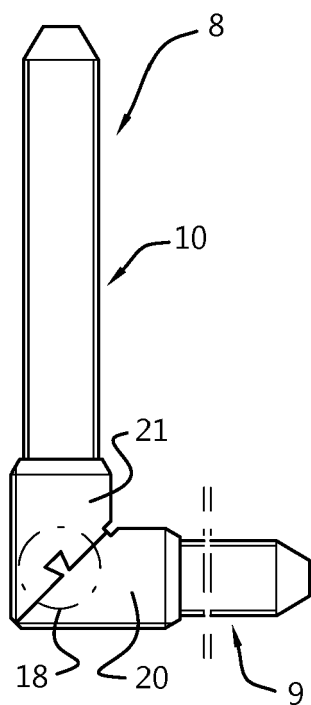


Fig. 3B

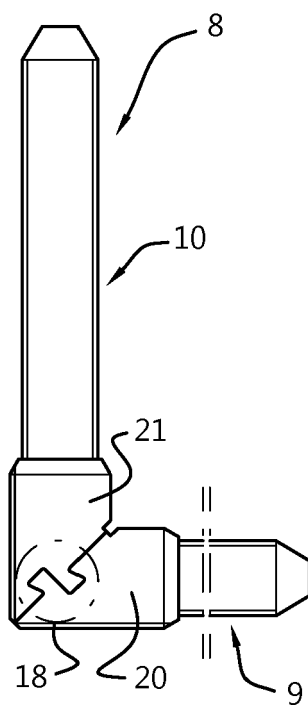


Fig. 3C

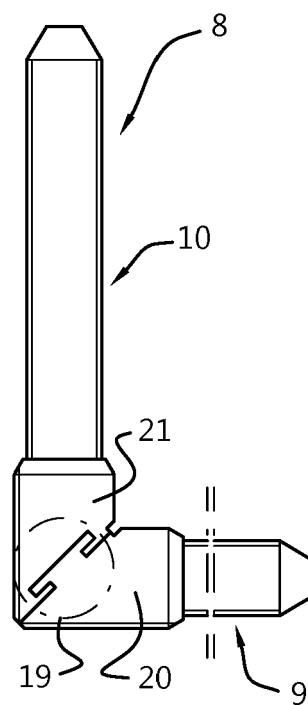


Fig. 4A

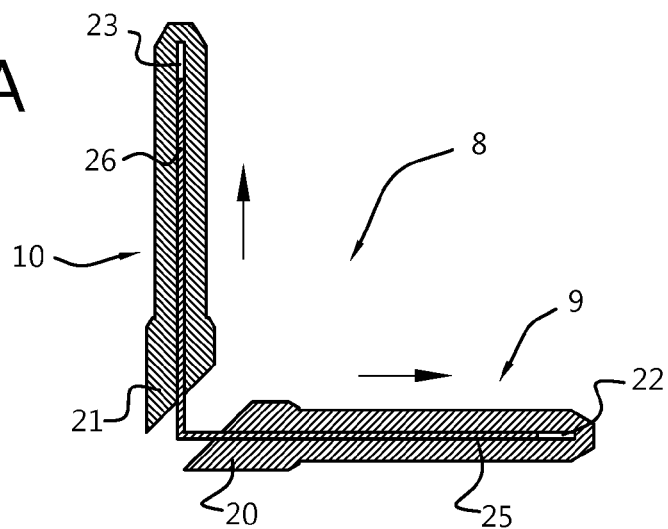


Fig. 4B

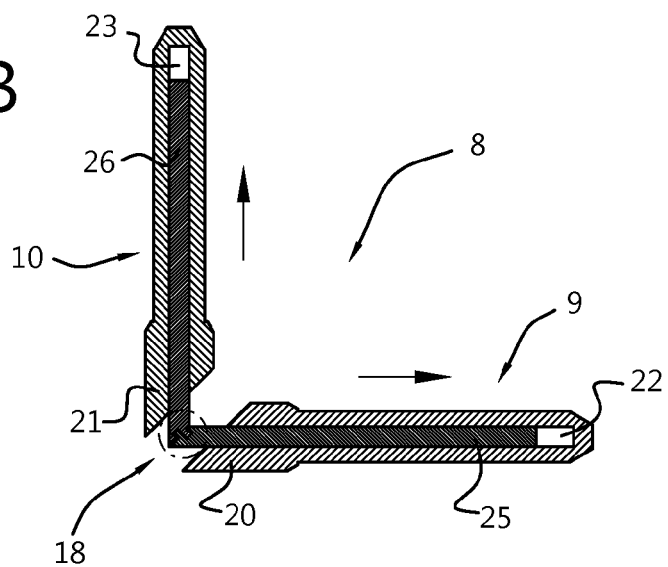


Fig. 4C

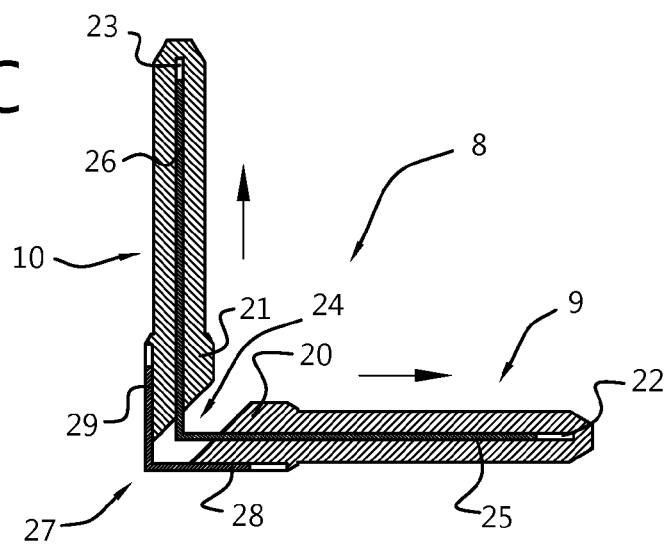


Fig. 5A

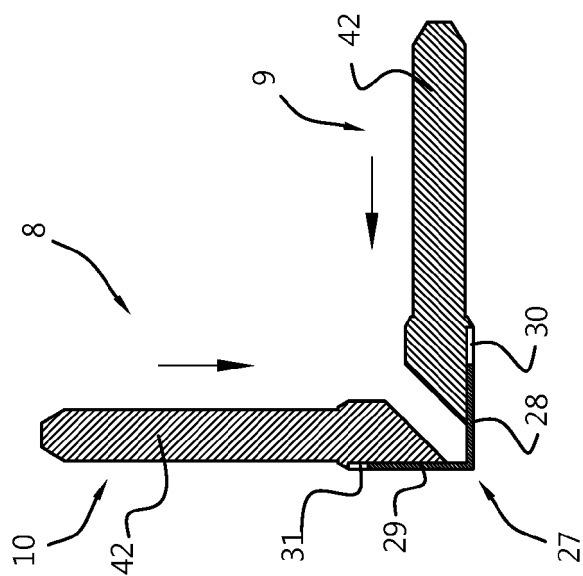


Fig. 5B

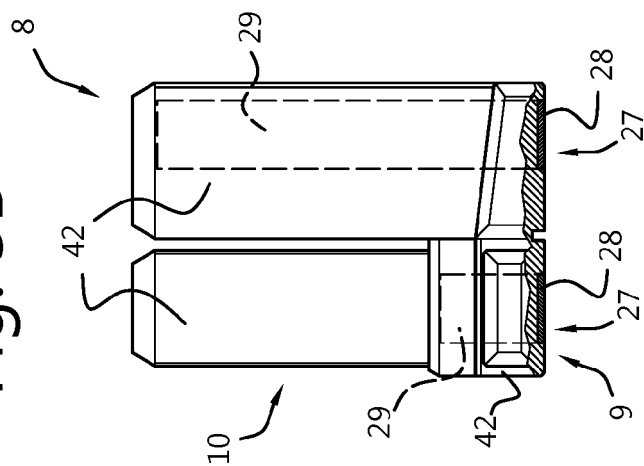


Fig. 5C

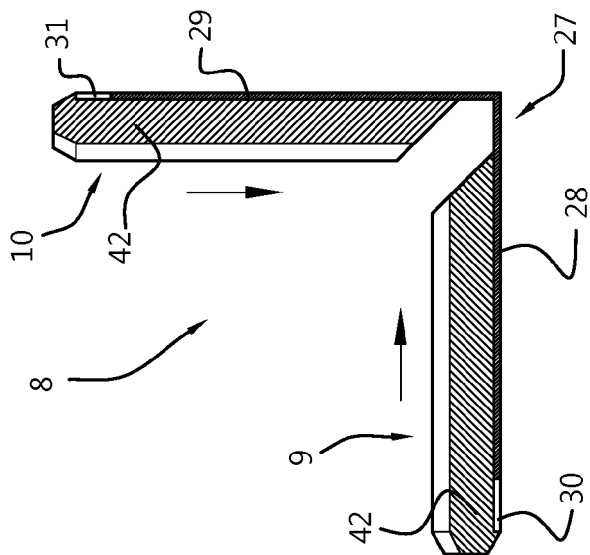


Fig. 5D

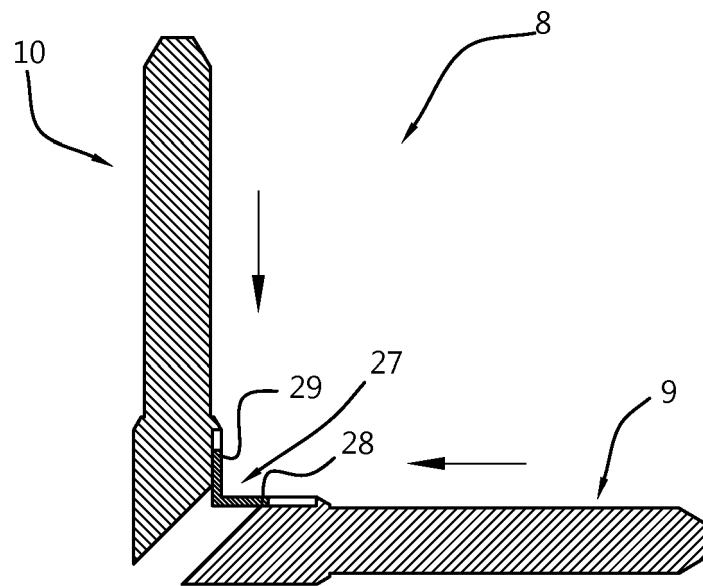


Fig. 6

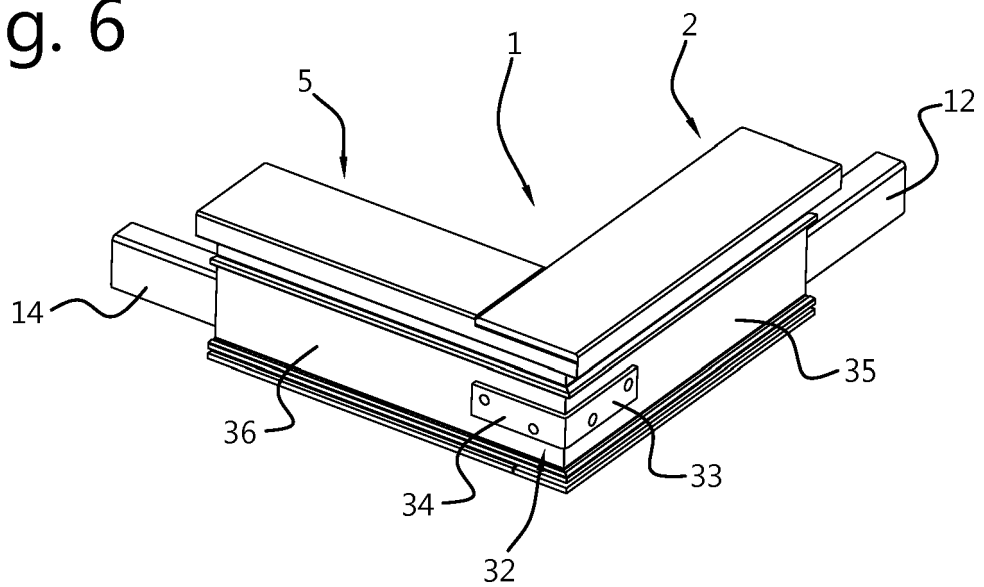
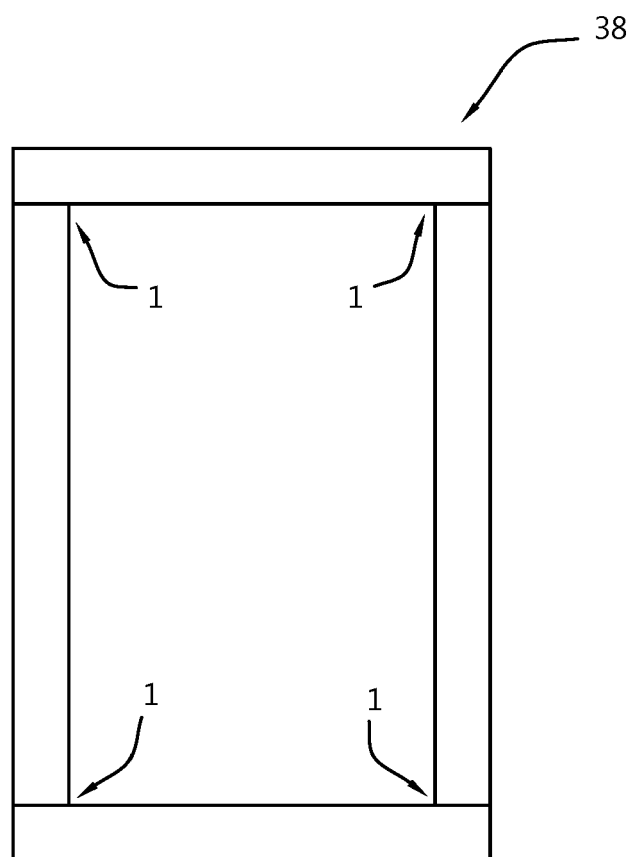


Fig. 7





EUROPEAN SEARCH REPORT

 Application Number
 EP 19 15 1024

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Y	* figures 1,6-8 *	9	E06B3/968
A	* paragraph [0020] - paragraph [0052] *	10	E06B3/22
Y	US 4 357 744 A (MCKENZIE EVERETT R ET AL) 9 November 1982 (1982-11-09) * column 3, lines 6-54; figures 1-4 *	9	ADD. E06B3/964
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			E06B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 January 2019	Examiner Hellberg, Jan
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25-01-2019

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