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(54) ALUMINIUM CARPENTRY SYSTEM HAVING IMPROVED THERMAL INSULATION

(57) The invention relates to an aluminium carpentry system comprising a frame, a sash movably mounted in the frame, a glazing unit, glazing clips and at least one hardware fitting, wherein both the frame and the sash consist of an external profile and an internal profile, connected via plastic thermal strips. The internal profile of the sash at the side facing the frame in a closed position of the system has a hardware groove of substantially U-shaped cross-section and being at least partially formed of plastic. In the system according to the invention the entire or partial covering of the hardware fitting operating in the hardware groove provides protection of hardware fittings from corrosion by eliminating galvanic areas and improves the thermal characteristics of the system by preventing the occurrence of thermal bridges between the hardware fitting and the sash profile and at the same time allows to avoid adverse effects associated with excessive widening of plastic thermal strips.

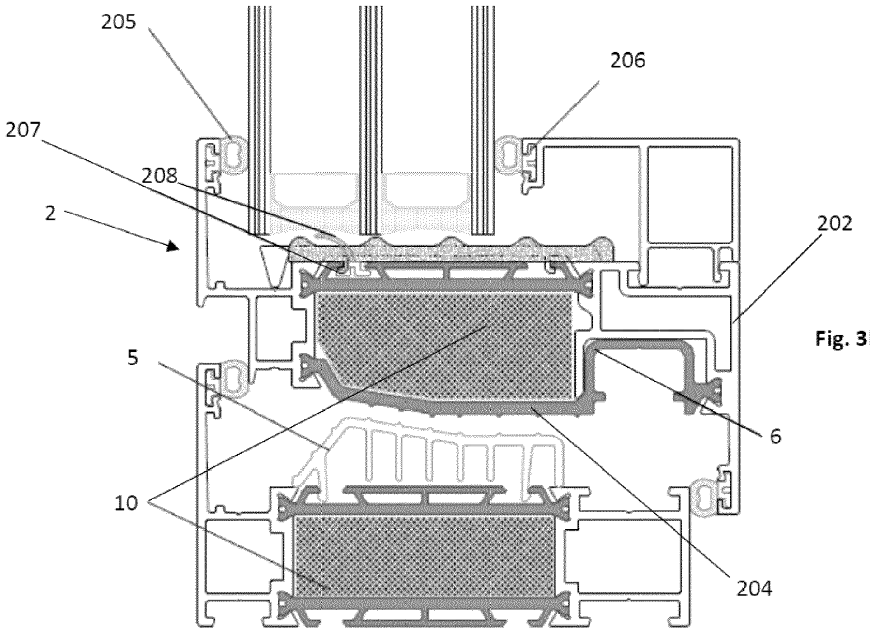

Fig. 3b

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Description

Technical field

[0001] The object of the invention is an aluminium carpentry system used for manufacturing such structures as windows, doors, etc., with improved thermal insulation and providing corrosion protection of the hardware fittings operating inside the hardware grooves.

Background art

[0002] Known carpentry systems (such as windows or doors) can be divided into three main types, due to the material used to form main profiles, i.e. the profiles forming a frame and a sash.

[0003] The first type are wooden systems, wherein main profiles are made of milled wood or wood composites. Wooden sash or frame profile is a monolithic structure made of a block of wood or a block of glued laminated timber. All gaskets and hardware fittings are mounted in a specially profiled channels made in the main profiles.

[0004] The second type are PVC systems, wherein main profiles consist of extruded PVC [poly(vinyl chloride)]. Each sash or frame profile is formed as a single multi-chamber structure with a uniform chemical composition. All gaskets and hardware fittings are mounted in profiled seats of the PVC main profile. Main advantages of the PVC systems include: a good thermal insulation to thickness ratio (normally they allow to achieve heat transfer coefficient for frame Uf = 1,2), a broad range of available wood-like and special coatings, low price, ease of manufacturing, lack of galvanic areas at the interface of hardware fittings and a profile, which is uniformly made of PVC. On the other hand, significant disadvantages of PVC carpentry include: high thermal expansion (in particular of dark colours), low stiffness of the profiles (while using other reinforcement materials results in deterioration of thermal insulation properties), generally limitation to single-storey constructions, lower durability of profiles and surfaces, lack of resistance to heat and fire and harmfulness of the thermal decomposition products during the fire.

[0005] The third type of carpentry systems are aluminium systems. Generally, in any aluminium carpentry a frame and sash profiles have a similar structure, consisting of an external aluminium profile and an internal aluminium profile, connected via plastic thermal strips. Generally, the connection is realized by clamping the profiles on edges of the thermal strips. Thermal strips located in the central part provide the required thermal insulation to the profiles (and as a result to the aluminium carpentry systems). Moreover, they provide static rigidity to the entire system. Thermal strips are used only in the aluminium systems, because - as indicated above - main profiles in the wooden and PVC carpentry are monolithically formed from a material having the required thermal insulation.

[0006] Both the external and the internal aluminium profiles are usually painted with powder coatings, anodized or coated in another way, which serves both aesthetic reasons and protection of the profiles from corrosion. The external sash profile, together with a glazing, gaskets and other elements mounted therein, protects from weather conditions, such as precipitation, sunshine. In turn, the internal profile of the sash has specially designed seats for mounting glass fixing profiles (glazing clips) and seats in form of hardware grooves, constituting channels for fixing working hardware fittings. Hardware fittings provide the ability to move the sash relative to the frame in a certain way, such as opening, tilting, sliding and blocking the sash in a desired position relative to the frame. Generally, hardware fittings are made of steel elements protected with anti-corrosion coatings.

[0007] Advantages of aluminium systems include: relatively low thermal expansion, high rigidity without the need for additional reinforcements, high durability of the surface, wide choice of available coating colours, ability to be mounted outside the construction in the thermal insulation plane, ability to realize large and complex multi-storey structures and to produce fire-resistant structures. Disadvantages of the aluminium systems include: worse thermal insulation to depth ratio compared to PVC systems (to achieve Uf = 1,2 additional expenditures are required); non-uniform construction making makes it difficult to obtain the required thermal coefficients, differences in thermal expansion of the materials, which the profiles are constructed of (freezing of the external aluminium profile, heating of the internal one); relatively complex manufacturing process; and presence of galvanic areas at the interface of hardware fittings and aluminium profiles.

[0008] There are also mixed systems, e.g. aluminium systems with external wooden cladding panels or PVC or wooden systems with aluminium cladding panels, but always it is the material of the main profiles that determines the basic features of the system, while the cladding panels perform aesthetic functions or increase the durability of the outer coating.

[0009] While the PVC and wooden carpentry systems generally belong to opening systems, i.e. unified and mass-produced window and door designs, the aluminium carpentry systems, manufactured in more complex processes, requiring a large number of material and design factors to be taken into account, are primarily used to design complex architectural and engineering structures, such as e.g. glazing of multi-storey office buildings or shopping malls, or realising single-storey tall structures (over 3m) or durable window and door structures resistant to multiple opening and closing. The above-mentioned differences in the design and materials of basic profiles and the resulting essentially disparate properties make the solutions in the area of aluminium carpentry systems show a clear distinction compared to the wooden or PVC carpentry systems.

[0010] The type of hardware fittings used imposes a standardized shape of the hardware groove, which must

be used in the sash profiles. As a standard, hardware fittings in the aluminium systems operate in an aluminium groove formed in the internal profile of the sash, in the PVC systems - in the groove formed in the PVC profile and in the wooden systems - in a groove milled in the wooden or wood composite profile. There are two types of grooves: euro groove type and PVC groove type which is generally deeper than the euro groove. The aluminium systems use both types of grooves, while the PVC and wooden systems use mainly PVC groove type.

[0011] Known aluminium carpentry systems include a number of solutions aimed to improve thermal insulation and other performance parameters. For example, PL 223656 B1 discloses a window consisting of a frame and a sash, in which both the frame and the sash consist of an external profile connected by means of thermal strips to an internal profile. The internal profile of the sash on the side facing the frame has a euro type hardware groove. In a closed window position form-fitted gaskets mounted on the frame at the side facing the sash completely fill the space between the thermal strip of the frame and the thermal strip of the sash, thereby protecting the structure interior from water intrusion, as well as contributing to the improvement of the window system thermal insulation. A simpler solution with a single profile gasket filling the space between the frame and the sash is disclosed for example in EP 2128371 B1.

[0012] EP 2 374 977 A2, in addition to the two gaskets system in the space between the frame and the sash, in order to increase thermal insulation a use of additional coating of cell elastomer or polyethylene foam is proposed together with glazing gaskets having extended skirts penetrating into this coating, jointly sealing the seat in the sash, wherein the glazed unit is embedded.

[0013] In turn, in the system described in US 7804032 B2 the hardware groove has an additional smaller groove with electrical cables placed therein.

[0014] A typical structure of frame and sash aluminium profiles with a division into an external and an internal profile and the plastic thermal strips placed there between significantly limits the development of the aluminium systems towards providing them with better thermal insulation. A common method is merely to expand aluminium profiles (or more precisely - thermal strips) to get the best thermal insulation (the larger the thermal strip, the better the Uf coefficients). Such action, however, has significant disadvantages, manifested especially in case of profiles with a width of approx. 95 mm or more. These include for example worse accuracy and stability and complicated design (too many components).

[0015] Moreover, as mentioned above, hardware fittings operating in the internal aluminium profile are made of steel elements protected with anti-corrosion coatings. As a result of sliding movements the coating of the hardware fittings is often damaged or even completely destroyed. A contact of the lower quality steel elements with raw aluminium then occurs, which in the presence of moisture results in formation of galvanic areas and, consequently, corrosion.

Summary of the invention

[0016] The aim of the present solution was to overcome the above-mentioned problems, associated with the use of prior art aluminium carpentry systems, by providing a system with enhanced thermal insulation without deteriorating the operating parameters, such as high stiffness, good static stability, the system further allowing for protection of hardware fittings from corrosion and improving their operation comfort. The further aim was the abandonment of using a central gasket so as to speed up the production of prefabricated window structures, at the same time providing the aluminium system with optimum water resistance and air permeability, both in the space under the window panes and at the interface between the external profiles of the sash and the frame.

[0017] Therefore, the object of the invention is an aluminium carpentry system comprising a frame, a sash movably mounted in the frame, a glazing unit, glazing clips and at least one hardware fitting,

wherein the frame consists of an external profile and an internal profile, which are connected via plastic thermal strips, and a central insulation element is mounted on the frame at the side facing the sash in a closed position of the system,

the sash consists of an external profile and an internal profile, which are connected via plastic thermal strips, wherein the internal profile of the sash at the side facing the frame in a closed position of the system has a hardware groove having substantially U-shaped cross-section, while at the opposite side it has a clamping groove for fixing the glazing clips,

the glazing unit comprising at least one glass pane is mounted in a mounting seat formed between the external profile of the sash provided with form-fitted external glazing gaskets, the external plastic thermal strip of the sash and the glazing clips provided with form-fitted internal glazing gaskets and mounted in the clamping groove of the internal profile of the sash,

at least one hardware fitting is slidably placed in the hardware groove of the internal profile of the sash,

at the edge facing the frame the internal profile of the sash is provided with form-fitted internal rebate gaskets, by means of which it sealingly engages the internal profile of the frame in a closed position of the system, wherein the hardware fitting is at least partially formed of plastic.

[0018] In the context of the present invention the term "substantially U-shaped" referring to the cross-sectional shape of hardware groove should be understood as covering both the basic U-shape as well as the forms including some additional small elements, e.g. projections facing inside the U-shape or extension of one or both of the free ends in a direction perpendicular or oblique relative to the U-shape arms.

[0019] Moreover, in the context of the invention the term "hardware groove" means a seat in which the hard-

ware fitting moves slidably, whereby the hardware groove walls directly contact the hardware fitting.

[0020] The term "internal" used within this description in respect of plastic thermal strips of the frame and the sash means a strip that is closer to the system interior, that is a space between the frame and the sash. The term "external" means, in turn, a strip that is more distant from this space, which in case of plastic thermal strip of the sash means a strip that is closer to the glazing unit, and in case of plastic thermal strip of the frame - a strip that is closer to the contact area of the frame with a structure surrounding the system of the invention.

[0021] In one preferred embodiment of the system according to the invention a hardware groove is set in a recess in the internal profile of the sash. Preferably the internal plastic thermal insulation of the sash is integrated with a substantially U-shaped hardware groove set in the recess in the internal profile of the sash.

[0022] In other preferred embodiment the hardware groove is entirely made of plastic.

[0023] In a further preferred embodiment, the recess in the internal profile of the sash has a substantially U-shaped cross-section and the hardware groove entirely fills the recess.

[0024] In a still further preferred embodiment, the internal plastic thermal strip of the sash forms one wall of a substantially U-shaped hardware groove, and the other walls of this groove are formed by the surfaces of the recess in the internal profile of the sash.

[0025] In a still further preferred embodiment of the system according to the invention at the edge facing the sash the external profile of the frame is provided with form-fitted external rebate gaskets, by means of which it sealingly engages the external profile of the sash in a closed position of the system and that all the glazing and the rebate gaskets of the system are made of the same material and have the same cross-sectional shape. Preferably each of the glazing and the rebate gaskets of the system consists of a mounting part made of a hard material and clamped permanently in the gasket seat of the frame, the sash or the glazing clip, respectively, and of a sealing part made of a soft elastic material, wherein both gasket parts are permanently connected together. In a preferred embodiment the central insulation element is in form of a plastic moulding, which is form-fitted in corresponding projections at the frame surface from the side facing the sash in a closed position of the system, wherein between the plastic moulding surface and the plastic thermal strip of the sash there is an air gap, the outlet of which from the outside of the system in cross section view is closer to the sash than its outlet from the inside of the system. In a particularly preferred embodiment the plastic moulding is mounted through clicking or sliding into guides formed by corresponding projections at the frame surface from the side facing the sash in a closed position of the system, and the width of the air gap is from 2.5 to 4 mm.

[0026] In a further preferred embodiment of the method according to the invention at least one gasket groove is formed in the plastic thermal strip of the sash at the side of a glazing unit, and that at least one window pane seal is fixed in said groove. Preferably the window pane seal consists of a mounting part made of a hard material and clamped in the seal seat of the plastic thermal strip and a sealing part made of a soft elastic material, wherein both seal parts are permanently connected together.

[0027] In a further preferred embodiment of the method according to the invention, the glazing unit consists of three glass panes separated by spacer strips.

[0028] In other preferred embodiment between the plastic thermal strips connecting the external and the internal profile of the frame and/or of the sash there is a thermal foam.

[0029] The hardware groove at least partially, and preferably entirely made of plastic provides a covering of the metal hardware fitting (as a rule made of stainless steel) from contacting aluminium surfaces of the recess in the internal profile of the sash. This protects against formation of galvanic areas, and at the same time prevents from formation of thermal bridge between the hardware fitting and the profile, thus improving the thermal insulation of the entire system.

[0030] The hardware groove according to the invention may be realized in three basic variants:

a) an internal plastic thermal strip of the sash is integrated with the hardware groove as a single element; in addition to the primary thermal and static function such a strip integrated with the hardware groove entirely made of plastic provides full covering of hardware fittings, separating them from the internal aluminium profile of the sash;

b) an internal plastic thermal strip of the sash forms one wall of a substantially U-shaped hardware groove and the remaining walls of this groove are formed by the surfaces of a substantially L-shaped recess in the internal profile of the sash; in this case the hardware groove is partially formed of plastic and partially of aluminium of the internal profile of the sash;

c) the internal plastic thermal strip of the sash and the hardware groove are two separate plastic elements; a plastic thermal strip realises its primary thermal and static function, while the plastic hardware groove provides a full covering of hardware fittings, separating them from the internal aluminium profile of the sash.

[0031] In case of one-piece forming with the internal thermal strip of the sash, as well as in e case of the groove and the strip being separate elements, the plastic hardware groove is made of plastic showing high thermal insulation [in particular having a thermal conductivity coefficient λ(lambda) from 0.5 to 0.03(W/m*K)], not entering into chemical reactions with aluminium profiles and steel parts of the hardware fittings.

[0032] The solution according to the invention is clearly changing tendencies and design trends in aluminium carpentry systems, in particular window and door systems. Continuous plastic element provides the sash with excellent thermal and static properties and protects the hardware fitting entirely [option (a)] or partially [option (b)] from contacting with the aluminium of the internal profile of the sash. The solution of option (c) also provides full protection from occurrence of galvanic areas and thermally separates the hardware fitting metal from the aluminium of the internal profile of the sash. In this embodiment known internal plastic thermal strips of the sash are used, which makes the modification of known systems require merely adjusting the structures of the internal profile of the sash to receive the plastic hardware groove of the invention.

[0033] Another aspect of the invention is the use of external rebate gaskets form-fitted on the frame external profile edge facing the sash. The external rebate gaskets provide tightness of the connection of the external profile of the sash and the frame, protecting the interior of the aluminium carpentry system from precipitation water and cold air access from the outside. They allow to abandon standard central gaskets used in known aluminium systems. Instead of them it is possible to use plastic mouldings, plugged or slid in appropriate projections/guides formed in the profiles and/or the plastic thermal strip of the frame, said mouldings being cheaper in terms of material cost, and above all in terms of manufacturing of prefabricated window structures. The plastic mouldings significantly improve the thermal characteristics of the system, and also prevent the intrusion of excess condensation and precipitation water into the building. The narrow gap between the plastic thermal strip of the sash and the plastic moulding effectively breaks the stream of cold air, preventing it from getting into the building.

[0034] Another aspect of the invention is the use of the same gasket type as both the external and internal glazing gasket and the external and internal rebate gasket, which significantly simplifies manufacturing of prefabricated structures containing the system according to the invention, although it requires appropriate changes to the design of the frame and sash, including above all the glazing clip profile and the space between the sash and the frame (see the previous aspect associated with the use of the plastic moulding).

[0035] A further aspect of the invention is the use of gaskets permanently clamped in the profiles of the frame, the sash and the glazing clips. Typically, aluminium profiles are offered on the market as separate items, and the gasket assembly is realized by the producer of the window joinery. Due to bi-material structure (a mounting part made of a hard material, clamped in the gasket seat, and a sealing part made of a soft elastic material) the gaskets according to this aspect of the invention may exist in form integrated with the profile.

[0036] Another aspect of the invention is the use of the window pane seal mounted in the thermal strip. As with the glazing gaskets and rebate gaskets according to the previous aspect of the invention the window pane seal is bi-material, i.e. has a hard mounting part, slid into the thermal strip seat and a soft sealing part. The seal may replace or supplement typically used sub-glazing foam. It prevents the penetration of condensation and precipitation water and air into the inside of structure in the glazing areas. This is particularly important in aluminium window systems exposed to high wind pressure on the surface of the glazing (e.g. at high floors of the buildings), which might cause temporarily slightly weaker pressure of the external glazing gasket on the glass, which in turn increases the risk of precipitation water and/or outside air intrusion into the space under the window panes.

Brief description of drawings

[0037] The invention will now be further illustrated in the preferred examples, with reference to the accompanying drawings, in which:

- fig. 1a, b show cross-sections of known types of hardware grooves in the sash profiles of the aluminium carpentry systems, wherein fig. 1a shows a EURO type hardware groove (aluminium), and fig. 1b - a PVC type hardware groove,
- fig. 2 shows a cross-section of a fragment of a prior art aluminium carpentry system,
- fig. 3a, b show cross-sections of fragments of the aluminium carpentry system according to the invention in two variants of the first embodiment,
- fig. 4a, b show cross-sections of fragments of the aluminium carpentry system according to the invention in two variants of the second embodiment,
- fig. 5a, b show cross-sections of fragments of the aluminium carpentry system according to the invention in two variants of the third embodiment.

Detailed description of a preferred embodiment

[0038] Fig. 1a and b illustrate cross-sections of two types of hardware grooves used in sash profiles of aluminium carpentry systems: fig. 1a shows a EURO type hardware groove (aluminium), and fig. 1b - a PVC type hardware groove. Regardless of the name, both types of grooves in known aluminium carpentry systems are made of aluminium as integral parts of the sash profile.

[0039] Fig. 2 shows a cross-section of the fragment of the prior art aluminium carpentry system, comprising a frame 1, a sash 2 movably mounted in the frame 1, a glazing unit 3, a glazing clip 4 and a hardware fitting (not shown in the drawing). The frame 1 consists of an external profile 101 and an internal profile 102 that are connected via plastic thermal strips 103, 104. A central in-

sulation element in a form of a central gasket A, form-fitted in appropriate projections at the surface of the external profile of the frame and internal plastic thermal strip 103, is mounted on the frame 1 at the side facing the sash 2 in a closed position of the system. The sash 2 consists of an external profile 201 and an internal profile 202, which are connected via plastic thermal strips 203, 204, wherein the internal profile 202 of the sash 2 has a recess forming a hardware groove B at the side facing the frame 1 in a closed position of the system, and on the opposite side it has a clamping groove 7 for fixing the glazing clip 4. The central gasket A contacts the projection on the internal plastic thermal strip 204 of the sash 2. The hardware fitting (not shown in the drawing) is slidingly placed in the hardware groove B.

[0040] The glazing unit 3 composed of two glass panes 301 separated with a spacer strip 302 is mounted in a mounting seat formed between the external profile 201 of the sash 2, the glazing clip 4 and an insulating pad C form-fitted in the space under the window panes in appropriate projections of the external 201 and internal 202 profile of the sash 2. The glazing clip 4 is form-fitted in the clamping groove 7 of the internal profile 202 of the sash 2. An external glazing gasket 205 is form-fitted in the external profile 201 of the sash 2, and an internal glazing gasket 206 is form-fitted in the glazing clip 4. The internal profile 202 of the sash 2 on the edge facing the frame 1 is provided with a form-fitted internal rebate gasket 106 by means of which it sealingly engages the internal profile 102 of the frame 1 in a closed position of the system.

[0041] Fig. 3a shows a cross-section of one of the variants of the first embodiment of the aluminium carpentry system according to the invention. The system comprises the frame 1, the sash 2 movably mounted in the frame 1, the glazing unit 3, the glazing clip 4 and a hardware fitting (not shown in the drawing). The frame 1 consists of the external profile 101 and the internal profile 102 that are connected via plastic thermal strips 103, 104. The space between the plastic thermal strips 103 and 104 is filled with a thermal foam 10. A central insulation element in a form of a plastic moulding 5 is mounted on the frame 1 at the side facing the sash 2. The plastic moulding 5 is form-fitted in appropriate projections at the surface of the internal plastic thermal strip 103.

[0042] The sash 2 consists of the external profile 201 and the internal profile 202, which are connected via plastic thermal strips 203, 204, wherein the internal profile 202 of the sash 2 has a hardware groove 6 at the side facing the frame 1 in a closed position of the system, and at the opposite side it has a clamping groove 7 for fixing the glazing clip 4. The internal plastic thermal strip 204 of the sash 2 is integrated with the hardware groove 6 having substantially U-shaped cross-section, being entirely made of plastic (the same as the internal thermal strip 204 and being mounted in the recess in the internal profile 202 of the sash 2. The hardware fitting (not shown in the drawing) is slidingly placed in the hardware groove 6.

[0043] Between the plastic moulding 5 surface and the internal plastic thermal strip 204 of the sash 2 there is an air gap 9, the outlet of which from the outside of the system in cross section view is closer to the sash 2 than its outlet from the inside of the system, so that the plastic moulding 5 surface facing the sash falls towards the internal profile of the frame.

[0044] The glazing unit 3 composed of three glass panes 301 separated with spacer strips 302 is mounted in a mounting seat formed between the external profile 201 of the sash 2, the external plastic thermal strip 203 of the sash 2 and the glazing clip 4, mounted in the clamping groove 7 of the internal profile 202 of the sash 2. The external glazing gasket 205 is form-fitted in the in the external profile 201 of the sash 2, and the glazing gasket 206 is form-fitted in the glazing clip 4.

[0045] The internal profile 202 of the sash 2 on the edge facing the frame 1 is provided with form-fitted internal rebate gasket 106, by means of which it sealingly engages the internal profile 102 of the frame 1 in a closed position of the system. The internal profile 101 of the frame 1 on the edge facing the sash 2 is in turn provided with the form-fitted external rebate gasket 105, by means of which it sealingly engages the external profile 201 of the sash 2 in a closed position of the system.

[0046] All the glazing gaskets 205, 206 and the rebate gaskets 105, 106 of the system are made of the same material and have the same cross-sectional shape. Each of the glazing gaskets 205, 206 and the rebate gaskets 105, 106 of the system consists of a mounting part 81 made of a hard material and clamped permanently in a gasket seat of the frame 1, the sash 2 or the glazing clip 4, respectively, and of a sealing part 82 made of a soft elastic material, wherein both gasket parts are permanently connected together.

[0047] Moreover, a gasket's groove 207 is formed in the plastic thermal strip 203 of the sash 2 at the side of the glazing unit 3, and a window pane seal 208 is fixed in the seat. The window pane seal 208 consists of a mounting part made of a hard material and clamped in the seal seat of the plastic thermal strip 203 of the sash 2 and a sealing part made of a soft elastic material, wherein both parts of the seal 208 are permanently connected together.

[0048] The internal plastic thermal strip 204 has a multi-chamber construction, while the space between the plastic thermal strips 203 and 204 is filled with the thermal foam 10.

[0049] Fig. 3b shows a cross-section of another variant of the first embodiment of the aluminium carpentry system according to the invention. It differs from the variant of fig. 3a described in detail in that:

- the recess in the internal profile 202 of the sash 2 has substantially U-shaped cross-section and the hardware groove 6 entirely fills this recess,
- the internal plastic thermal strip 204 has no multi-

chamber construction,
- the plastic moulding 5 has a slightly different form.

[0050] Fig. 4a shows a cross-section of one of the variants of the second embodiment of the aluminium carpentry system according to the invention. It differs from the variant of fig. 3a described in detail in that the internal plastic thermal strip 204 of the sash 2 forms one wall of the substantially U-shaped hardware groove 6, and the other walls of this groove 6 are formed by the surfaces of substantially L-shaped recesses in the internal profile 202 of the sash 2. In this case the hardware groove 6 is partially formed of plastic (the same as the internal thermal strip 204), and partially of aluminium of the internal profile 202 of the sash 2.

[0051] Fig. 4b shows a cross-section of another variant of the second embodiment of the aluminium carpentry system according to the invention. It differs from the variant of fig. 4a in that:

- the internal plastic thermal strip 204 has no multichamber construction,
- the plastic moulding 5 has a slightly different form.

[0052] Fig. 5a shows a cross-section of one of the variants of the third embodiment of the aluminium carpentry system according to the invention. It differs from the variant of fig. 3a in that the internal plastic thermal strip 204 of the sash 2 is not integrated with the hardware groove 6 but is a separate element. The hardware groove 6 has substantially U-shaped cross-section, is entirely made of plastic and is mounted in the recess in the internal profile 202 of the sash 2, said recess having substantially U-shaped cross-section, and the hardware groove 6 entirely fills the recess.

[0053] Fig. 5b shows a cross-section of other variant of the third embodiment of the aluminium carpentry system according to the invention. It differs from the variant of fig. 5a in that:

- the internal plastic thermal strip 204 has no multichamber construction,
- the plastic moulding 5 has a slightly different form.

Claims

1. An aluminium carpentry system comprising a frame (1), a sash (2) movably mounted in the frame (1), a glazing unit (3), glazing clips (4) and at least one hardware fitting,

wherein the frame (1) consists of an external profile (101) and an internal profile (102), which are connected via plastic thermal strips (103, 104), and a central insulation element is mounted on the frame (1) at the side facing the sash (2) in a closed position of the system,

the sash (2) consists of an external profile (201) and an internal profile (202), which are connected via plastic thermal strips (203, 204), wherein the internal profile (202) of the sash (2) at the side facing the frame (1) in a closed position of the system has a hardware groove (6) having substantially U-shaped cross-section, while at the opposite side it has a clamping groove (7) for fixing the glazing clips (4),

the glazing unit (3) comprising at least one glass pane (301) is mounted in a mounting seat formed between the external profile (201) of the sash (2) provided with form-fitted external glazing gaskets (205), the external plastic thermal strip (203) of the sash (2) and the glazing clips (4) provided with form-fitted internal glazing gaskets (206) and mounted in the clamping groove (7) of the internal profile (202) of the sash (2),

at least one hardware fitting is slidably placed in the hardware groove (6) of the internal profile (202) of the sash (2),

at the edge facing the frame (1) the internal profile (202) of the sash (2) is provided with form-fitted internal rebate gaskets (106), by means of which it sealingly engages the internal profile (102) of the frame (1) in a closed position of the system, **characterized in that** the hardware fitting (6) is at least partially formed of plastic.

2. The aluminium carpentry system according to the claim 1, **characterized in that** the hardware groove (6) is set in a recess in the internal profile (202) of the sash (2).

3. The aluminium carpentry system according to the claim 1 or 2, **characterized in that** the internal plastic thermal strip (204) of the sash (2) is integrated with a substantially U-shaped hardware groove (6) set in the recess in the internal profile (202) of the sash (2).

4. The aluminium carpentry system according to one of the claims 1-3, **characterized in that** the hardware groove (6) is entirely made of plastic.

5. The aluminium carpentry system according to one of the claims 1-4, **characterized in that** the recess in the internal profile (202) of the sash (2) has a substantially U-shaped cross-section and the hardware groove (6) entirely fills the recess.

6. The aluminium carpentry system according to the claim 1, **characterized in that** the internal plastic thermal strip (204) of the sash (2) forms one wall of the substantially U-shaped hardware groove (6), and the other walls of this groove (6) are formed by the surfaces of the recess in the internal profile (202) of the sash (2).

7. The aluminium carpentry system according to one of the claims 1-6, **characterized in that** at the edge facing the sash (2) the external profile (101) of the frame (1) is provided with form-fitted external rebate gaskets (105), by means of which it sealingly engages the external profile of the sash (201) in a closed position of the system, and that all the glazing (205, 206) and the rebate gaskets (105, 106) of the system are made of the same material and have the same cross-sectional shape.

8. The aluminium carpentry system according to the claim 7, **characterized in that** each of the glazing (205, 206) and the rebate gaskets (105, 106) of the system consists of a mounting part (81) made of a hard material and clamped permanently in the gasket seat of the frame (1), the sash (2) or the glazing clip (4), respectively, and of a sealing part (82) made of a soft elastic material, wherein both gasket parts are permanently connected together.

9. The aluminium carpentry system according to the claim 7 or 8, **characterized in that** the central insulation element is in form of a plastic moulding (5), which is form-fitted in corresponding projections at the frame (1) surface from the side facing the sash (2) in a closed position of the system, wherein between the plastic moulding (5) surface and the internal plastic thermal strip (204) of the sash (2) there is an air gap (9), the outlet of which from the outside of the system in cross section view is closer to the sash (2) than its outlet from the inside of the system.

10. The aluminium carpentry system according to the claim 9, **characterized in that** the plastic moulding (5) is mounted through clicking or sliding into guides formed by corresponding projections at the frame (1) surface from the side facing the sash (2) in a closed position of the system, and the width of the air gap (9) is from 2.5 to 4 mm.

11. The aluminium carpentry system according to one of the claims 1-10, **characterized in that** at least one gasket groove (207) is formed in the plastic thermal strip (203) of the sash (2) at the side of a glazing unit (3), and that at least one window pane seal (208) is fixed in said groove.

12. The aluminium carpentry system according to the claim 11, **characterized in that** the window pane seal (208) consists of a mounting part made of a hard material and clamped in the seal seat of the plastic thermal strip (203) of the sash (2) and a sealing part made of a soft elastic material, wherein both parts of the seal (208) are permanently connected together.

13. The aluminium carpentry system according to one of the claims 1-12, **characterized in that** the glazing unit (3) consists of three glass panes (301) separated by spacer strips (302).

14. The aluminium carpentry system according to one of the claims 1-13, **characterized in that** between the plastic thermal strips (103, 104, 203, 204) connecting the external (101, 201) and the internal profile (102, 202) of the frame (1) and/or of the sash (2) there is a thermal foam (10).

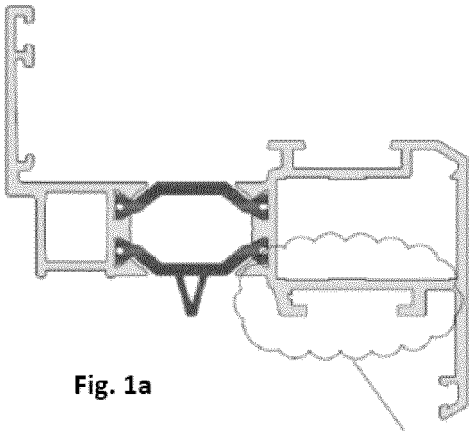

Fig. 1a

PRIOR ART

EURO type hardware groove

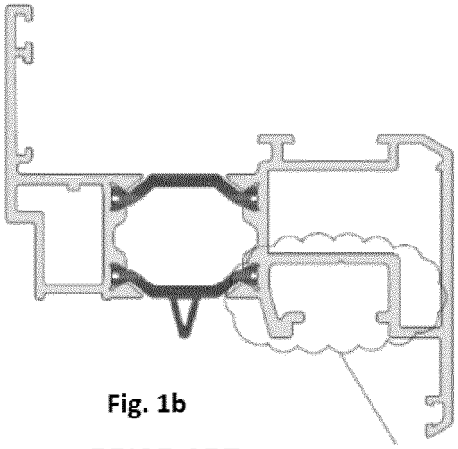

Fig. 1b

PRIOR ART

PVC hardware groove type

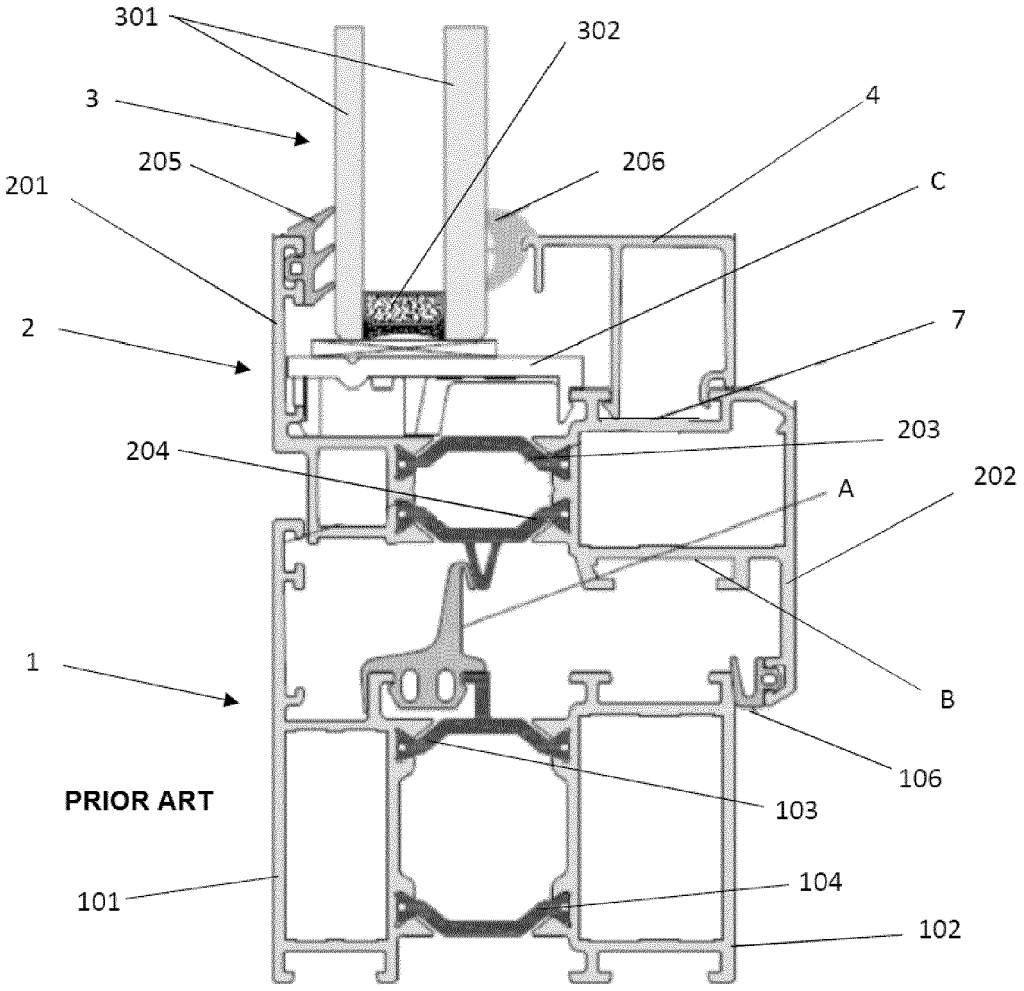

Fig. 2

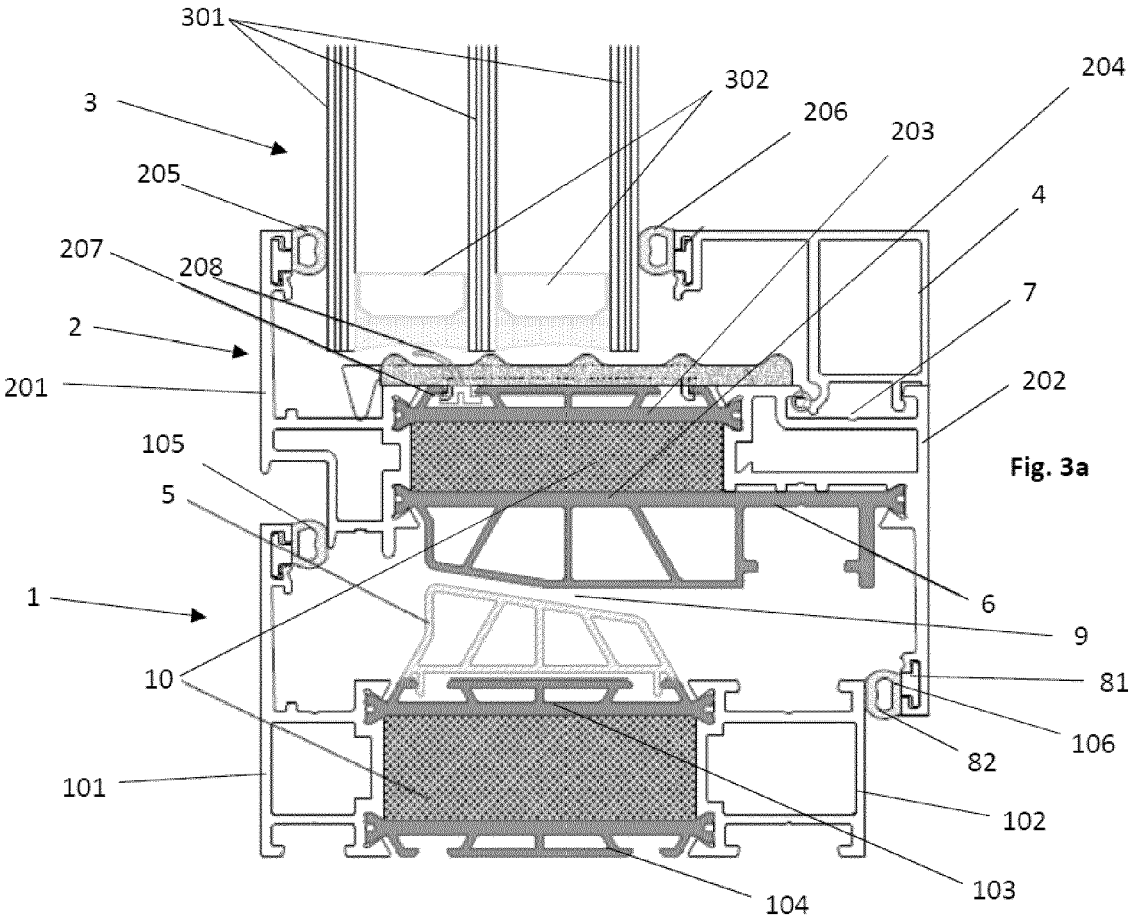
301
3
205
207
208
2
201
105
5
1
10
101
302
206
203
204
4
7
202
6
9
81
106
82
102
103
104

Fig. 3a

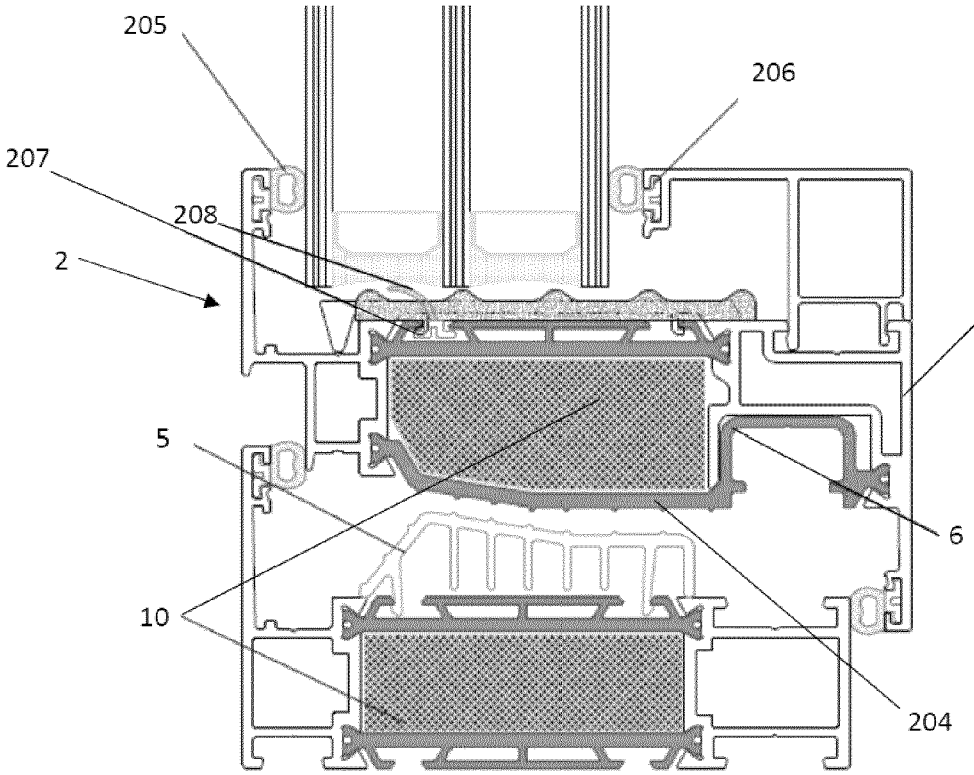
205
207
208
2
206
202
5
10
6
204

Fig. 3b

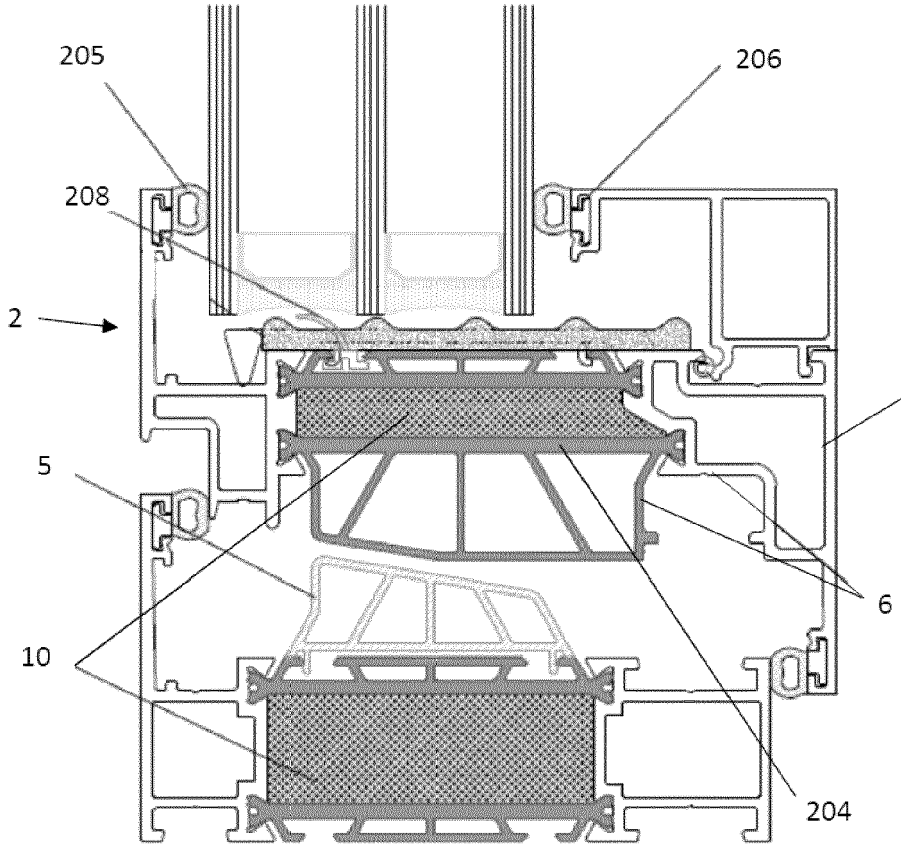

Fig. 4a

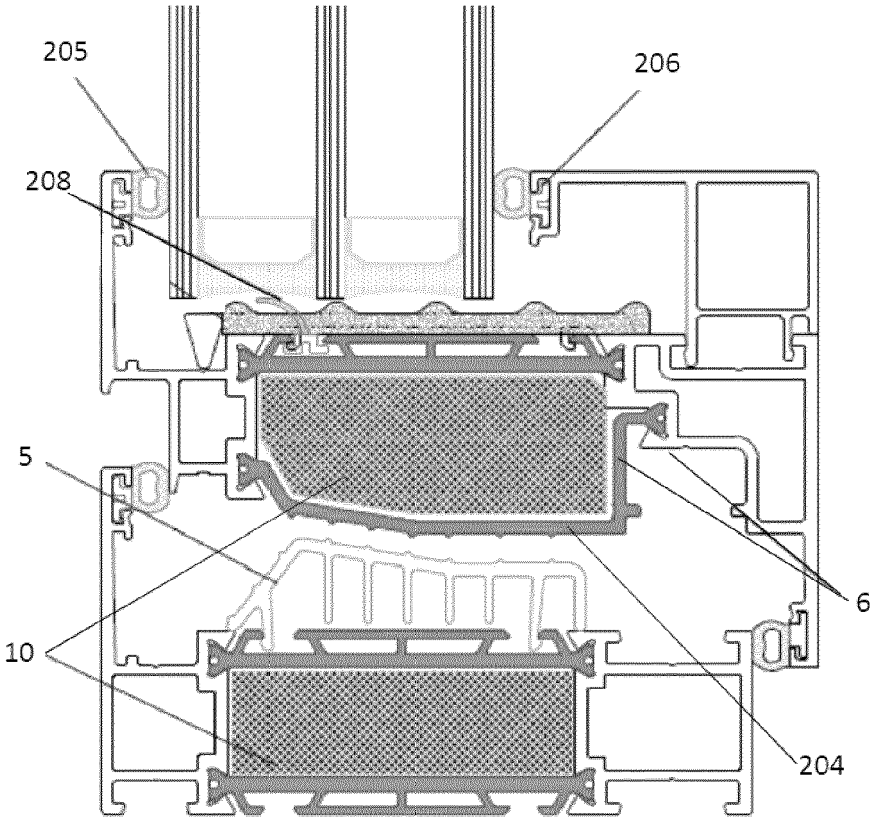

Fig. 4b

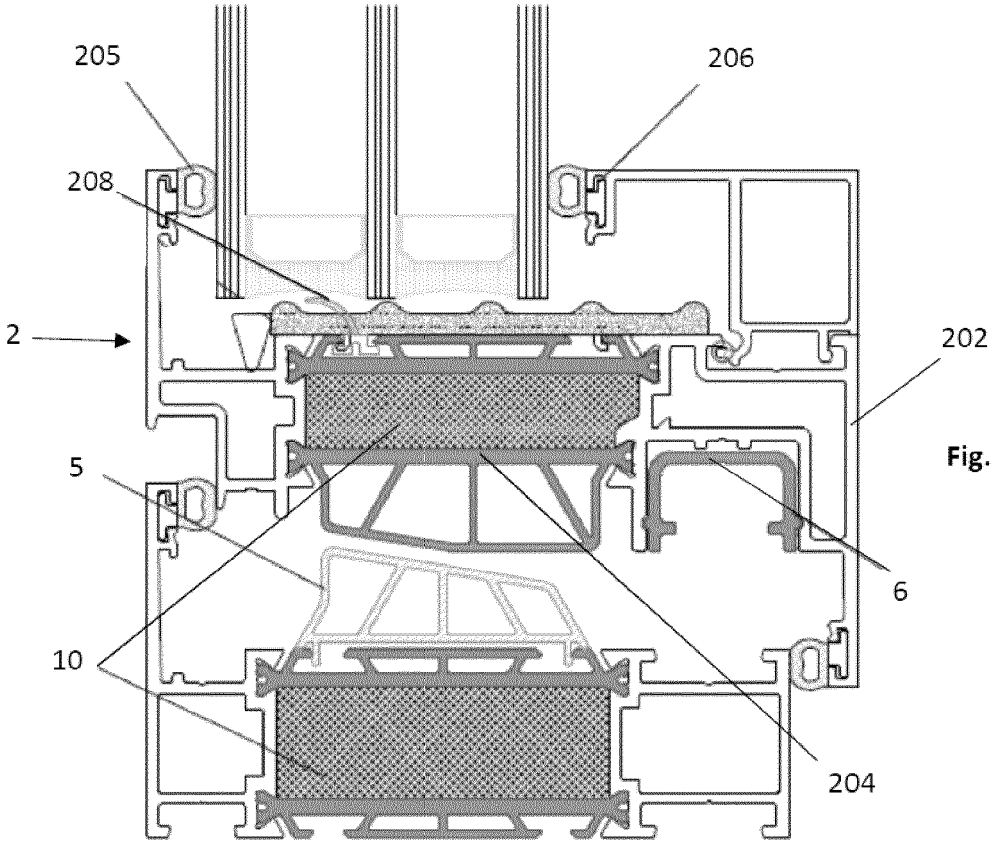

Fig. 5a

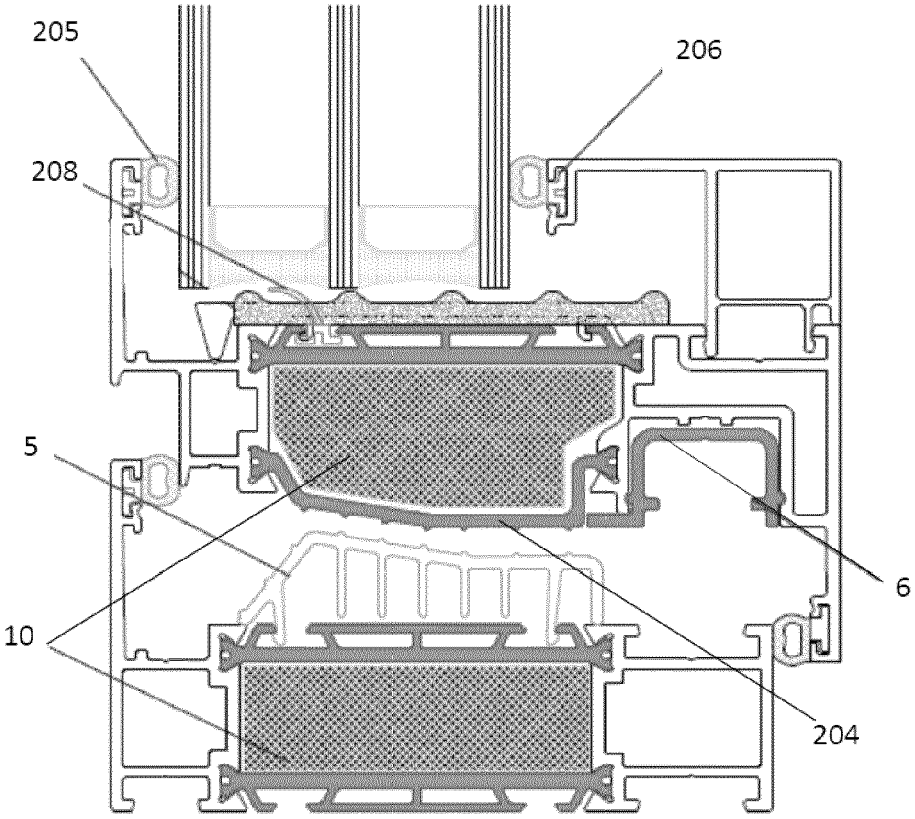

Fig. 5b

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EUROPEAN SEARCH REPORT

Application Number
EP 16 46 1577

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	BE 1 018 057 A3 (MERTENS JORIS [BE]) 6 April 2010 (2010-04-06)	1,2,4,5, 7,8, 11-13	INV. E06B3/263 E06B3/273
Y	* page 5, line 6 - page 14; figures 6-8 *	9,10,14	ADD. E06B3/62
X	EP 2 116 685 A2 (NORSK HYDRO AS [NO]) 11 November 2009 (2009-11-11) * figures 1,2 *	1,7,8, 11-13	
A	DE 200 03 060 U1 (SEUFFERT GUENTHER HERMANN [DE]) 20 April 2000 (2000-04-20) * abstract; figure 1 *	1,2,4,5, 7-14	
Y	DE 44 24 928 C1 (SOMMER METALLBAU STAHLBAU GMBH [DE]) 7 March 1996 (1996-03-07) * column 3, line 55 - column 4, line 52; figures 2,4 * * column 5, lines 12-28 *	9,10,14	

TECHNICAL FIELDS SEARCHED (IPC)
E06B

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
The Hague	26 June 2017	Hellberg, Jan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
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Application Number
EP 16 46 1577

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1, 2, 4, 5, 7-14

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 16 46 1577

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 2, 4, 5, 7-14

   With groove in internal profile from plastic having an central insulation element in form of a plastic moulding

   ---

2. claim: 3

   With groove in one of the thin strips separating the aluminum profiles

   ---

3. claim: 6

   With groove partly of thin strip partly of internal profile

   ---

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 46 1577

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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26-06-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
BE 1018057 A3	06-04-2010	NONE	
EP 2116685 A2	11-11-2009	DE 102008022893 A1	19-11-2009
		EP 2116685 A2	11-11-2009
		ES 2523688 T3	28-11-2014
DE 20003060 U1	20-04-2000	NONE	
DE 4424928 C1	07-03-1996	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- PL 223656 B1 **[0011]**
- EP 2128371 B1 **[0011]**
- EP 2374977 A2 **[0012]**
- US 7804032 B2 **[0013]**