



(11)

EP 2 287 432 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
23.02.2011 Bulletin 2011/08

(51) Int Cl.:
E06B 3/10 (2006.01)
E06B 3/36 (2006.01)

E06B 3/08 (2006.01)
E06B 1/36 (2006.01)

(21) Application number: 09164805.5

(22) Date of filing: 07.07.2009

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

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(54) Systems of outwardly opening window assemblies

(57) A system of outwardly opening window assemblies comprising at least two window assemblies (1,40), a first (1) of said at least two window assemblies comprising a window frame (2), a window sash (3) displaceably connected to the window frame via a mounting fitting, a double or triple glazed window pane (4) mounted in the window sash, a glazing bead (5) mounted on the outside of the window pane after the window pane has been placed in the sash and a primary sealing interface (10) located between the frame and the window sash in the closed position of the window, and a second (40) of said at least two window assemblies comprising a window frame (41), a double or triple glazed window pane (4) identical to the window pane (4) of the first window as-

sembly (1) and mounted directly in the window frame (41), a glazing bead (5) mounted on the outside of the window pane (4) after the window pane has been placed in the window frame and a primary sealing interface (42) located between the window frame and the window pane. The distance (w_{4a}) from the primary sealing interface (10) of the first window assembly to the outside surface (15) of the window pane (4) of the first window assembly (1) is greater than the distance (w_{4c}) from the primary sealing interface (42) of the second window assembly to the outside surface (15) of the window pane (4) of the second window assembly (40). A compound window assembly and a post for a compound window assembly are also disclosed. Additional systems of outwardly opening window assemblies are also disclosed.

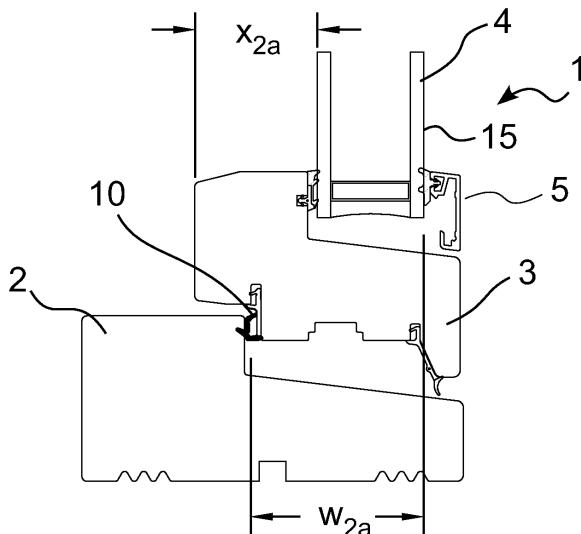


Fig. 2(a)

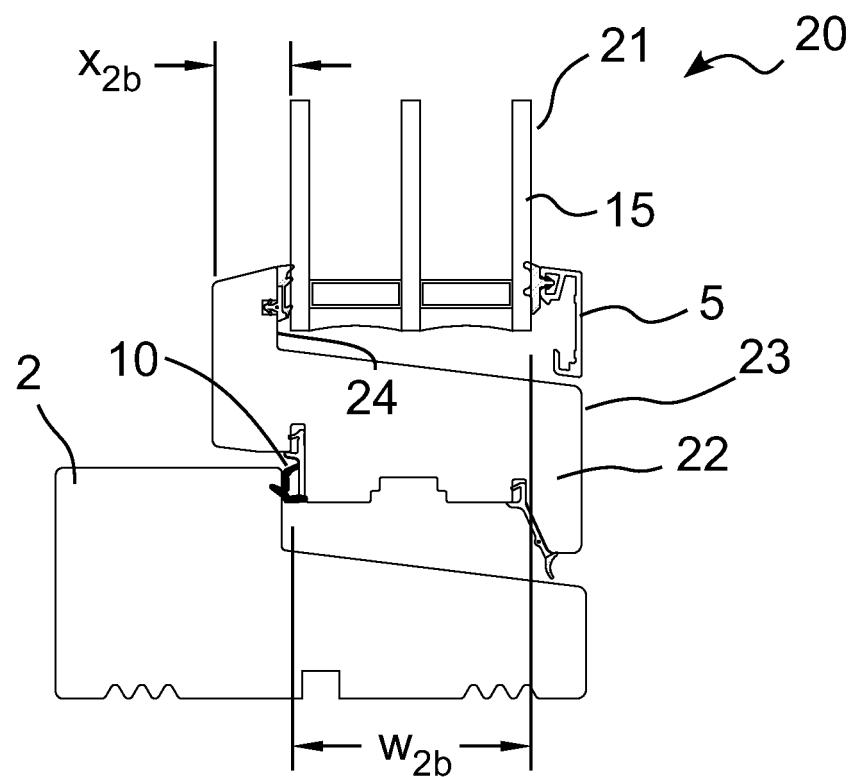


Fig. 2(b)

Description

[0001] The current specification discloses a number of different inventions related to "systems of window assemblies". Only one invention is currently defined in the claims section, but suggestions for claims directed to the other inventions are found in the description. The claim suggestions in the description are suitable for forming the basis of divisional applications based on this current specification.

[0002] The inventions in this specification are all related to "systems of window assemblies". It is important to make the distinction for the sake of this specification between a "single window assembly" and a "system of window assemblies". A "single window assembly" is as its name suggests a single window assembly typically comprising a frame, a sash connected to said frame and a panel element mounted in said sash. However, manufacturers of window assemblies rarely design or manufacture single window assemblies. Instead they design and manufacture "systems of window assemblies".

[0003] A system of window assemblies will comprise at least two different types of window assemblies which are related in some manner. For example, many systems of window assemblies will comprise one window assembly which is side hung, one window assembly which is top hung, and one window assembly which has a fixed panel element. The frame/sash/panel elements in the three different window assemblies will be essentially the same, but the fittings used will be different in the three different window assemblies. This will give a common visual impression to the three different window assemblies and will allow windows of different types to be mixed in a single building project without leading to conflicting visual impressions. Furthermore, from a manufacturing perspective, the manufacturing complexity is reduced by designing and manufacturing a system of window assemblies since there are fewer components to manufacture and stock. In the above example, there are three different functions, but only one type of frame/sash/panel element. One concrete example of a system of window assemblies is the "V200" system of windows produced by Velfac. The V200 system of window assemblies comprises a large number of different types of window assemblies all sharing the same visual identity. Another concrete example is the "Aldus" system from Rationel Vinduer A/S.

[0004] In general, systems of window assemblies can be identified as systems of window assemblies since they will be marketed as systems of window assemblies by the manufacturers. This can be verified by looking at the home pages and/or product catalogues of different window manufacturers. In case where it is not clear whether two window assemblies are part of a system of window assemblies from the manufacturers own marketing material, different ways of identifying a system of window assemblies are provided here. These ways are all equally useful, but it could in the future be decided to weight one

or more of the ways more important than others. One way is to define a system of window assemblies as window assemblies having a common exterior visual identity between different types of window assemblies, for example, double glazed, triple glazed, side hung, top hung, reversible, etc. Another way of defining a system of window assemblies, is as window assemblies having a common frame element. Another way of defining a system of window assemblies, is window assemblies having a common fittings cavity. Another way of defining a system of window assemblies, is as window assemblies which use the same fittings. Another way of defining a system of window assemblies, is as window assemblies using the same outer glazing beads.

[0005] When designing a system of window assemblies, the main technical design problems lie in designing the frame and sash elements and the fittings such that they can be shared between many different types of window assemblies. In the last few years, this problem has increased since there are more and more variants which need to be catered for. One example is the demand for different types of panel elements which vary greatly in thickness. Traditionally double glazed window panes with argon gas between the two panes of glass have been used. These types of window panes typically have a thickness of about 24mm. However lately, due to increasing demands to the thermal resistivity of window assemblies, there is a large focus on using triple glazed window panes. Triple glazed window panes are made up to 52mm wide when using argon gas. Traditionally it has not been possible to use these very wide triple glazed panes in wooden windows. Therefore, Krypton gas has been used instead of argon gas. Krypton gas is a much better insulator and allows the gap between the panes of glass to be made smaller. This allows triple glazed windows to be made at a thickness of about 36mm. Window panes of 36mm thickness have been used with wooden windows in the past. However, Krypton is much more expensive than argon gas and triple glazed windows have therefore been very expensive.

[0006] It is therefore a first aspect of one of the inventions of the current specification to provide a system of window assemblies which can accept window panes which vary greatly in thickness. For example, a system of window assemblies which can accept window panes which vary between 24 and 52 mm in thickness.

[0007] Another example of a variant between different window assemblies in a system of window assemblies is that in certain cases it is desired to have a system of window assemblies where one window assembly has a wooden sash and another window assembly has a wooden sash with an exterior "environmental shell", for example a shell of aluminium or composite material mounted on the wooden sash. In order to reduce the number of manufactured components necessary, the window system could be arranged such that the same fittings can be used in both types of window assemblies. In most cases, window assemblies with wooden exteriors and

window assemblies with "environmental shell" exteriors are parts of two different window systems since different fittings need to be used for the different exteriors.

[0008] It is therefore an aspect of one of the inventions of the current specification to provide a system of wooden window assemblies which can either have a wooden exterior or an "environmental shell" exterior.

[0009] Another example of a variant between window assemblies in a system of window assemblies is fixed or openable window assemblies. In openable window assemblies, the window pane can be opened and in fixed window assemblies, the window pane is fixed to the frame such that the window pane can't be opened. In many building projects, fixed and openable window assemblies are mixed and therefore they have to be related visually and constructionally to a certain extent.

[0010] It is therefore an aspect of one of the inventions of the current specification to provide a system of window assemblies which comprises both fixed and openable window assemblies.

Summary of the invention

[0011] Some of the above mentioned aspects are provided in part by a system of outwardly opening window assemblies according to claim 1. In this way a system of window assemblies can be provided which allows both fixed and openable window assemblies to be mixed in a single system where the number of variants which need to be manufactured and stored are reduced significantly.

[0012] It should be noted that an "outwardly opening window assembly" as used in this specification should be understood as a window assembly having a sash mounted in a frame where the sash is arranged to open by swinging or moving in an outward direction. In the open position, the sash is therefore arranged for the most part outside the frame member.

[0013] It can also be noted that in this specification, the term "outside" and "inside" refer respectively to the outside and inside of a house in which the window assembly is mounted. It can also be noted that the person skilled in the art will usually be able to identify the outer and inner surfaces of the window assembly, even if the window assembly is not mounted in a house due to the design of the seals and the design of the mounting hardware.

[0014] In one embodiment, as mentioned in claim 2, the exterior placement of the window pane can be standardized between fixed and openable window assemblies. This allows, for example the same glazing bead to be used in both fixed and openable window assemblies within the same system of window assemblies.

[0015] In another embodiment, a system of window assemblies can be provided which combines fixed, openable double glazed and openable triple glazed window assemblies. According to the features of claim 4, the glazing beads used in all three different window assemblies could be the same.

[0016] In certain embodiments, window panes filled with argon gas can be used. In these window panes, the thickness of the triple glazed window panes could be greater than 45 mm and/or up to 52 mm. In general, window thicknesses of between 24 and 52 mm could be used.

[0017] In certain embodiments, the sash members and the frame members could be made from wood which allow cutting operations to be used to change the dimensions of the profiles in an easy manner. Different variants of the frame and sash members can therefore be made just before the window is assembled in order to reduce the number of stock profiles necessary.

[0018] A compound window assembly and a post for a compound window assembly are also provided.

[0019] It should be emphasized that the term "comprises/comprising/comprised of" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof. For example, if in the claims it is stated that "the device comprises one element", then this should be understood as "the device comprises at least one element".

Brief description of the drawings

[0020] In the following, the invention will be described in greater detail with reference to embodiments shown by the enclosed figures. It should be emphasized that the embodiments shown are used for example purposes only and should not be used to limit the scope of the invention unnecessarily.

35 Figure 1 shows a cross section through one vertical side of an outwardly opening side hung window assembly with a hinge.

40 Figures 2(a) and 2(b) show two variants of a first embodiment of a system of outwardly opening window assemblies.

45 Figures 3(a) and 3(b) show two variants of a second embodiment of a system of outwardly opening window assemblies.

50 Figures 4(a)-4(d) show four different variants of a third embodiment of a system of window assemblies.

55 Figures 5(a)-5(d) show four different variants of a fourth embodiment of a system of window assemblies.

Figure 6 shows a perspective view of a window assembly with one fixed window pane and one openable window pane.

Figure 7 shows a front view of the window assembly

of figure 8.

Figure 8 shows a cross section view taken along the plane as defined by the line VIII-VIII in figure 7.

Figure 9 shows an exploded perspective view of the frame of the window assembly of figure 6.

Figures 10(a) and 10(b) show two different variants of a fifth embodiment of a system of window assemblies.

Figures 11 (a) and 11 (b) show two different variants of a sixth embodiment of a system of window assemblies.

Detailed description of the embodiments

[0021] The cross section of an outwardly opening window assembly 1 shown in figure 1 comprises a window frame element 2, a window sash element 3, a double glazed window pane 4, a glazing bead 5 which holds the window pane in place after the window pane has been placed in the window sash and a mounting fitting 6 in the form of a hinge.

[0022] In this embodiment, the window frame element 2 and the window sash element 3 are made from wooden profile elements. The profile elements are in this embodiment built up by laminating different pieces of wood together to arrive at a basic profile element. The basic profile element is then run through a profiling machine which removes wood to arrive at the final profile. This method of manufacturing wooden profile elements will be well known to the person skilled in the art. By building the basic profile element such that the cross section of the basic profile element is as close to cross section of the final profile element as possible, the material wastage is reduced to a minimum. However, in certain cases, it will be desired to use solid pieces of wood. This will increase the material wastage, but result in a finer finished product with an attractive visual appearance.

[0023] As will also be known to the person skilled in the art, the window sash is built up of four sash members or elements assembled into a rectangular window sash by joining the individual sash elements at the corners of the rectangle. The window frame is also built up of four frame members or elements which are assembled into a rectangular frame by joining the frame elements at the corner of the rectangular frame. Different ways of assembling the frame and the sash are known to the person skilled in the art and the details won't be discussed further here.

[0024] In the current embodiment, the four frame elements along the four sides of the window are identical in cross section and the four sash elements along the four sides of the window are identical in cross section. This is true for all the embodiments disclosed in this specification, but many of the teachings of this specification

could also be used on window assemblies having non-identical frame and/or sash elements.

[0025] As can be seen from the figure, the window pane 4 is held in place in the sash by the glazing bead 5. The glazing bead is in this case mounted to the sash via a clip system (not shown) which attaches to the surface 7 located underneath the window pane. This is useful in this embodiment since the surface 7 does not extend past the outer surface of the window pane. Therefore, it is difficult to mount the glazing bead with traditional fasteners such as nails and screws. However, the glazing bead could be mounted to the sash element directly via screws, nails or other form of fastening mechanism in other cases where the sash element allows this. It should be noted that the surface 7 is sloped about seven degrees. This is to allow moisture which could find its way into the window sash to run out of the sash at the bottom of the sash. In particular it should be noted that the building code of many countries requires this sloped surface on the bottom sash member of a window sash. The same is true for window frames as can be seen from the figures. This sloped surface imposes significant design limitations to the design. Some window manufacturers have therefore decided to make window sashes where the bottom sash member is different from the side and top sash members. For example, the side and top sash members could have a straight surface whereas the bottom sash member has a sloped surface. This is also true for frames. In the current embodiments, in order to save variants, the same frame and sash profile is used on all four sides of the window.

[0026] As can be seen from the figure, the window pane is supported on the inner side of the window pane by an outwardly facing "support" surface 8 of the sash element. A seal element 9 is placed between the support surface 8 and the window pane to absorb any tolerances and to provide a water tight seal. As can be seen from the figure, the support surface 8 and the surface 7 to which the glazing bead is mounted are two surfaces of an integrated element 3. This means that the two surfaces are not surfaces of two different distinct elements, but are surfaces of the same element. The outwardly facing "support" surface is therefore an integrated part of the sash element in contrast to the glazing bead which is added to the sash element after the window pane is placed into or set into the window sash. It should be noted that this type of sash could be called a sash where the window pane is mounted from the outside. There are other types of window sashes where the support surface is integrated with the sash is located on the outside of the window pane. In this case the window pane is mounted from the inside. A removable glazing bead is then mounted on the inside of the window pane to hold the window pane in place. Still other types of sashes are "U" shaped sashes where the window pane is inserted into the sash in a direction parallel to the plane of the window. In these types of constructions, the sash is built up around the outside of the window pane. This is in contrast to the sash

type shown in the figures where the sash is assembled into a rectangle first and then the window pane is placed in the sash.

[0027] It can also be seen that the sash element could be described as having an "L" form where a first leg of the L extends along the inner surface of the window pane and a second leg of the L extends underneath the window pane. The first leg of the L provides the support surface 8 which provides the sealing interface between the window pane and the sash element. The first leg of the L also provides support for the window pane to prevent it from moving in directions which are towards the inside of the window assembly. The second leg of the L provides a surface to which the glazing bead is fastened. The second leg of the L also provides support to prevent the window pane from moving in directions which are parallel to the plane of the window pane.

[0028] The frame member 2 of the current embodiment could also be described as having an "L" form where a first leg of the L provides a support surface for the primary sealing interface 10 and the second leg of the L provides an attachment surface for the mounting fittings. The second leg of the L also provides support for a fixed window pane as will be shown in, for example, figures 4c and 4d. The area between the two legs of the L which is "missing" from the frame member, can be called a frame recess as will be discussed further later on. As can be seen from figure 1, the area between the frame and the sash form a "fittings cavity" which provides room for mounting the fittings of the window assembly. This fittings cavity is essentially constant for different window assemblies in some systems of window assemblies. By providing a constant fittings cavity between different window assemblies, the same fittings can be used in different window assemblies.

[0029] In order to seal the window assembly, a primary sealing interface 10 is provided between the window frame and the window sash. According to this specification the "primary sealing interface" should be understood as being the main sealing interface between the frame and the sash. In this embodiment there are two sealing interfaces. The first sealing interface is the innermost sealing interface 10 and the other is an outer sealing interface 11 located at the outer periphery of the window assembly. In this case, it is clear that the innermost sealing interface is the "primary" sealing interface as it is the sealing interface which gives the best sealing interface. In other cases where there are more than one sealing interfaces located between the frame and the sash and where it is not clear which one is the primary sealing interface, then the innermost sealing interface is to be chosen as the primary sealing interface for the sake of this specification.

[0030] In the following discussion, a number of dimensions will be discussed. The first dimension which is of interest is the distance "t" from the primary sealing interface 10 to the innermost surface 12 of the frame element. According to this specification, when measuring to the

primary sealing interface, it is meant to measure to the middle of the sealing interface. The second dimension which is of interest is the distance "u" from the primary sealing interface 10 to the outermost surface 13 of the frame element. This distance "u" could be called the depth or width of the frame recess. The third dimension is the distance "v" from the primary sealing interface to the outermost surface 14 of the sash element. In this example, the distance "v" is slightly smaller than the distance "u", but it could be imagined that these two distances were identical or essentially identical. The fourth dimension is the distance "w" from the primary sealing interface to the outer surface 15 of the window pane. The fifth dimension is the distance "x" from the innermost surface 17 of the sash element to the innermost surface 16 of the window pane. The sixth dimension is the distance "y" from the primary sealing interface 10 to the innermost surface 17 of the sash element. The seventh dimension is the distance "z" from the primary sealing interface 10

5 to the middle of the fitting groove 18. It can be noted that as the frame member had a frame recess with dimension "u", the sash has a sash recess with a dimension which is equal to "v+y-x".

[0031] The two window assemblies shown in figures 2a and 2b are two outwardly opening window assemblies of a first embodiment of a system of window assemblies according to a first invention of the current specification. The first invention is not currently defined in the claim set, but suggestions for drafting claims directed to the first invention are provided later on in this specification. The first window assembly 1, shown in figure 2a, is the same as was shown in figure 1. The second window assembly 20, shown in figure 2b, is almost the same as the one shown in figure 1, but has a triple glazed window pane 21 instead of a double glazed window pane as was the case with figure 2a. The only other difference is the sash element 22 of figure 2b which is different than the sash element 3 of figure 1 (and figure 2a). The same reference numerals will be used for the same features

30 as in figure 1.

[0032] As can be seen from the figures, even though the first window assembly 1 has a double glazed window pane and the second window assembly 20 has a triple glazed window pane, the dimension t is the same in both figures, the dimension u is the same in both figures, the dimension v is the same in both figures, the dimension w (see W_{2a} and W_{2b}) is the same in both figures, the dimension y is the same in both figures and the dimension z is the same in both figures. The only dimension which is different is x, see x_{2a} and x_{2b}. For simplicities sake only x_{2a}, x_{2b}, w_{2a} and w_{2b} are shown on the figures.

[0033] In this example, the frame element 2 is the same in both window assemblies 1, 20. Also the sash elements 3 and 22 are almost identical, except for the difference in the dimension x_{2a} and x_{2b}. This difference is formed by removing more material from the basic profile element for the sash element 22 of figure 2b than sash element 3 of figure 2a. This could also be described as cutting a

deeper sash recess in the second window assembly than in the first window assembly. The result is that the surface 24 which supports the inner surface of the window pane 21 of the second window assembly is placed closer to the inside of the window assembly than the surface 8 of the sash which supports the inner surface of the window pane 4 of the first window assembly.

[0034] As should be clear to the person skilled in the art when comparing figures 2a and 2b, the same fittings can be used for both window assemblies. This significantly reduces the number of fitting variants which have to be stocked. It can also be seen that the fitting cavity between the sash and the frame is the same for the two window assemblies. It can also be seen that the visual impression of the two windows from the outside are identical.

[0035] The window assembly embodiments 30, 31 of figures 3a and 3b are very similar in concept to the window assembly embodiments 1, 20 shown in figures 2a and 2b. The difference in this case is that the frame 32 and sash elements 33, 34 have aluminium environmental shells 35, 36 mounted on the outside of the frame and sash elements respectively in order to provide a exterior maintenance free window assembly. However, the distances as discussed in relation to figures 2a and 2b are the same as for figures 3a and 3b.

[0036] The section below can be used as a guide to draft claims which could be used to define the first invention.

[0037] An independent claim could be drafted as follows: A system of outwardly opening window assemblies comprising at least two window assemblies, a first (1) of said at least two window assemblies comprising a window frame (2), a window sash (3) displaceably connected to the window frame via a mounting fitting, a double glazed window pane (4) mounted in the window sash, a glazing bead (5) mounted on the outside of the window pane after the window pane is set in the window sash and a primary sealing interface (10) between the frame and the sash in the closed position of the window, and a second (20) of said at least two window assemblies comprising a window frame (2), a window sash (22) displaceably connected to the window frame via a mounting fitting, a triple glazed window pane (21) mounted in the window sash, a glazing bead (5) mounted on the outside of the window pane after the window pane is set in the window sash and a primary sealing interface (10) between the frame and the sash in the closed position of the window, characterized in that distance (w2a) from the primary sealing interface (10) to the outside surface (15) of the window pane (4) of the first window assembly (1) is the same as the distance (w2b) from the primary sealing interface (10) to the outside surface (15) of the window pane (21) of the second window assembly (22).

[0038] Dependent claims could be drafted as follows. The claims could come in any order and have different claim dependencies.

[0039] A system of outwardly opening window assem-

blies according to a previous claim, where the glazing bead in the first window assembly is identical with the glazing bead in the second window assembly.

[0040] A system of outwardly opening window assemblies according to a previous claim, where the distance from the primary sealing interface of the first window assembly to the innermost face of the window sash of the first window assembly is the same as the distance from the primary sealing interface of the second window assembly to the innermost face of the window sash of the second window assembly.

[0041] A system of outwardly opening window assemblies according to a previous claim, where the distance from the innermost surface of the window sash of the first window assembly to the surface of the sash which is in contact with the innermost surface of the window pane of the first window assembly is greater than the distance from the innermost surface of the window sash of the second window assembly to the surface of the sash which is in contact with the innermost surface of the window pane of the second window assembly.

[0042] A system of outwardly opening window assemblies according to a previous claim, where a cross section of one of the window frame elements of the window frame of the first window assembly taken along a plane which is perpendicular to the plane of the first window assembly is identical to a cross section of one of the window frame elements of the window frame of the second window assembly taken along a plane which is perpendicular to the plane of the second window assembly.

[0043] A system of outwardly opening window assemblies according to a previous claim, where a cross section through a window sash element of the window sash of the first window assembly taken along a plane which is perpendicular to the plane of the window assembly and a cross section through a window sash element of the window sash of the second window assembly taken along a plane which is perpendicular to the plane of the window assembly are identical except for the position of the surface which is in contact with the innermost surface of the window pane.

[0044] A system of outwardly opening window assemblies according to a previous claim, where the first and second window assemblies are side hung window assemblies and in that the hinges used in the first and second window assemblies are identical.

[0045] A system of outwardly opening window assemblies according to a previous claim, where the triple glazed window pane of the second window assembly is filled with argon gas and is at least 45mm thick.

[0046] A system of outwardly opening window assemblies according to a previous claim, where the window sashes and/or the window frames of the first and second window assemblies are made of wood.

[0047] A system of outwardly opening window assemblies according to a previous claim, where the window sash elements of the window sashes of the first and second window assemblies are designed such that the sur-

face of the window sash element which is in contact with the innermost surface of the window pane and the surface of the window sash element on which the glazing bead is mounted are two surfaces of the same integrated element. In this case, integrated element should be understood as an element made from a single piece of material which is formed into the desired shape.

[0048] A system of outwardly opening window assemblies according to a previous claim, where the window frame and the window sash of the first window assembly are made up of four identical frame elements and four identical sash elements respectively joined together in a rectangle and in that the window frame and the window sash of the second window assembly are made up of four identical frame elements and four identical sash elements joined together in a rectangle.

[0049] A claim to a method of manufacturing a system of window assemblies could also be drafted as follows: A method of manufacturing a system of window assemblies according to a previous claim, where the method comprises the steps of building a first window assembly with a double glazed window pane and with sash elements having a distance x_{2a} from the innermost surface of the sash element to the support surface for the window pane and building a second window assembly with a triple glazed window pane and with sash elements having a distance x_{2b} from the innermost surface of the sash element to the support surface for the window pane and where the distance x_{2b} is less than the distance x_{2a} .

[0050] A method of manufacturing a system of window assemblies according to a previous claim, where the first window sash and the second window sash are made from wooden profile elements and in that the distances x_{2a} and x_{2b} are provided by removing more or less material in a cutting operation from identical base profile elements.

[0051] It should be clear to the person skilled in the art that the above suggestions for claims can be amended and combined as desired.

[0052] Figures 4a and 4c illustrate a second invention of this specification. Claims related to the second invention are defined in the claims section.

[0053] The second invention relates to a system of window assemblies where a first window assembly 1 has an openable window sash 2 and a second window assembly 40 has a fixed window pane 4. Figure 4a shows a first window assembly 1 which is the same as the window assembly shown in figures 1 and 2a. Figure 4c shows a fixed window assembly 40. Both window assemblies comprise double glazed window panes 4. The window panes 4 of both window assemblies are held in place by an identical glazing bead 5. In the first window assembly 1, the glazing bead is mounted to the openable window sash 2 and in the second window assembly 40, the glazing bead is mounted to the frame 41. As was the case with the openable window assembly, the glazing bead of the second window assembly is in the current embodiment mounted to the frame member via a clip system

(not shown). However, other forms of mounting, such as glue, nails, screws, etc could be imagined in other window assembly geometries as will be known to the person skilled in the art.

5 **[0054]** In figure 4a, the window pane 4 is in sealed contact with the window sash which is in sealed contact in the closed position of the window assembly with the window frame. In figure 4c, the window pane is in direct sealing contact with the window frame via a seal 42. For **10** window assemblies of the type exemplified by the second window assembly, the primary sealing interface for the sake of this specification can be defined as the seal between the window pane and the window frame.

[0055] As can be seen from the figures the distance **15** w_{4a} from the primary sealing interface 10 of the first window assembly to the outside surface 15 of the window pane 4 is greater than the distance w_{4c} from the primary sealing interface 42 of the second window assembly to the outside surface 15 of the window pane 4. This is **20** achieved by providing two frame elements 2, 41 which have different frame recess or frame groove dimensions. In the first window assembly, the frame recess is much deeper than in the second window assembly. However, besides the dimension of the recess, the remaining geometry of the frame members of the first and second frame members are the same.

[0056] By arranging the frame members as shown in figures 4a and 4c, the dimension s_{4a} and s_{4c} from the outer surface of the window pane to the outer surface of **30** the sash element are the same in both the first and the second window assemblies. This allows the same glazing bead 5 to be used in both the fixed and the openable window assemblies. Since the form of the glazing bead to a certain extent defines the exterior visual impression **35** of a window assembly, openable and fixed windows of the type shown in figures 4a and 4c will provide to a great extent a similar exterior visual impression.

[0057] Figures 4b and 4d show two other examples of **40** a system of window assemblies comprising both an openable window assembly 20 and a fixed window assembly 50. In most aspects the window assemblies of 4b and 4d are the same as the window assemblies of 4a and 4c, except that the window assemblies of 4b and 4d have triple glazed windows 21 instead of double glazed **45** windows 4.

[0058] However, it is of interest to note that the distance w_{4b} and w_{4d} are the same. This is because the window pane shown in the window assemblies of figures 4b and **50** 4d is the thickest window pane for which the window assemblies are designed for. In this position, the innermost surface of the window pane of the openable window assembly is flush with the primary sealing interface. However, for window pane thicknesses which are smaller than that shown in figures 4b and 4d, the dimension from **55** the primary sealing interface between the frame and the window pane to the outer surface of the window pane for fixed window assemblies will be smaller than the dimension from the primary sealing interface between the frame

and an openable sash to the outer surface of the window pane for openable window assemblies.

[0059] It can also be noted that the window assemblies 1, 20 and 40 could all be part of a single system of window assemblies. In this case, the system of window assemblies comprises a first window assembly which has a double glazed window pane mounted in an openable sash, a second window assembly with a double glazed window pane fixedly mounted to the window frame and a third window assembly with a triple glazed window pane mounted in an openable sash. In this system of window assemblies, the distances w4a and w4b are the same, even though one window has a double glazed window pane and the other has a triple glazed window pane. This system of window assemblies could be described as a combination of the first invention as described above and the second invention as described above. A system of window assemblies comprising the window assemblies of figures 4a, 4b, 4c and 4d could also be considered to be a system of window assemblies according to a combination of the first and second inventions.

[0060] A system of window assemblies according to the second invention could be manufactured by providing a basic frame element which is the same for all window assemblies in the system of window assemblies. Then in the profiling step, different amounts of material could be removed depending on which type of window assembly was to be made. If a double glazed openable window assembly was made, the frame recess would be greater than if a double glazed fixed window assembly was made.

[0061] A method claim to the second invention could also be drafted as follows: A method of manufacturing a system of window assemblies characterized in that the method comprises the steps of building a first outwardly opening window assembly with a double or triple glazed window pane arranged in a window sash which is displaceably connected with a window frame and building a second window assembly with a double or triple glazed window pane identical with the window pane of the first window assembly and where the window pane of the second window assembly is mounted directly to the frame member of the second window assembly, characterized in that the step of manufacturing the frame member of the first window assembly comprises the step of providing a frame recess having a depth X1 and in that the step of manufacturing the frame member of the second window assembly comprises the step of providing a frame recess having a depth X2 and where the depth X1 is greater than the depth X2.

[0062] A method of manufacturing a system of window assemblies according to a previous claim, characterized in that the window sash and the window frame of the first window assembly and the window frame of the second window assembly are made from wooden profile elements and in that the depths X1 and X2 are provided by removing more or less material in a cutting operation from identical base profile frame elements.

[0063] Figures 5a-5d are for the most part the same

as figures 4a-4d. The main difference is that the dimensions of the sash and frame elements are slightly different and that an aluminium environmental shell has been added to the outside of the window frame and the window sash.

5 The person skilled in the art will see the similarities between figures 4a-4d and figures 5a-5d so these figures will not be discussed in more detail here but are provided to a show additional embodiments of systems of window assemblies. For example the window assemblies of figures 5a and 5c form a system, as do the window assemblies of figures 5a, 5b and 5c and as do the window assemblies of figures 5a, 5b, 5c and 5d.

[0064] Figures 6-9 illustrate a third invention of this specification which to a certain extent is related to the second invention. Figures 6-9 show different views of a window assembly 80 which comprises a single window frame 81 split into two areas, a fixed window 82 area on the left of figure 6 and an openable window 83 area on the right of figure 6. The fixed window pane is not shown in the figures in order to simplify the figures, but is for the most part similar to that shown in figure 4c. The two window areas are separated by a post 84. In the current embodiment, the post is mounted in between two opposing window frame members. This type of window assembly is well known in the prior art and is in some cases called a "compound window assembly" since it is assembled from multiple window areas, each area possibly comprising a different function. For example a compound window might have, as in the current example, a fixed and an openable window area. Another example is compound window with a side hung, a top hung and a fixed window area. In the case of a three part compound window, there are two posts, a first post between two opposing frame members and a second post between a frame member and the first post. Compound windows can also be made with four, five, etc areas. The examples are limitless.

[0065] As was discussed in relation to figures 4a and 4c, when mixing fixed and openable windows in the system of window assemblies, the frame recess has different dimensions depending on whether it was a fixed window assembly (figure 4c) or an openable (figure 4a) window assembly. This is the same in the current compound window assembly 80. However, since the two windows 81, 82 of the window assembly 80 shown in figures 8-11 share a common frame 81, the frame recess is "stepped". This is best shown in figure 9. As can be seen, the frame recess 85 at the fixed window area 81 is not as wide as the frame recess 86 for the openable window area 82. This results in a step 87 in the frame recess at the transition between the openable window area 82 and the fixed window area 81. This step 87 is covered by the post 84 and cannot be seen when the window assembly 80 is assembled. The difference in the width of the frame recess 85, 86 can also be seen, from the cross section shown in figure 8. From this cross section, it can also be seen that the post is arranged with two different recess depths on its two sides. On the side of the post 84 facing

the fixed window area 82, the recess 85 is not as wide as the recess 86 on the side of the post facing the openable window area 83.

[0066] It should be noted that in this specification, the term "frame recess" is used to describe the groove which is formed in the frame and in which a window sash or a fixed window pane is arranged. One surface of the frame recess faces outside and forms one part of the primary sealing interface, either between a window sash and the window frame or between a fixed window pane and the window frame. It can also be mentioned that when the "depth" or the "width" of the frame recess is used, the dimension which is being referred to is the dimension which is perpendicular to the plane of the window assembly.

[0067] Figures 6-9 have been drawn rather schematically without any great details of the fixed window pane or the openable window sash. However, the person skilled in the art should be able to fill in the missing details. For example, the cross sections marked A in figure 7 will to a great extent look like the cross section of figure 4a when the window sash, window pane and glazing bead are mounted properly. Also, the cross sections marked C in figure 7 will to a great extent look like the cross section shown in figure 4c when the fixed window pane and the glazing bead are mounted properly. Furthermore, it could be imagined that the cross section marked B will look like the cross section of figure 4c on its left and like the cross section of figure 4a on its right, however with the frame members being replaced by the cross section of the post as shown in figure 8.

[0068] The third invention is defined by the claims in the claim set. It should be noted that the third invention is defined in two different ways. A first way is to base the invention on a window assembly having a window frame with a stepped frame recess and a second way is to base the invention on a window assembly having a post having different recess depths on either side of the post.

[0069] Figures 10a and 10b disclose a fourth invention of this specification. It should be noted that the figures 10a-10b are described quite quickly without too many details as many of the details have already been described with respect to previous figures. For example figure 10a is the same as figure 1, 2a and 4a. Figure 10a is the same as figure 3a and 5a. The person skilled in the art will be able to see the similarities between the different embodiments and be able to fill in any missing details.

[0070] As can be seen from the figures, figure 10a shows a first double glazed openable window assembly in a wood exterior and figure 10b shows a second double glazed openable window assembly an aluminium exterior "environmental shell". It should be noted that the phrase "environmental shell" is used to describe a shell of material which is added to the outside of a window frame/sash element in order to protect the main material of the window frame/sash from the outside environment. This reduces the need for frequent exterior maintenance.

For example, windows having a wooden exterior need to be painted regularly in order to increase their lifetime. By adding a shell of aluminium to the outside of the wooden window, the aluminium protects the underlying wooden material and reduces the need for maintenance. While aluminium is currently being used for many applications, many other materials would also be suitable for example glass fiber or other composite materials.

[0071] As can be seen from the figures the distance v10a from the primary sealing interface 10 of the first window assembly 1 to the outer surface 14 of the window sash 3 of the first window assembly is the same as the distance v10b from the primary sealing interface 10 of the second window assembly 30 to the outer surface 37 of the environmental shell 36 of the window sash 33 of the second window assembly. By keeping this distance constant, the same fittings can be used for both window assemblies. This reduces the number of different fittings which need to be manufactured. In order to keep the distances as mentioned above the same, material is removed from the front of the frame and sash elements before the aluminium environmental shells are mounted on the outwardly facing surfaces of the sash and frame elements. The frame member 32 of the second window assembly 30 is essentially the same as the frame member 2 of the first window assembly 1 with the only difference being the length of the "nose" of the frame member. In the second window assembly, the "nose" of the frame member has been cut off in order to make room for the environmental shell. The same can also be said for the difference between the sash member 33 of the second window assembly and the sash member 3 of the first window assembly.

[0072] This is in contrast to prior art solutions where window assemblies with wooden exteriors and window assemblies with environmental shell exteriors were typically parts of two different systems of window assemblies which could not be mixed.

[0073] The fourth invention could be defined by a claim as follows: A system of outwardly opening window assemblies comprising at least two window assemblies, a first of said at least two window assemblies comprising a wooden window frame with an exposed wooden exterior surface, a wooden window sash having an exposed wooden exterior surface and being displaceably connected to the window frame via a mounting fitting, a double or triple glazed window pane mounted in the window sash, a glazing bead mounted to the window sash on the outside of the window pane after the window pane is placed in the window sash and a primary sealing interface between the window frame and the window sash in the closed position of the window, and a second of said at least two window assemblies comprising a wooden window frame, a wooden window sash displaceably connected to the window frame via a mounting fitting, a double or triple glazed window pane mounted in the window sash, a glazing bead mounted to the window sash on the outside of the window pane after the window pane is

placed in the window sash, a primary sealing interface between the window frame and the window sash in the closed position of the window and environmental shells mounted on the outermost surface of the wooden window sash and the outermost surface of the wooden window frame, characterized in that distance from the primary sealing interface of the first window assembly to the exterior surface of the wooden window sash of the first window assembly is the same as the distance from the primary sealing interface of the second window assembly to the exterior surface of the environmental shell mounted on the window sash of the second window assembly.

[0074] The fourth invention is also illustrated by figures 11 a and 11 b which show the same as figures 10a and 10b but with triple glazed window panes instead of double glazed window panes.

[0075] Additional dependent claims can be provided by using the same features as the dependent claims of inventions 1 and 2. It should also be noted that the fourth invention could be combined with the first and/or second inventions. For example a system of window assemblies comprising the window assemblies of figures 2a, 2b, 3a and 3b would be a combination of inventions 1 and 4. Or a system of window assemblies comprising the window assemblies of figures 4a, 4c, 5a and 5c would be a combination of inventions 2 and 4. A system of window assemblies comprising the window assemblies of figures 2a, 2b, 3a, 3b, 4c and 5c would be a combination of inventions 1, 2, and 4

[0076] It is to be noted that the figures and the above description have shown the example embodiments in a relatively simple and schematic manner. Specific mechanical details have not been shown since the person skilled in the art should be familiar with these details and they would just unnecessarily complicate this description.

Claims

1. A system of outwardly opening window assemblies comprising at least two window assemblies (1,40), a first (1) of said at least two window assemblies comprising a window frame (2), a window sash (3) displaceably connected to the window frame via a mounting fitting, a double or triple glazed window pane (4) mounted in the window sash, a glazing bead (5) mounted on the outside of the window pane after the window pane has been placed in the sash and a primary sealing interface (10) located between the frame and the window sash in the closed position of the window, and a second (40) of said at least two window assemblies comprising a window frame (41), a double or triple glazed window pane (4) identical to the window pane (4) of the first window assembly (1) and mounted directly in the window frame (41), a glazing bead (5) mounted on the outside of the window pane (4) after the window pane has been

placed in the window frame and a primary sealing interface (42) located between the window frame and the window pane, **characterized in that** the distance (w_{4a}) from the primary sealing interface (10) of the first window assembly to the outside surface (15) of the window pane of the first window assembly (1) is greater than the distance (w_{4c}) from the primary sealing interface (42) of the second window assembly to the outside surface (15) of the window pane (40).

- 5 2. A system of outwardly opening window assemblies according to claim 1, **characterized in that** the distance (s_{4a}) from the outer surface (15) of the window pane (4) of the first window assembly (1) to the outer surface (14) of the window sash (3) of the first window assembly is the same as the distance (s_{4c}) from the outer surface (15) of the window pane (4) of the second window assembly (40) to the outer surface (43) of the window frame (41) of the second window assembly.
- 10 3. A system of outwardly opening window assemblies (1,40) according to claim 1 or 2, **characterized in that** the glazing bead (5) of the first window assembly (1) is the same as the glazing bead (5) of the second window assembly (40).
- 15 4. A system of outwardly opening window assemblies (1,40,20) according to any one of claims 1-3, **characterized in that** the system of window assemblies further comprises a third window assembly (20), said third window assembly comprising a window frame (2), a window sash (22) displaceably connected to the window frame via a mounting fitting, a double or triple glazed window pane (21) having a different width than the window pane (5) of the first window assembly (1) and being mounted in the window sash (22), a glazing bead (5) mounted on the outside of the window pane (21) after the window pane has been placed in the sash (22) and a primary sealing interface (10) located between the frame and the window sash in the closed position of the window, and where the distance (w_{4b}) from the primary sealing interface of the third window assembly to the outer surface 15 of the window pane (21) of the third window assembly (20) is the same as the distance (w_{4a}) from the primary sealing interface (10) of the first window assembly (1) to the outer surface (15) of the window pane (4) of the first window assembly (1).
- 20 5. A system of window assemblies (1,40,20) according to claim 4, **characterized in that** the glazing beads (5) in the first, second and third window assemblies are the same.
- 25 6. A system of outwardly opening window assemblies

according to any one of claims 4 and 5, **characterized in that** the cross section of the window frame (2) of the first window assembly (1) is identical to the cross section of the window frame (2) of the third window assembly (20) and where the cross section of the window frame (41) of the second window assembly (40) is identical to the cross sections of the first and third window assemblies, except for the position in a direction perpendicular to the plane of the window assembly of the surface (44) of the window frame (41) which forms the support for the primary sealing interface (42) of the second window assembly (40). 5

7. A system of outwardly opening window assemblies according to any one of claims 4-6, **characterized in that** the window sash (3) of the first window assembly (1) and the window sash (22) of the third window assembly (20) are identical except for the position of the surface (8,24) which is in contact with the innermost surface (16) of the window pane (4,21). 10

8. A system of outwardly opening window assemblies (1,40,20) according to any one of claims 4-7, **characterized in that** at least one of the window panes (21) of the first, second and third window assemblies is filled with argon gas and is at least 45mm thick. 15

9. A system of outwardly opening window assemblies (1,40) according to any one of claims 1-8, **characterized in that** window sash (3) of the first window assembly (1) and the window frames (2,41) of the first and second window assemblies are made primarily from wood. 20

10. A system of outwardly opening window assemblies (1,40) according to any one of claims 1-9, **characterized in that** the window sash (3) of the first window assembly (1) is designed such that the surface (8) of the window sash which is in contact with the innermost surface of the window pane (16) and the surface (7) of the window sash (3) to which the glazing bead (5) is mounted are two surfaces of the same integrated element and **in that** the window frame (41) of the second window assembly (40) is designed such that the surface (44) of the window frame (41) which is in contact with the innermost surface (16) of the window pane (4) and the surface (45) of the window frame (41) on which the glazing bead (5) is mounted are two surfaces of the same integrated element. 25

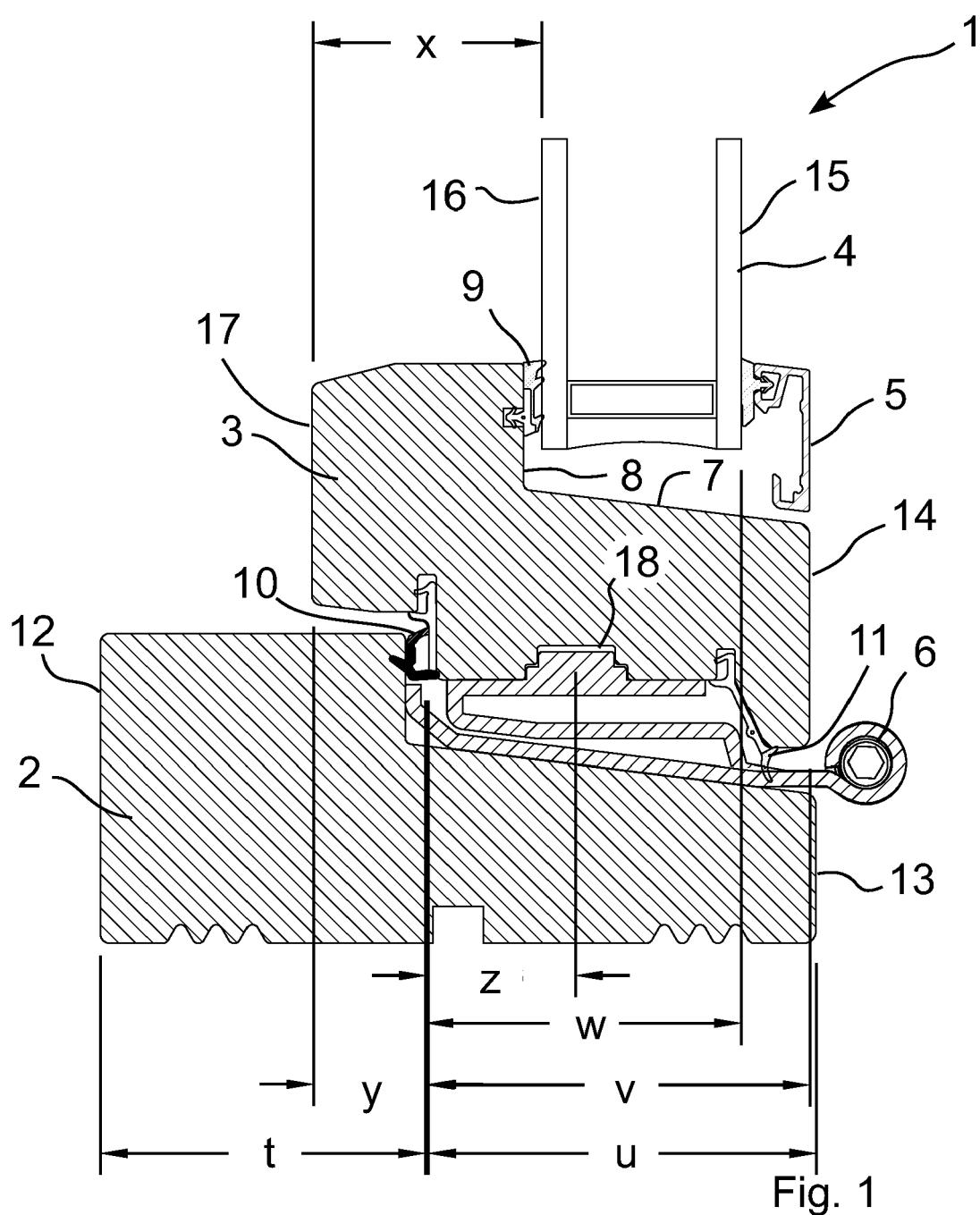
11. A compound window assembly (80) comprising a window frame (81) having a first window area (82) with a fixed window pane mounted directly on the window frame and having a primary sealing interface between the window frame and the inner surface of the fixed window pane and a second window area (83) with an openable window sash (88) having a primary sealing interface between the window sash and the window frame (81) in the closed position of the openable window sash, the fixed window area and the openable window area being separated by a post (84) fixed in the window frame, said post contributing to the primary sealing interface of the fixed window area on one side of the fixed window area and to the primary sealing interface of the openable window area on one side of the openable window area, **characterized in that** the distance perpendicular to the plane of the window assembly from the primary sealing interface of the fixed window area to the outer surface of the fixed window pane is less than the distance perpendicular to the plane of the window assembly from the primary sealing interface of the openable window area to the outer surface of a window pane mounted in the openable window sash of the openable window pane and where the outer surface of the fixed window pane and the outer surface of the window pane of the openable window sash lie in the same plane. 30

12. A compound window assembly according to claim 11, **characterized in that** the window frame is assembled from four window frame members mounted in a rectangle and where at least one of said four window frame members has a frame recess which has two different depths along two different lengths of the frame member corresponding to two different areas of the window assembly resulting in a change in depth of the frame recess at a location on the frame member. 35

13. A compound window assembly according to claim 11 or 12, **characterized in that** the window frame is made primarily of wood. 40

14. A post (84) suitable for a compound window assembly (80), said post being arranged for mounting in a window frame assembly (81) of a compound window, said post comprising a first frame recess (85) for engagement with a fixed window pane on one side of the post and a second frame recess (86) for engagement with an openable window sash (88) on another side of the post, **characterized in that** the first frame recess (85) is not as deep as the second frame recess (86). 45

15. A post (84) according to claim 13, **characterized in that** the post is made from wood. 50



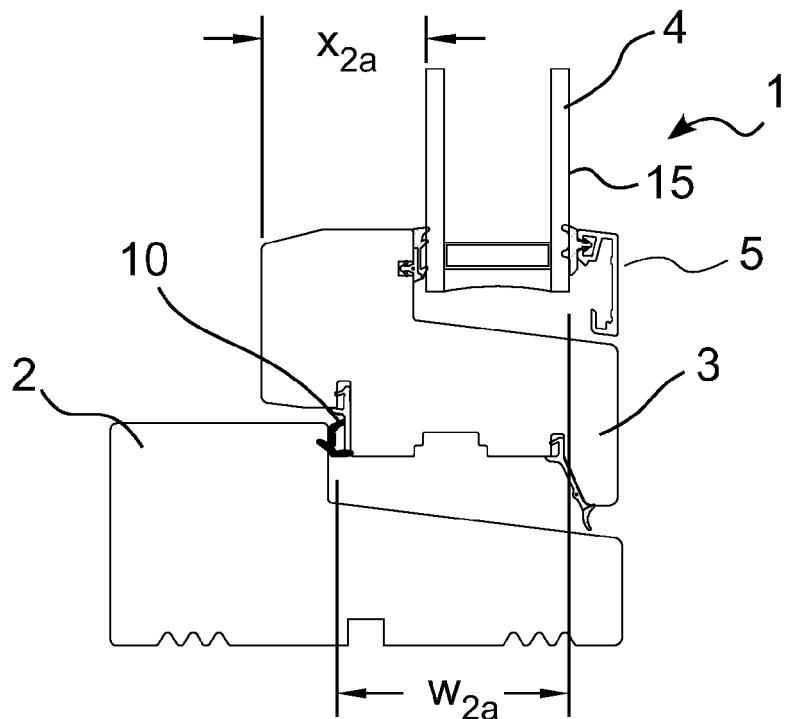


Fig. 2(a)

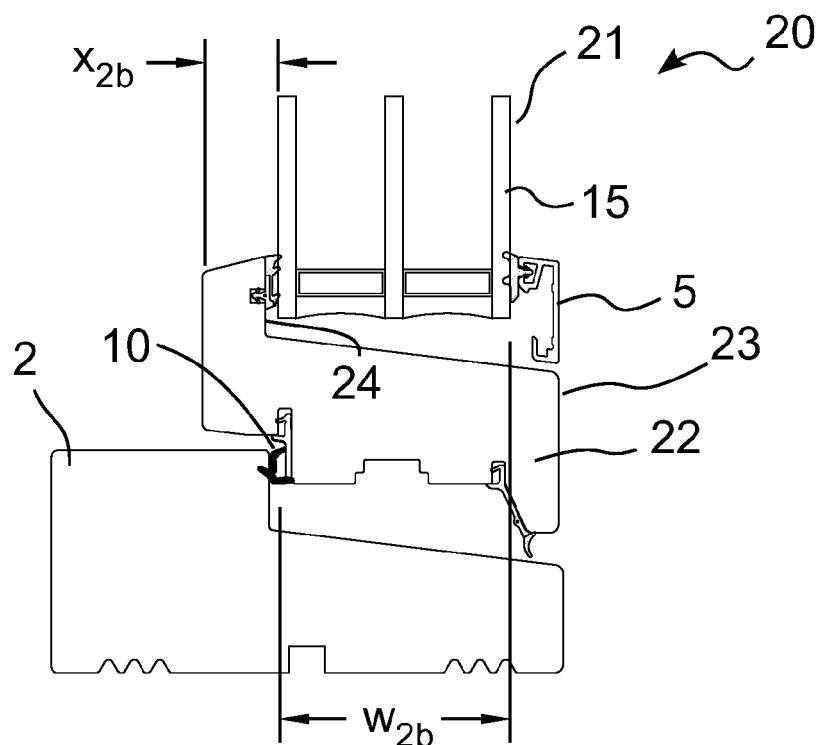


Fig. 2(b)

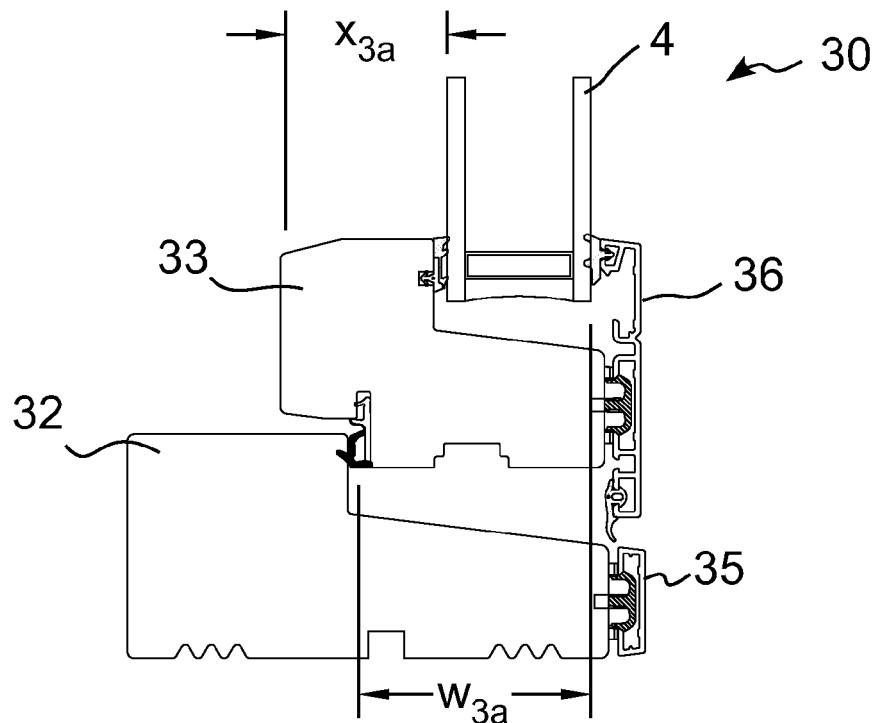


Fig. 3(a)

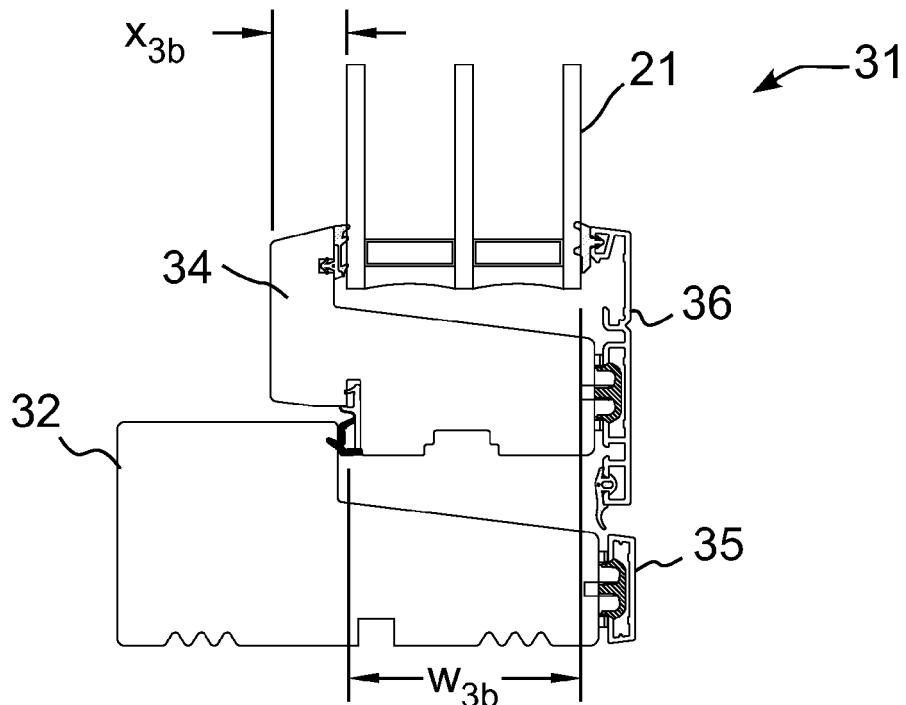


Fig. 3(b)

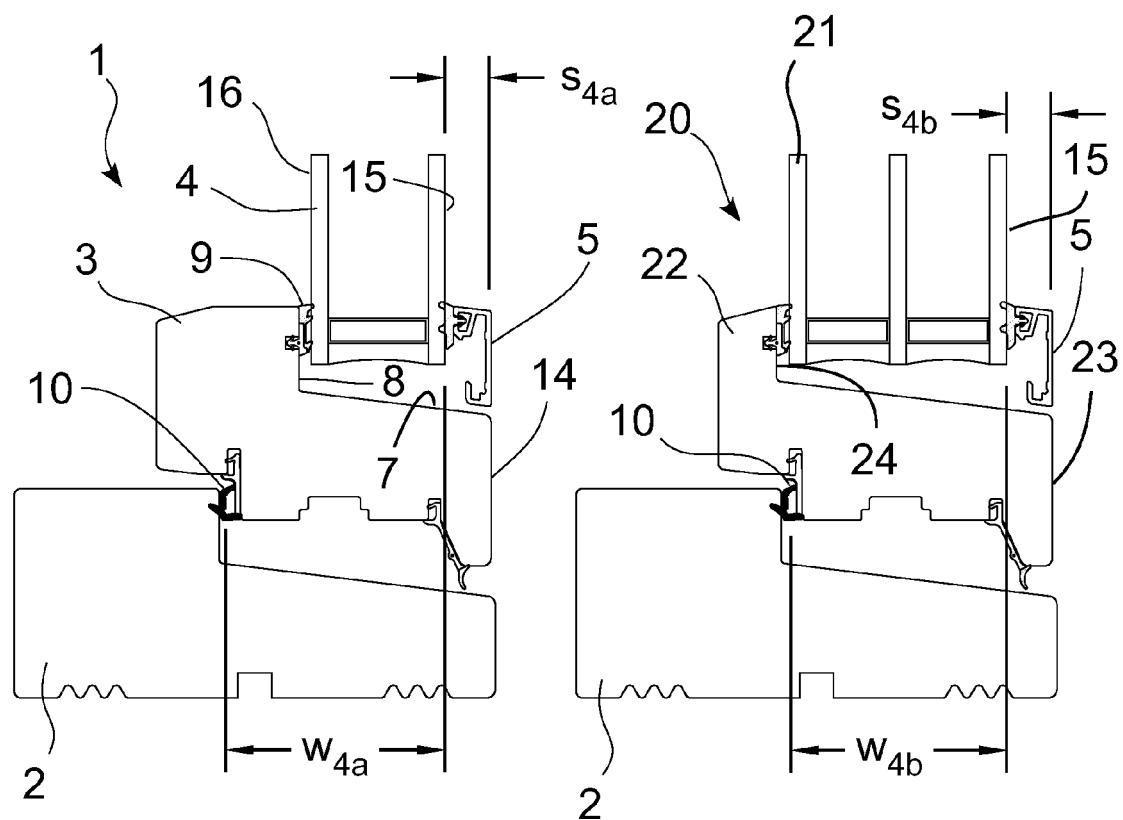


Fig. 4(a)

Fig. 4(b)

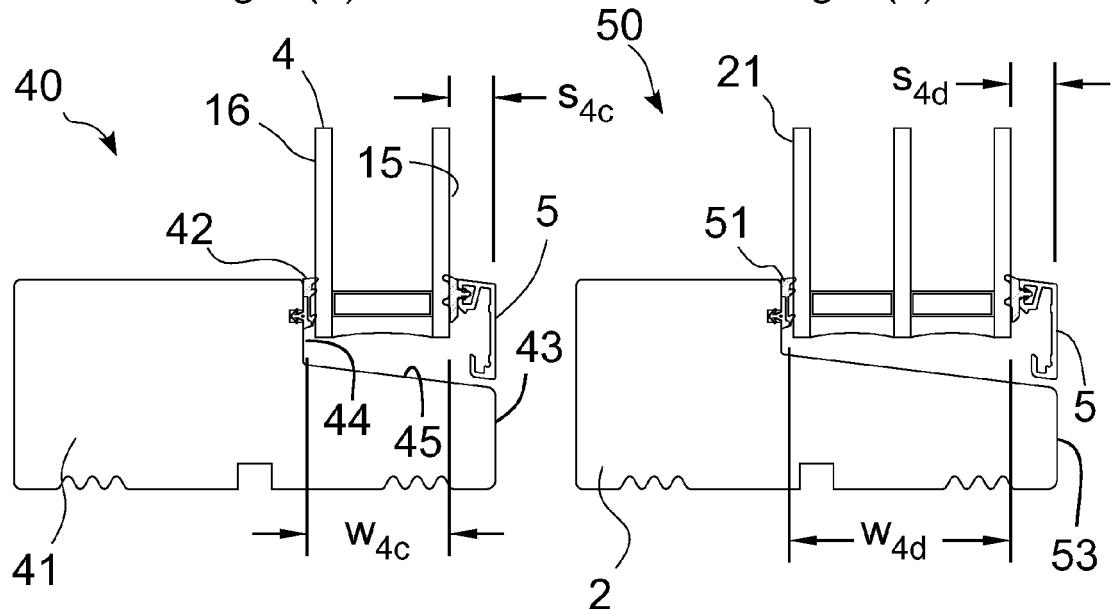


Fig. 4(c)

Fig. 4(d)

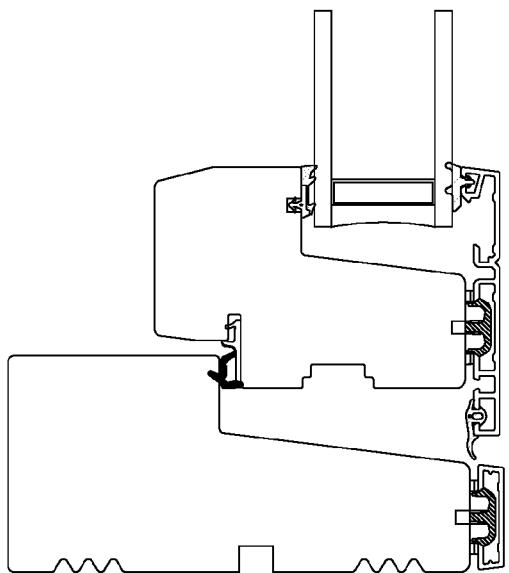


Fig. 5(a)

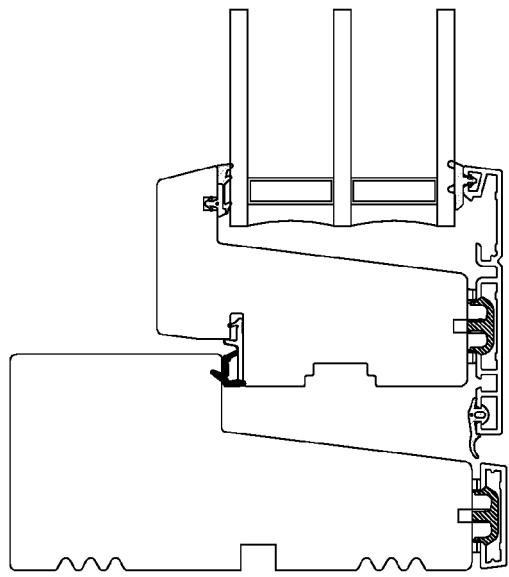


Fig. 5(b)

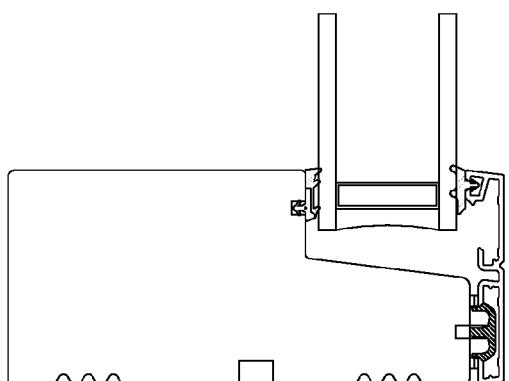


Fig. 5(c)

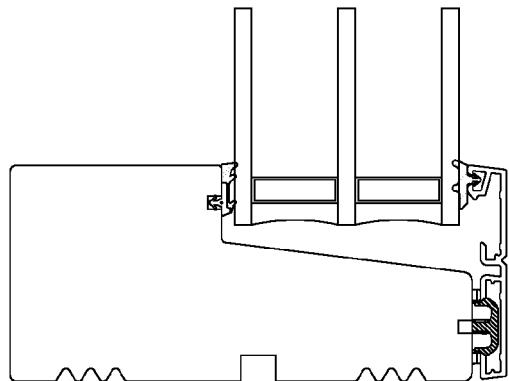


Fig. 5(d)

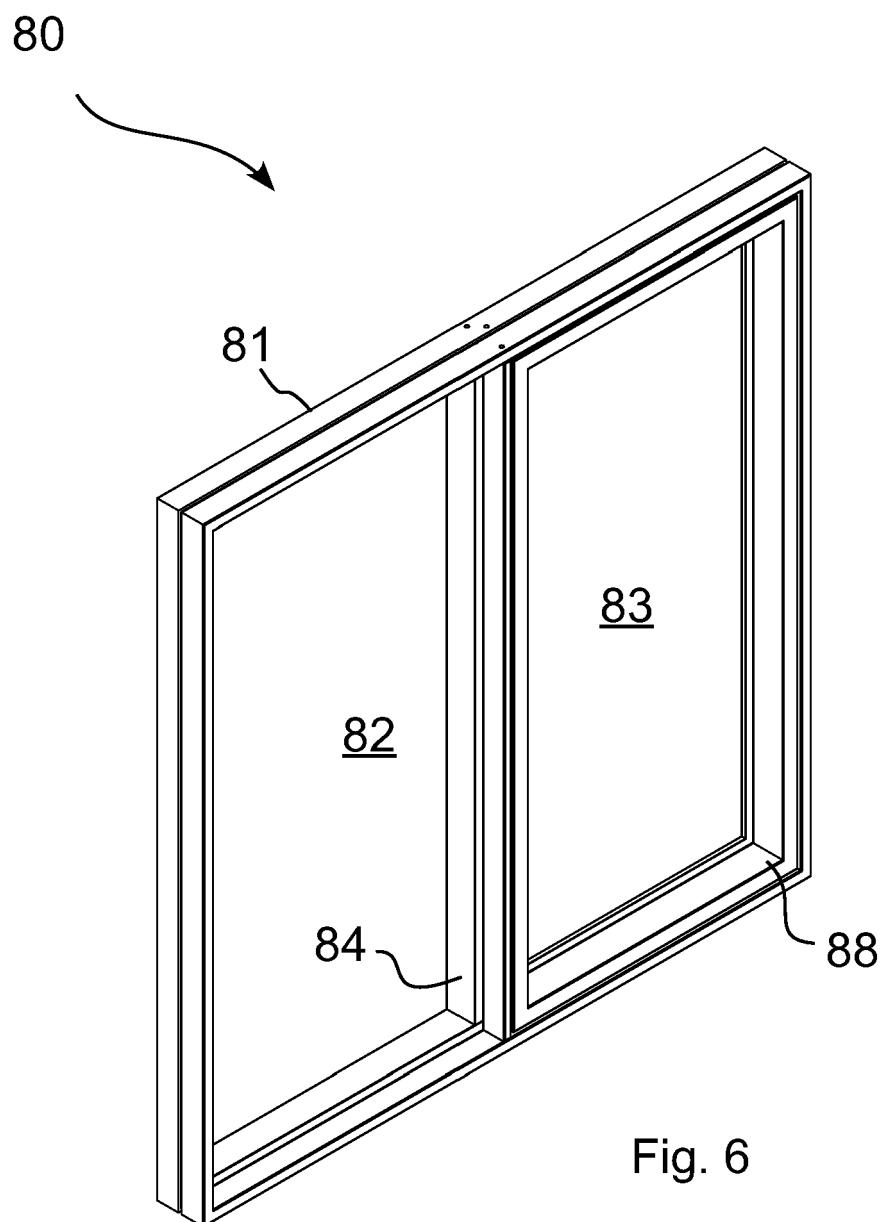


Fig. 6

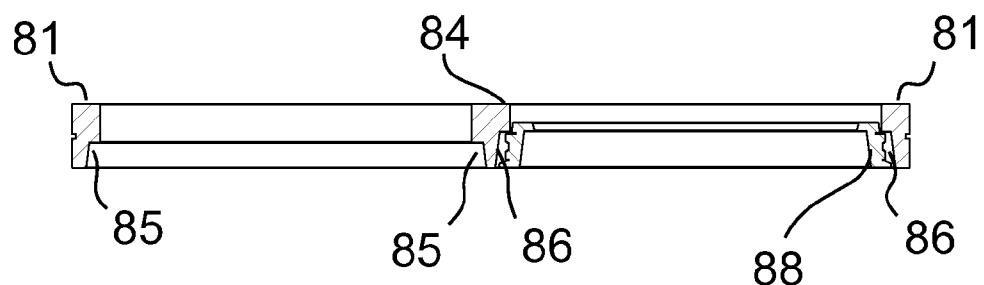
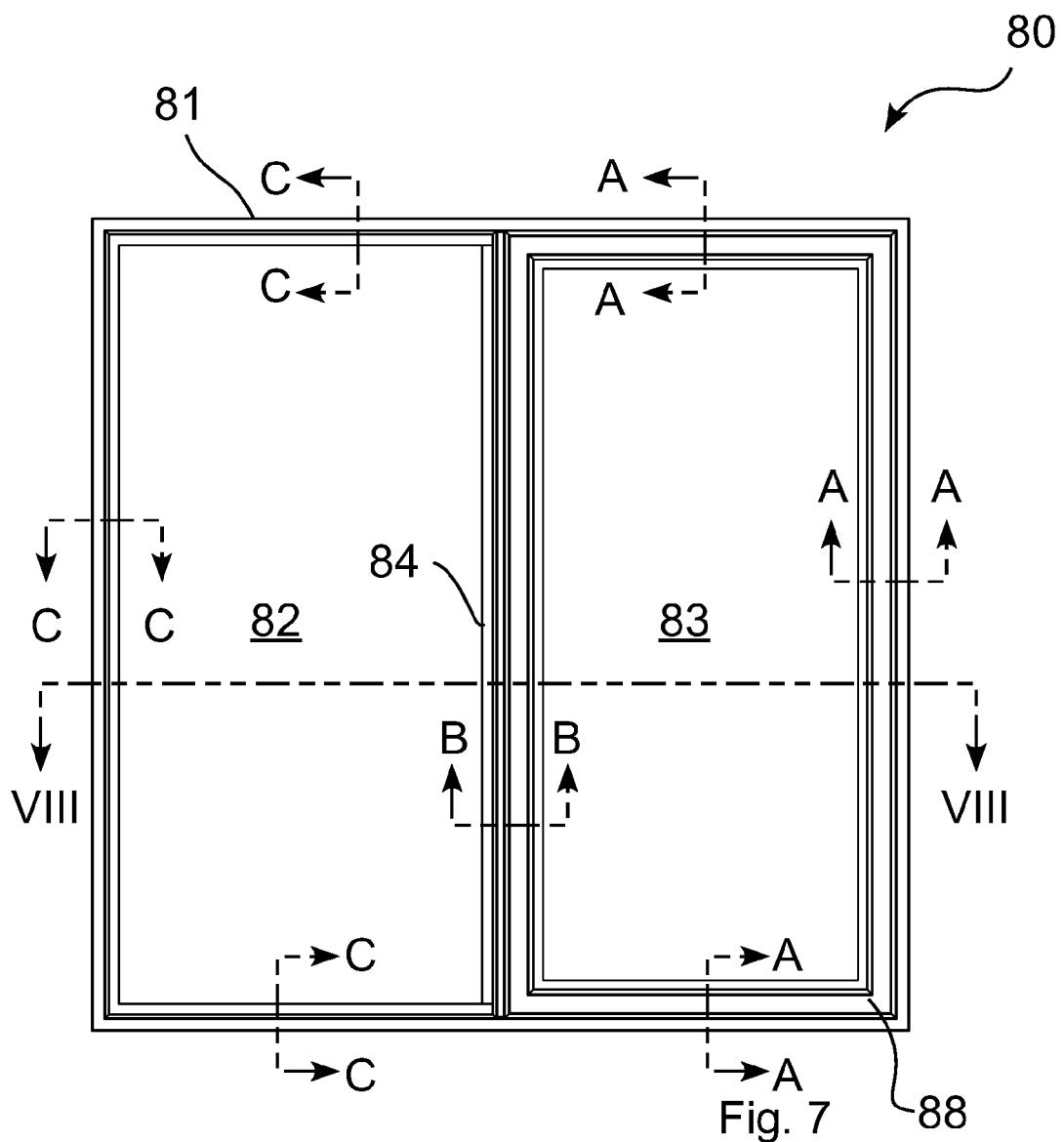


Fig. 8

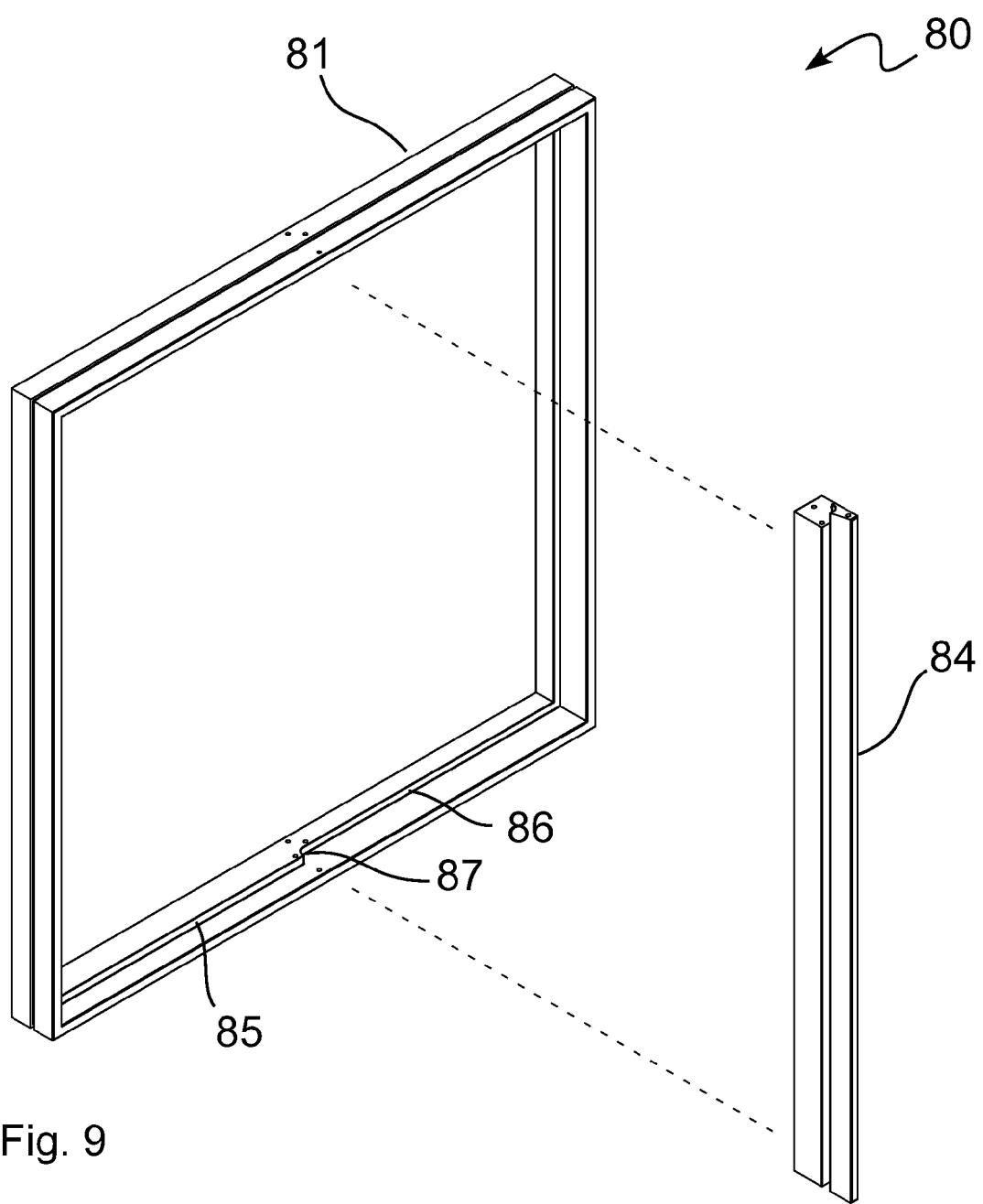
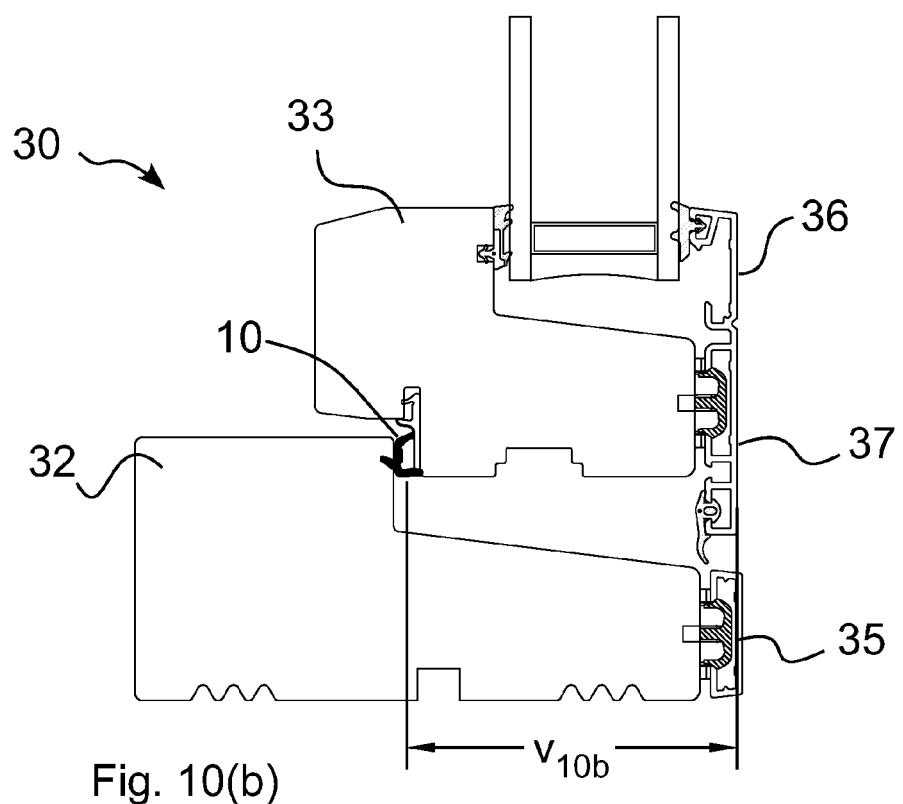
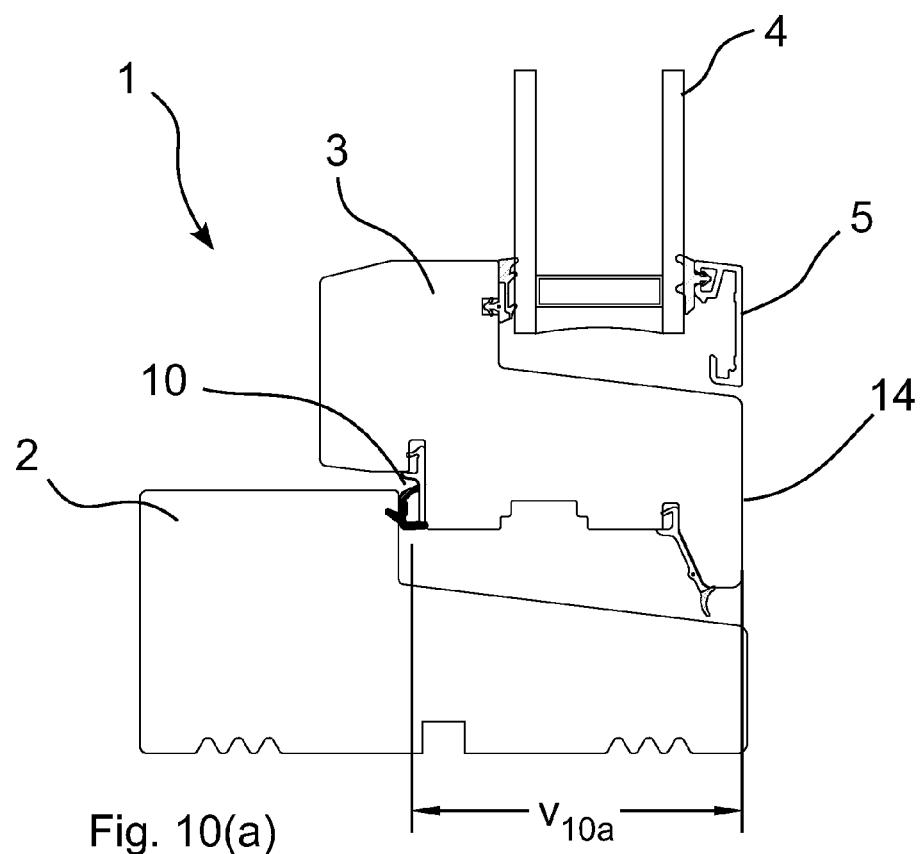
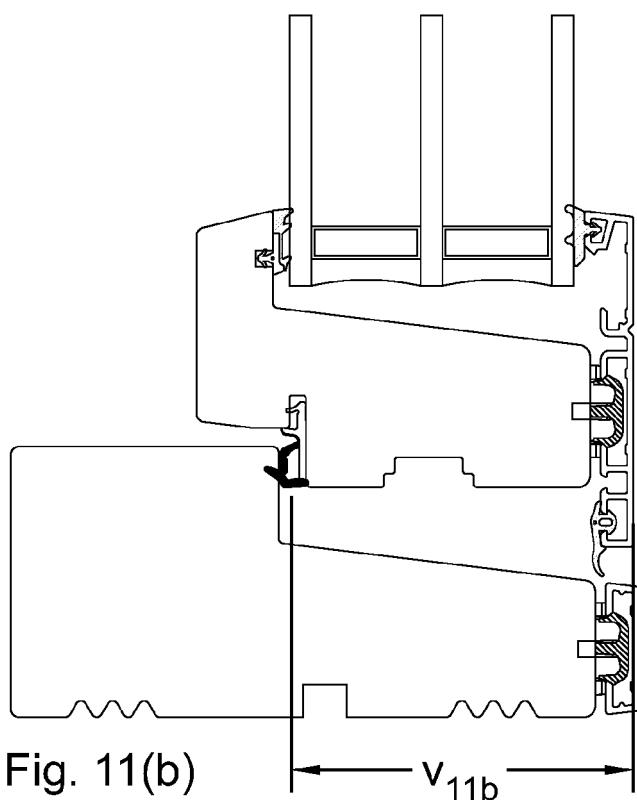
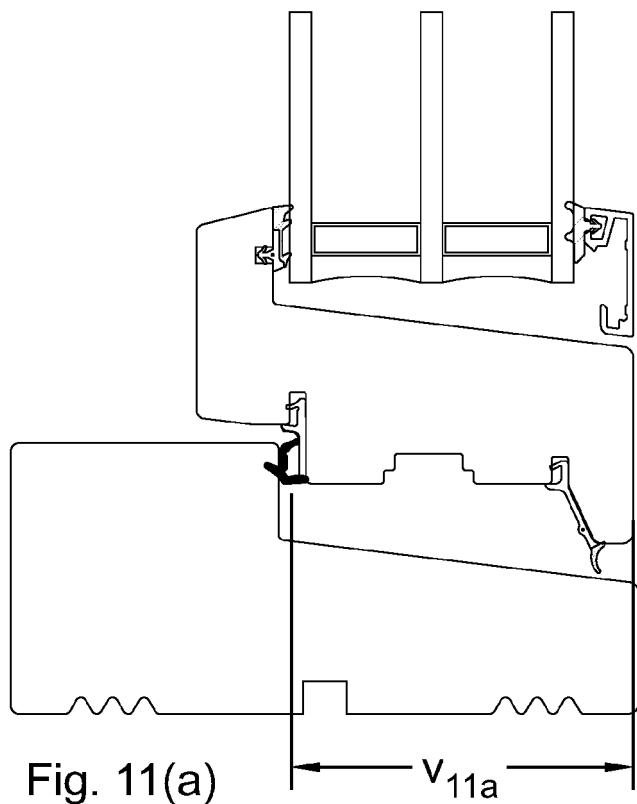


Fig. 9







EUROPEAN SEARCH REPORT

 Application Number
 EP 09 16 4805

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	GB 2 283 776 A (EXTRUDAWOOD LIMITED [GB] SPACE AGE JOINERY [GB]; EXTRUDAWOOD LTD [GB]) 17 May 1995 (1995-05-17) * abstract; figures * -----	1,11,14	INV. E06B3/10 E06B3/08 E06B3/36
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A	GB 2 259 321 A (SCHOLES ERNEST M H [GB]) 10 March 1993 (1993-03-10) -----		
			TECHNICAL FIELDS SEARCHED (IPC)
			E06B
<p>2 The present search report has been drawn up for all claims</p>			
2	Place of search	Date of completion of the search	Examiner
	Munich	13 January 2010	Peschel, Gerhard
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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

EP 09 16 4805

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-01-2010

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
GB 2283776	A	17-05-1995	NONE			
GB 2453874	A	22-04-2009	NONE			
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