

(12) INNOVATION PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. **AU 2014101283 A4**

(54) Title
An improved glazed opening assembly and system for improving performance of glazed openings in a building

(51) International Patent Classification(s)
E06B 9/24 (2006.01) **E06B 9/52** (2006.01)
E06B 5/00 (2006.01)

(21) Application No: **2014101283** (22) Date of Filing: **2014.10.21**

(45) Publication Date: **2014.12.04**
(45) Publication Journal Date: **2014.12.04**
(45) Granted Journal Date: **2014.12.04**

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ABSTRACT

A window frame assembly for mounting on an existing window exterior, including: a frame for mounting on an exterior window casing, the frame including at least one mounting plate; a window sash attached to the at least one mounting plate; and a window element held by the sash, wherein the window element is any one or more of: a heat resistant material; a pane of tempered glass; a pane of glass coated with a material designed to resist, diminish or limit the passage of light or other radiation of a particular characteristic such as ultraviolet light; a mesh screen of material sufficiently strong to resist impact by flying objects; a mesh screen sufficiently robust to resist forced entry by an intruder; a mesh screen designed to prevent ingress of insects or similar pests known to be sometimes present in a particular location; or another material with a characteristic regarded by building occupants as providing a desirable improvement to environmental conditions of a building.

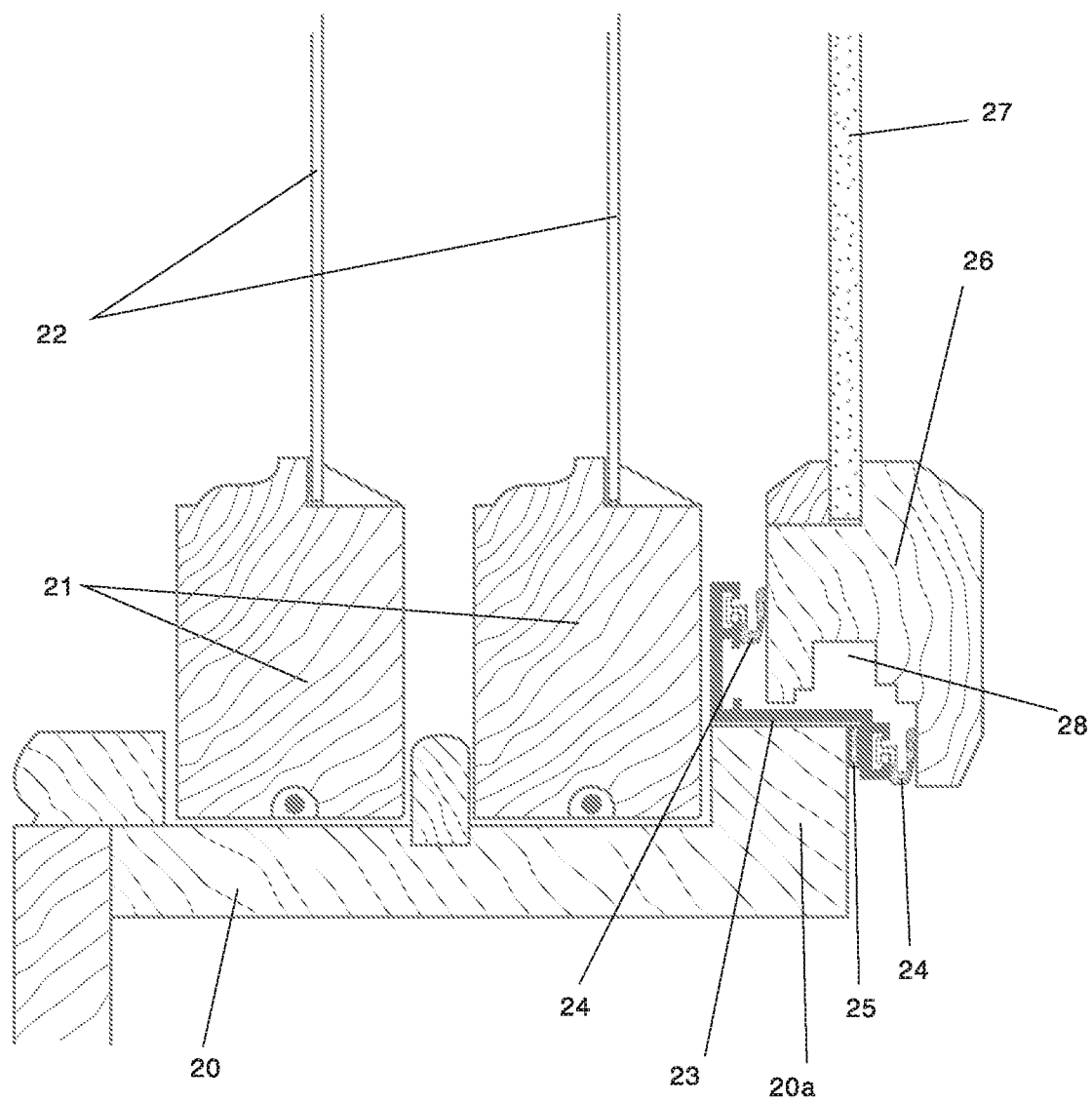


FIGURE 2.

AN IMPROVED GLAZED OPENING ASSEMBLY AND SYSTEM FOR IMPROVING PERFORMANCE OF GLAZED OPENINGS IN A BUILDING

FIELD OF THE INVENTION

[0001] This invention relates in general to glazed openings, such as windows or glazed doors, in a building. This invention more particularly relates to a supplementary window frame assembly that facilitates enhanced performance of a window and the use of this supplementary window frame in a method of installation to add desired features to a window.

BACKGROUND TO THE INVENTION

[0002] Almost all buildings have windows or doors (or both) which are glazed. These are described generically as glazed openings. Without limiting its application, use of the term 'window' in the description is understood to also apply more generally to any form of glazed opening.

[0003] The original purpose of a glazed opening was to allow natural light to enter the building while protecting the interior of the building from the weather. However, glazed openings have become architectural features with many forms of decoration as well as for providing ventilation. With increased prosperity, many property owners are seeking improvement in the range of available functions of glazed openings in a building to increase the security and/or the environmental performance of the glazed openings.

[0004] Environmental performance can include different performance elements arising from changes to climatic conditions, legislative requirements and occupiers' expectations and which are becoming increasingly important, such as:

- a) improved tolerance of glazing elements to high wind velocities and the impact of hail or flying objects due to storms, hurricanes or cyclones;
- b) reduced transfer of heat to or from the building through the glazed elements arising from a substantial temperature differential between the controlled environment inside the building and the exterior ambient conditions;
- c) reduced transfer of noise between the external environment and the interior of the building;
- d) improved privacy for the occupants of a room in the event that the glazed openings of the building are overlooked by publicly accessible space or by glazed openings, balconies, etc. in an adjacent building; and
- e) improved fire rating of glazed openings of the building.

[0005] Of course, in new construction the design of external glazed doors, windows and other types of glazed openings in a building can be engineered to meet the desired economic balance between the various performance requirements and the desired architectural/visual design effects.

[0006] However, requirements for additional or changed performance may develop over time; for example, a requirement to reduce penetration of ultraviolet radiation into the interior of the building.

[0007] In such an event, retrofitting additional elements or otherwise changing the characteristics of existing windows or other openings poses a number of challenges, including cost, physical constraints and achieving adequate performance requirements.

[0008] Buildings have been constructed over the years using a wide variety of door and window construction techniques and materials. Often window frames and doors were made of timber, which degrades over time. In addition, the translucent elements (such as windows and door panes) were generally made of simple single glazing with low strength sheet glass. Further, simple locking

devices were often fitted that, while considered suitable for their day, now provide either inadequate access or security, or inconvenient access for cleaning or natural ventilation. These windows and doors are often seen as the weak point in the building, and can be perceived as no longer meeting occupier requirements.

[0009] There are many factors that can lead to dissatisfaction with existing glazed openings in a building. They are usually separated into two categories (i) environmental or external factors and (ii) modern expectation factors. To address the dissatisfaction, additional performance of glazed openings are required. Additional performance requirements might arise from the first category of environmental or external factors, such as, increased traffic densities, changed legislative requirements, or an increase in burglaries. The world's current variable climate characteristics can also create a need for building glazed openings to better withstand the changing climatic conditions.

[0010] Alternatively, or in addition, performance requirements may change due to the second category of factors, modern expectations. That is, a general expectation of higher amenity levels for occupiers in improving characteristics such as, environmental comfort, energy efficiency, ease of maintenance, etc. This may be either when compared to newer buildings or it may arise from an increase in the prosperity of the residents, because access to funds enables the inclusion of elements that provide such improved characteristics.

[0011] The occupier of a building who wishes to enhance the performance of the building's glazed openings is often faced with replacing all the existing glazed openings in a building with new windows and doors. However, this can be expensive and time consuming.

[0012] Alternatively, existing windows and doors can be retrofitted with additional features but present retrofit solutions have significant disadvantages. These present retrofit solutions may provide less than satisfactory performance and/or compromising the aesthetics of the building's appearance. Some styles of

windows and doors are particularly difficult to retrofit because of their design and the need to maintain the original look and aesthetics of the glazed opening. A sash window is one such design that is difficult to retrofit.

[0013] A sash window or hung sash window is made of one or more movable panels or 'sashes' that form a frame to hold panes of glass, which are often separated from other panes by narrow muntins or glazing bars. Although any window with this style of glazing is technically 'a sash', the term is used almost exclusively to refer to windows where the glazed panels are opened by sliding vertically, or horizontally.

[0014] The sash window is often found in buildings of the Georgian, Edwardian and Victorian eras or styles. The classic arrangement of a sash window has three panes across by two panes up on each of two sashes, giving a 'six over six' panel window, although this is by no means a fixed rule. Innumerable late Victorian and Edwardian suburban houses were built in England using standard sash window units, but older, hand-made units could be of any size. Such a window typically consists of an upper and lower sash that slide vertically in separate grooves in the side jambs or in full-width metal weatherstripping. This type of window provides a maximum face opening for ventilation of one-half the total window area.

[0015] A significant advantage of sash windows is that they provide efficient cooling of interiors during warm weather. Opening both the top and bottom of a sash window by equal amounts allows warm air at the top of the room to escape, thus drawing relatively cool air from outside into the room through the bottom opening.

[0016] To facilitate operation, the weight of the glazed panel is usually balanced by a heavy steel, lead, or cast iron sash weight or counter-weight concealed within the window frame so as to hold it in place in any location. The sash weight is connected to the window by a sash cord or chain that runs over a

pulley at the top of the frame, although spring balances or compliant weather-stripping are sometimes used. Sash windows may also be fitted with simplex hinges, which allow the window to be locked into hinges on one side while the counterbalance on the other side is detached, allowing the window to be opened for escape or cleaning.

[0017] The name 'hung sash window' is more usual in the United States, and typically refers to a double hung window with two sashes that can move up and down in the window frame. A 'single hung window' has two sashes but normally the top sash is fixed and only the bottom sash slides. Triple and quadruple hung windows may be used for very tall openings, for example in churches or halls.

[0018] Most sash windows were generally single glazed; although double-glazed sashes are available in some newly constructed windows. It has been more common for existing single-glazed sash windows to be replaced with top-hung casement windows when double glazing is retro-fitted because of the difficulty of compensating for the extra weight of the double-glazed sashes. Some top-hung double-glazed casement units are manufactured to give the appearance of sashes.

[0019] There have been many attempts to improve performance of glazed openings over the years. Often window modifications are made by replacing the existing windows with newer, high performance windows. However, such replacement windows can be very expensive and both the removal of the existing windows and fitting of the replacement windows may damage the interior and/or exterior finishes of the building. In some cases the rectification of that damage is also very expensive and disruptive to the occupants.

[0020] Existing windows can sometimes be retained and retrofitted by fitting additional seals to the window. However, these are often not very effective in achieving the required improved performance and they can change the appearance of the windows which is often not desirable.

[0021] Other prior art solutions include replacing the existing window glass with heavier or higher-performing, low emissivity glass. However, this often also requires changes to sash springs or balance weights or to window hinges and other hardware, and may also be damaging to interior or exterior finishes. In addition, these types of modifications can be costly, intrusive and often relatively ineffective in addressing occupants' concerns.

[0022] The addition of secondary glazing is a known method of obtaining improvement over the modifications described above. Secondary glazing allows an air barrier to be established between the original and the additional glazing element that is useful in improving acoustic and thermal performance for such glazed openings.

[0023] There are a number of secondary glazing systems available in the market. One such example is a system which uses magnets to secure an acrylic sheet to existing frames.

[0024] This and other systems can be unsuitable for many buildings. They can be cumbersome to use, may limit ventilation, be difficult to service and maintain, and may render the window frame unsuitable for repainting. Importantly, they may be aesthetically inappropriate and change the whole appearance of the building.

[0025] Secondary-glazing treatments that are fitted to the interior side of the glazed opening present additional difficulties to the occupier. They can interfere with existing window furnishings, and in addition, since such systems retain the existing glass as the exterior surface, and this glass may be 'out of code', the occupants may be unsafe. These secondary-glazing treatments also fail to provide any enhancement in protection of the existing windows against damage from wind storms or flying debris and may not improve protection to the building interior against fire storms from 'wildfires' or 'bushfires'.

[0026] As such, the present invention seeks to address the disadvantages and inadequacies of prior art systems.

SUMMARY OF THE INVENTION

[0027] According to an aspect of the present invention there is provided a window frame assembly for mounting on the exterior of an existing window, including: a frame for mounting on an exterior window casing, the frame including at least one mounting plate; a window sash attached to the at least one mounting plate; and a window element held by the sash.

[0028] A building occupant or owner can select the window element to meet the specific requirements of the building and its location, including any one or more of:

- a transparent pane of double glazed glass;

- a heat resistant material; a pane of tempered glass;

- a pane of glass coated with a material designed to resist, diminish or limit the passage of light or other radiation of a particular characteristic such as ultraviolet light;

- a mesh screen of material sufficiently strong to resist impact by flying objects;

- a mesh screen sufficiently robust to resist forced entry by an intruder;

- a mesh screen designed to prevent ingress of insects or similar pests known to be sometimes present in the particular locale, or

- another material with a characteristic regarded by the building occupants as providing a desirable improvement to the environmental conditions, external and internal, of the building.

[0029] Preferably, the window frame mounting plate comprises a low-profile extrusion that is a fully functional mounting. The mounting plate is inexpensive to manufacture and adaptable to many situations enabling a range of different functional solutions.

[0030] The window sash is a piece of application-specific joinery that is manufactured to suit the particular application. It is designed to be generally aesthetically compatible with the style and appearance of the existing window exterior and can be constructed from any variety of timber, aluminium, vinyl or other material to suit the particular application. This allows the user to make particular value judgements on the relative importance of aesthetics, function and impact.

[0031] Preferably the mounting plate has a cross section including a body and two arms extending perpendicularly from the body in opposite directions, and wherein each arm has at least one holding member.

[0032] The window frame assembly preferably further includes at least one seal, wherein the at least one seal is held in place between the mounting plate and the sash by each holding member.

[0033] The window frame assembly preferably further includes a locking mechanism.

[0034] According to a further aspect of the present invention there is provided a method of window frame installation including the steps of: mounting a window frame assembly as described above on an exterior of an existing window lining; inserting a window element into a sash; and attaching the sash to the mounting plate.

[0035] The present invention advantageously improves the performance of the existing glazed openings. The present invention provides the flexibility to

customize the required performance characteristics of the window whilst maintaining substantially the same external appearance of the glazed opening and providing improved utility and operational flexibility.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] It will be convenient to further describe the invention with respect to the accompanying drawings which illustrate preferred embodiments thereof. Other embodiments of the invention are possible, and consequently, the particularity of the accompanying drawings and associated description is not to be understood as superseding the generality of the preceding description of the invention.

[0037] Figure 1 shows an embodiment of the present invention installed on an existing traditional double-hung wooden sash window.

[0038] Figure 2 shows a vertical cross sectional view A-A of the embodiment in Figure 1.

[0039] Figure 3 shows a cross-section of an embodiment of a mounting plate of the present invention used in the installation shown in Figure 2.

[0040] Figure 4 shows the mounting plate of Figure 3 without any seals.

DESCRIPTION OF PREFERRED EMBODIMENT

[0041] Embodiments of the invention will now be explained with reference to the drawings.

[0042] Figure 1 illustrates a window frame assembly 100 of the present invention installed on an exterior of an existing sash window.

[0043] Figure 2 illustrates a cross-sectional view of the window frame assembly 100 of Figure 1 through A-A installed on the exterior of a conventional existing sash window. In Figure 2 there are two existing window sashes 21 each having a pane of glass 22. The existing sashes are housed in a window liner 20. A portion 20a of the window liner defines the exterior of the existing window.

[0044] To secure an additional or secondary sash 26 to the existing window, a mounting plate 23 is secured in place to the exterior portion of the window lining 20a. The additional sash 26 with a glazing element 27, such as a pane of insulated glass or double glazed element, forming a secondary window is fixed in place on the mounting plate 23. A resilient adhesive acoustic tape 25 is placed as a permanent seal between the mounting plate 23 and the exterior portion 20a of window lining 20. The resilient adhesive acoustic tape 25 is commercially available in a range of thicknesses sufficient to suit the range of dimensions such window linings normally have. In the case where the resilient adhesive acoustic tape does not fit the dimension of a particular window the application-specific joinery of the sash 26 can compensate for any deviation. An acoustic seal 24 is fitted to the mounting plate 23 to form a weather tight seal against the sash 26 when the secondary window is closed.

[0045] The mounting plate 23 is shown in further detail in Figures 3 and 4. The mounting plate 23 is preferably extruded PVC or aluminium. The mounting plate 23 is very stable because it is secured in two planes on to the existing exterior window lining 20a (see figure 2); that is, on both vertical and horizontal faces of the exterior window lining 20a. This arrangement allows the mounting plate to be constructed with a low profile, which is a key advantage of the mounting plate 23. The low profile ensures that the mounting plate is not visible when installed and the secondary window is closed thus creating minimal impact on the architectural and aesthetic integrity of the building.

[0046] The mounting plate 23 includes a body 231 and two arms 232, 232a extending perpendicularly on either side of the body 231, forming a step profile.

One arm 232 on the mounting plate is significantly longer than the other arm 232a. Each arm 232, 232a has a holding member 236, 236a having an opening 234, 234a for holding a seal 24 (shown in Figures 2 and 3). One arm 232 has a further holding member, formed by projections 237 and 237a, and having an opening 239 to receive a stiffening member 238. The stiffening member is preferably sheet metal and provides a rigid right angled joint at the corners of the mounting plate 23. The body 231 of the mounting plate is secured to the existing window lining 20a by means of a screw (as shown in Figure 3) or by any other conventional securing means. The mounting plate allows a more compact edge for the additional sash 26 to sit against.

[0047] The additional sash 26 mounted to the existing window as shown in Figure 2 may have rebating 28 for a multi-point locking security system (not shown) or the like. In addition, the mounting plate 23 may also have an opening (not shown) to receive a latch (also not shown) of the multi-point locking security system which can also be installed with or as part of the additional sash 26. The opening can be custom shaped to fit the latch which is installed as part of the multi-point locking security system.

[0048] The mounting plate can be manufactured in standard lengths to fit standard window frames, or alternatively it can be 'made to measure' to fit custom window frames. The mounting plate, if made of aluminium may be anodized or powder-coated or, if made of PVC otherwise tinted to provide a durable finished surface in a range of standard designer colours or in a bespoke colour to suit a particular instalment. As shown in Figures 2 and 3 the mounting plate 23 is fitted with two types of seals during installation. One seal is a permanent weather seal 25 between the frame of the existing opening (see exterior lining 20a in Figure 2) and the mounting plate 23. The other weather seal 24 is held by holding members 236, 236a and is placed between the mounting plate 23 and the application-specific piece of joinery, for example, the additional sash 26 as shown in Figure 2.

[0049] In a normal installation, the seal 24 is of a type similar to Schlegel® QEZ 376 T-slot Perimeter seal, manufactured in open cell resilient urethane foam core and clad in an embossed polyethylene UV stabilized paint resistant liner. The seal can be changed based on the specific requirements for a project. For example, if improved fire resistance is required, a seal with intumescent properties can be used.

[0050] Different shapes and configurations of the window frame or window sash 26 may be used depending on the type of window, for example, a single or double hung window, or a casement window, that will be installed.

[0051] Referring again to Figure 1, the installed window frame assembly 100 may have a concealed hinge, preferably a heavy duty friction hinge, at the top 7 and bottom 8 of the frame assembly. In Figure 1 this is located on one side of the window frame assembly. In addition, the window frame assembly has a folding handle 4 for opening and closing the window frame assembly and to fit in with the aesthetics of the existing window frame. Preferably, as shown in Figure 1, on the other side of the window frame to the hinges 7 and 8 and marked C-C there is a multipoint locking spigot located at the bottom 6, midpoint 3 and top 5 of the side of the window frame. As can be seen in Figure 1, the traditional window lock 10 on the existing sashes 21 is still visible once the additional (or secondary) sash 26 has been installed.

[0052] The present invention is a simple but effective durable mounting plate and frame which fits within the existing building opening. This enables an additional functional element of application-specific joinery, such as a casement window sash, to be fitted to the existing building opening and to provide the desired enhanced performance, such as to reduce noise, enhanced fire or wind protection, increased energy efficiency, photovoltaic coated glass, storm shutters, etc. The mounting plate is hidden by the design of the additional functional element, such as the additional window sash, and therefore does not impact on the external appearance of the building opening. Furthermore, in a specific

embodiment the mounting plate can provide the latching plate for a multi-point locking security system.

Advantages

[0053] The window frame assembly of the present invention has many advantages over the prior art. It provides flexibility to address a requirement for enhanced performance in a number of areas. The present invention enables the user to modify an existing window to have better resistance to high wind velocities so that it will not break when impacted by hail or flying objects due to storms, hurricanes or cyclones and provides a method of achieving this. For example, the following window elements: (i) laminated or toughened glass of appropriate thickness for the expected duty; (ii) protective mesh, and/or (iii) screening grilles, could be used in the window frame assembly of the present invention to achieve the advantageous modifications described above.

[0054] Another advantage of the present invention is that it enables a reduction in the transfer of heat to or from the building due to temperature differential between the controlled environment inside the building and the exterior ambient conditions. This could be achieved by the use of: (i) low thermal emissivity glass; (ii) reflective films, or (iii) an additional double-glazed window element providing effective triple glazing with a sealed air space between the additional window element and the existing building opening.

[0055] A further advantage of the present invention is that it enables a reduction in the transfer of noise between the external environment and the interior of the building. This can be achieved by the addition of an extra laminated glass element of a different thickness to the original glass (to reduce sympathetic vibrations) with a sealed air space between it and the existing building opening. The seals provided by the invention reduce the transmission of sound through the frames.

[0056] The present invention also enables improved privacy for the occupants of a room. For example, if an adjacent building's glazed openings overlook the glazed openings of a room, the use of an additional glazing element with the required degree of opacity could be used as the window element to reduce visibility into that room whilst still enabling a sufficient amount of light into the room.

[0057] The present invention enables photovoltaic integration in buildings. Existing facades may benefit from the integration of PV glass incorporated in the window element to increase the potential capture of energy and hence improve the energy efficiency of the building.

[0058] The present invention also has the potential to increase the fire rating of a building by including a fire resistant element, such as tempered glass or another element with the required degree of fire rating.

[0059] The additional benefit arising from the inclusion of a multipoint security lockable mounting system with an integral multiple seal system allows either removal of the additional element or, in the case of a window, the optional addition of an easy-to-operate casement or other type of sash.

[0060] The present invention allows the existing windows in a building to be retained and yet gain substantial improvements in any one or more required performance parameter. By suitable detailed design of the additional window frame, it can blend in with the existing glazed opening. This is particularly important for architectural elements in buildings of a particular period or style.

[0061] The present invention has the commercial advantage of enabling lower maintenance costs, improved aesthetics, reduced noise transfer, improved energy efficiency and security as well as many other attributes whilst retaining the existing windows, window dressings and surface finishes. It provides a method, product and an easier technique for improving building performance at a lower

cost compared with traditional methods of improving the performance of building openings.

[0062] Of great significance is that the magnitude of on-site works and the impact on existing building finishes and decoration (such as curtains) is greatly reduced, and so not only is the total cost reduced, but also the extent of disruption to the occupants of the building is reduced.

[0063] A key advantage and innovation of the present invention is the low profile design of the mounting plate. This allows the components which attach the additional sashes to existing window frames to be completely hidden. The components of prior art systems are generally visible from either the interior or exterior of the glazed opening.

[0064] An additional advantage of the present invention is that the mounting plate is inexpensive to manufacture and install. This means that the occupier can choose a sash or sashes with many more characteristics (functional, aesthetic or both) than would have been the case when using more expensive systems that do not achieve the same beneficial results. In particular, the mounting plate can be used to facilitate interchangeability of sashes, as might occur when an insect screen is replaced by a storm window when the need arises.

[0065] It will be appreciated by persons skilled in the art that other embodiments and arrangements of the method and system are also possible within the spirit and scope of the invention described herein or as claimed in the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A window frame assembly for mounting on an existing window exterior, including:

a frame for mounting on an exterior window casing, the frame including at least one mounting plate;

a window sash attached to the at least one mounting plate; and a window element held by the sash,

wherein the window element is any one or more of:

a heat resistant material;

a pane of tempered glass;

a pane of glass coated with a material designed to resist, diminish or limit the passage of light or other radiation of a particular characteristic such as ultraviolet light;

a mesh screen of material sufficiently strong to resist impact by flying objects;

a mesh screen sufficiently robust to resist forced entry by an intruder;

a mesh screen designed to prevent ingress of insects or similar pests known to be sometimes present in a particular location; or

another material with a characteristic regarded by building occupants as providing a desirable improvement to environmental conditions of a building.

2. A window frame assembly according to claim 1 wherein the mounting plate has a cross section including a body and two arms extending perpendicularly from the body in opposite directions, and wherein each arm has at least one holding member.

3. A window frame assembly according to claim 2 further including at least one seal, wherein the at least one seal is held in place between the mounting plate and the sash by each holding member.

4. A window frame assembly according to any one of claims 1 to 3 further including a locking mechanism.
5. A method of window frame installation including the steps of:
mounting a window frame assembly according to any one of claims 1 to 4 on an exterior of an existing window lining;
inserting a window element into a sash; and
attaching the sash to the mounting plate.

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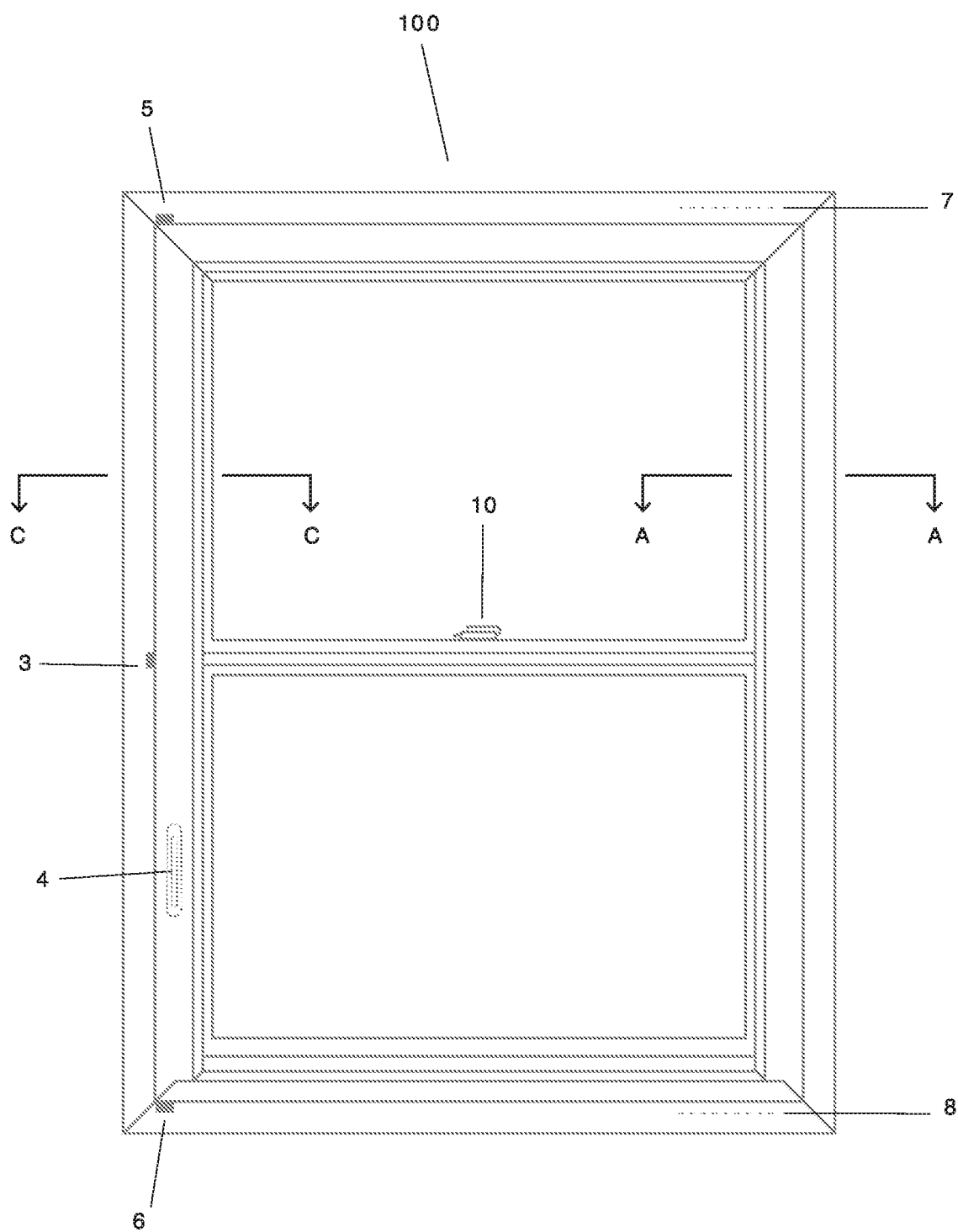


FIGURE 1

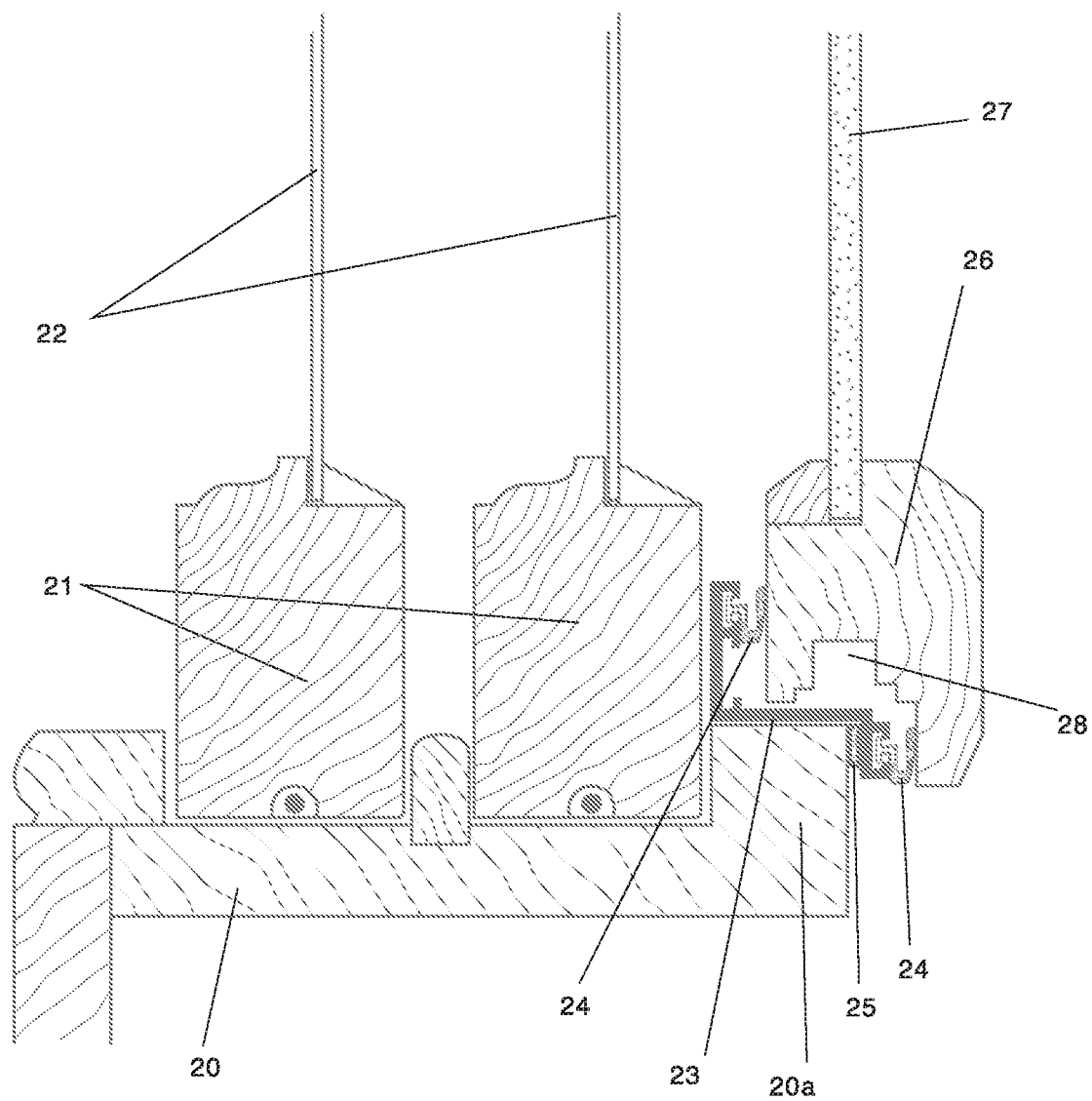


FIGURE 2.

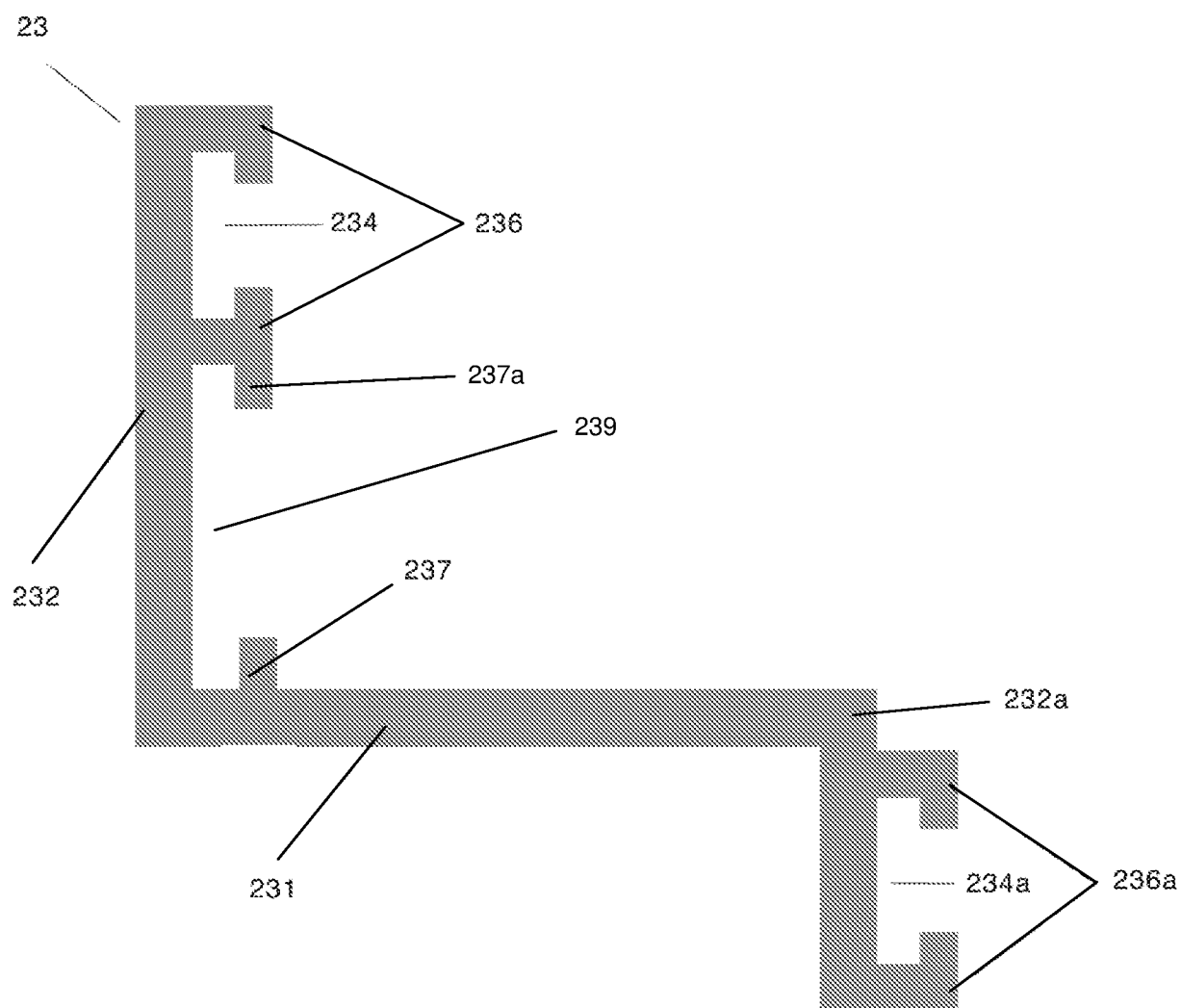


FIGURE 4