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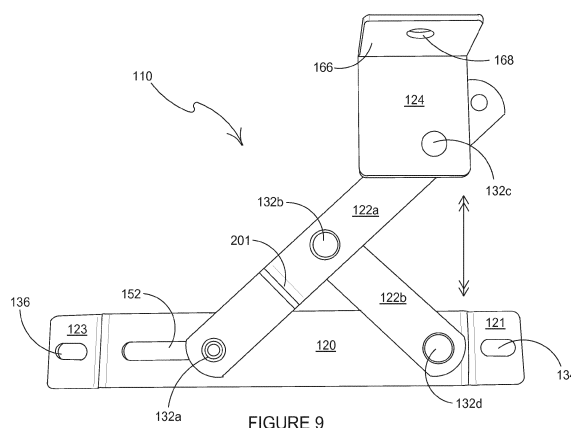
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(54) **Hinging device, modular building system and method**

(57) The invention relates to modular building constructions, wall modules (90) for such constructions and to hinging devices (10) used to attach articles (80a, 80b) such as windows and doors to the wall modules. The wall modules may comprise one or more apertures (95, 97, 99) for a window or door and one or more hinging devices. The hinging devices comprise a first fixing component (66/24) for attaching the hinging device to the wall module. A second fixing component (20/21/23) is provided for attaching the hinging device to the window. First and second moveable arms (22a, 22b) are pivotally mounted to the first fixing component. The first and second moveable arms may each comprise a slot (54, 52) and may each be coupled to the first fixing component (66/24) and to one another, via said slot. The hinging device main-

tains a secure attachment of the window to the wall module and releasably secures the window to the wall module in a first position wherein the window is stowed entirely within the aperture. The window is permanently secured to the wall module in a second installation position wherein the window stands proud of an outer surface (90b) of the wall module. The second installation position is linearly spaced from the first position by a distance that may be proportional to the depth of a cavity provided between the wall module and an exterior skin ('B') of the modular building construction. The hinging device controls the linear movement of the window relative to the wall module from the first, stowed, position to the second installation position.



Description

TECHNICAL FIELD

[0001] The present invention relates to a hinging device and to a modular building system in which the hinging device is utilised. More specifically but not exclusively, the hinging device is configured for fixing an article in at least two spaced positions and the hinging device pivotally moves to move the article between those at least two spaced positions. The hinging device finds beneficial application in modular building systems and more specifically, but not exclusively, in timber frame building systems. In such systems articles, for example windows and doors, can be pre-installed off-site within a wall module using the hinging device such that they are securely stowed for transportation to site and then, on-site, moved into an installation position using the hinging device.

[0002] Aspects of the invention relate to a hinging device, to a wall module, to a modular building and to a method.

BACKGROUND

[0003] It is known to construct modular buildings and to pre-fabricate the modular buildings off-site. Pre-fabricated modular parts are transported to site and assembled together on-site to form the modular buildings. Further construction is then carried out on-site to complete the building; such further construction may include, for example, laying an exterior skin of brick work and applying an interior wall finishing, for example plasterboard. The benefits of such modular constructed buildings include the speed of construction of the modular buildings, the consistency of the quality in the finished product and the cost savings associated with, for example, reduced labour costs and increased working efficiencies.

[0004] It may be appreciated that there are many considerations in constructing modular buildings, including the transportation of the modular parts and the costs associated with their secure and timely transportation. The cost of fuel is high and increasing. It is important to minimise the number of journeys required to transport the pre-fabricated modular parts to site. It is important therefore to optimise the number of building modules carried in the payload of each delivery vehicle (giving consideration to legal weight limits). It is also important to avoid return journeys to a site, for example to replace items damaged during transportation and/or to replace incorrect items.

[0005] Typically, modular buildings comprise wall modules, for example open and closed panel timber frames, structurally insulated panels (SIP), steel frames and cross-laminated timber constructions, that are craned into a vertical and final fit position on site. Fenestration products, for example windows and doors, need to be installed within the wall modules. This is often done on-site. Advantageously however, off-site installation in-

volves a decrease in on-site labour, a decrease in on-site deliveries, more rapid completion time, no requirement for onsite storage of the fenestration products, an increase in security and a reduced fire risk due to the part-constructed building being secure straight away. Additionally, because some manufacturing mistakes in a fenestration product may not be noticed until the point of its installation, off-site installation additionally benefits from avoiding or minimising the cost of rectifying a manufacturing mistake, which can otherwise increase the completion time of the modular building due to the delay involved in obtaining a correct fenestration product.

[0006] It is advantageous therefore to factory-fit the fenestration products into wall modules. In the completed building the fenestration products typically do not stay entirely within the wall modules, but in their installation position, the windows and doors typically stand proud of an outer surface of a wall module in order to account for a cavity between the wall module and the exterior skin of brickwork. Transportation of wall modules with fenestration products in their final installation position leaves the entire module vulnerable to damage during transportation and reduces the number of wall modules that can be contained within a single payload. It is therefore advantageous to stow the windows or doors within the aperture in the wall module off-site. It is desirable to minimise the labour involved in the on-site installation of the windows and doors by having a hinging device that can hold the window or door in the stowed position and that can facilitate the movement and accurate placement of the window or door in the installation position. It is further desirable for such mechanisms to be strong and robust and capable of supporting the weight of the windows and doors without the need to have an excessive number of such mechanisms. It is further desirable to have a mechanism that can accommodate different cavity depths. In some applications cavity depths of 150mm, 200mm or more may be required and it is desirable for such mechanisms to be capable of extending a window or door from its stowed position into an installation position wherein the window or door is held out at such a distance (150mm, 200mm or more).

[0007] An aim of the present invention is to at least mitigate the above mentioned problems and/or to provide an improvement in the field of modular building construction.

SUMMARY

[0008] Aspects of the invention relate to a hinging device, to a wall module, to a modular building, and to a method as claimed in the appended claims.

[0009] According to an aspect of the present invention for which protection is sought, there is provided a hinging device comprising: a first fixing component for securely attaching the hinging device to a first article, the first fixing component comprising an inner plate and an outer plate and having a substantially "L"-shaped cross-section; a

second fixing component for securely attaching the hinging device to a second article, the second fixing component comprising a main member that is substantially planar and which comprises at least one leg portion unitarily formed with the main member and disposed in a plane offset from the plane of the main member; a first moveable arm; a second moveable arm; at least one slot formed in at least one of: the main member of the second fixing component, the first moveable arm and the second moveable arm; and means for pivotally coupling the first and second moveable arms to one another, thereby providing a moveable connection between the first and second fixing components and being configured to partially cross over one another. The slot controlling relative movement of the first and second moveable arms for enabling the second fixing component to linearly move past the first fixing component. The hinging device thereby being structured and arranged for securing the first article to the second article in a first position; for securing the first article to the second article in a second position linearly spaced from the first position; and for controlling the relative linear movement of the first and second articles between the first and second positions. In this way two rigid arms, preferably formed from metal, are used to support the first article. Beneficially, the robust structure of the hinging device may be highly reliable and may enable greater cavity depths to be accommodated.

[0010] Preferably, the second fixing component comprises two leg portions, each unitarily formed with the main member and formed at opposite ends of the main member, wherein each of the two leg portions is disposed in a plane offset from the plane of the main member, and wherein the two leg portions are in the same plane as one another.

[0011] Preferably, each leg portion comprises a slot-shaped aperture through which fixing means can pass to securely attach the hinging device to a second article.

[0012] Preferably, each of the first and second moveable arms is substantially planar and at least a portion of the first moveable arm rests in a different plane to the plane in which the second moveable arm rests.

[0013] Optionally, the first and second moveable arms are positionable between the inner plate of the first fixing component and the substantially planar main member of the second fixing component.

[0014] Optionally, the inner plate of the first fixing component is pivotally coupled to at least one of the first and second moveable arms and wherein the inner plate of the first fixing component and the main member of the second fixing component are disposed in parallel planes.

[0015] Preferably, a hinging device wherein, by virtue of the pivotal connection between the inner plate of the first fixing component and the first and/or second moveable arm, when the hinging device is in use and the inner plate of the first fixing component is securely attached to a first article and the second fixing component is attached to a second article, the outer plate of the first fixing component and the main member of the second fixing com-

ponent are maintained substantially orthogonal relative to one other.

[0016] Optionally, the at least one slot comprises a single slot formed in the main member.

[0017] Preferably, the first moveable arm comprises a first aperture and a first rivet, which first rivet pivotally couples the first moveable arm to the second fixing component via said single slot formed in the main member; wherein the first moveable arm comprises a second aperture and a second rivet, which second rivet pivotally couples the first moveable arm to the second moveable arm; and wherein the first moveable arm comprises a third aperture and a third rivet, which third rivet pivotally couples the first moveable arm to the inner plate of the first fixing component.

[0018] Preferably, the second moveable arm comprises a fourth aperture and a fourth rivet, which fourth rivet pivotally couples to the second moveable arm to the main member of the second fixing component, and wherein the second moveable arm comprises a fifth aperture which receives said second rivet for pivotally coupling the first moveable arm to the second moveable arm.

[0019] Preferably, the second moveable arm has a length between the fourth and fifth apertures that is shorter than a length of the first moveable arm between the first aperture and the third aperture.

[0020] Optionally, the at least one slot comprises two slots, a first slot formed in the first movable arm and a second slot formed in the second moveable arm.

[0021] Preferably, the first moveable arm is pivotally mounted to the second fixing component; and the second moveable arm is pivotally mounted to the second fixing component, wherein the first and second moveable arms are pivotally coupled via said first and second slots to the first fixing component and to one another.

[0022] Preferably, a first rivet passing through an aperture in the first fixing component, passing through the first slot of the first moveable arm and passing through the second slot of the second moveable arm couples the first fixing component to each of the first and second moveable arms and couples the first and second moveable arms to one another.

[0023] Alternatively, each of the first and second moveable arms is pivotally mounted to a leg portion of the second fixing component by further rivets and wherein the first fixing component, second moveable arm and first moveable arm are stacked on top of each other in the region of said first rivet.

[0024] Preferably, the first moveable arm, second moveable arm and first fixing component each comprise a first aperture and in said first position, the first apertures in each of the first moveable arm, second moveable arm and first fixing component overlap to a sufficient degree such that a single locking means can releasably secure the first article to the second article in said first position.

[0025] Preferably, the first moveable arm and second moveable arm each additionally comprise a second aperture and in said second position, the second apertures

in each of the first moveable arm and second moveable arm and the first aperture in the first fixing component overlap to a sufficient degree such that a single locking means can secure the first article to the second article in said second position.

[0026] Preferably, the locking means comprises a lock-off screw that passes through each of the first moveable arm, the second moveable arm and the first fixing component and into the first article and releasably secures the first article to the second article in the first position and by virtue of the lock-off screw being unscrewable, permanently secures the first article to the second article in said second position.

[0027] Preferably, the first aperture in the first fixing component is slot-shaped; wherein the first aperture in the first moveable arm is substantially circular; wherein the first aperture in the second moveable arm is substantially circular; wherein the second aperture in the first moveable arm is slot-shaped and wherein the second aperture in the second moveable arm is slot-shaped.

[0028] Preferably, a notional central longitudinal axis of the first slot of the first moveable arm is disposed at between 30° and 55° relative to a notional central longitudinal axis of the second aperture in the first moveable arm and wherein a notional central longitudinal axis of the second slot of the second moveable arm is disposed at between 30° and 55° relative to a notional central longitudinal axis of the second aperture in the second moveable arm.

[0029] According to another aspect of the present invention for which protection is sought, a wall module comprises an aperture, a fenestration and one or more hinging devices according to any of the relevant preceding paragraphs, the one or more hinging devices for maintaining a secure attachment of the fenestration to the wall module; for releasably securing the fenestration to the wall module in a first position wherein the fenestration is stowed entirely within the aperture; for permanently securing the fenestration to the wall module in a second installation position wherein at least a portion of the fenestration stands proud of an outer surface of the wall module, the second installation position being linearly spaced from the first position by a distance; and for controlling the linear movement of the fenestration relative to the wall module from the first, stowed, position to the second, installation, position.

[0030] Alternatively, a wall module wherein the first moveable arm, second moveable arm and first fixing component each comprise a first aperture and in said first stowed position, the first apertures in each of the first moveable arm, second moveable arm and first fixing component overlap to a sufficient degree such that a locking means passing through each of the first moveable arm, the second moveable arm and the first fixing component and into a reveal of the aperture in the wall module releasably secures the article to the wall module in said first stowed position.

[0031] Preferably, the first moveable arm and second

moveable arm each additionally comprise a second aperture and in said second installation position, the second apertures in each of the first moveable arm and second moveable arm and the first aperture in the first fixing component overlap to a sufficient degree such that a locking means passing through each of the first moveable arm, the second moveable arm and the first fixing component and into the reveal of the aperture of the wall module permanently secures the article to the wall module in said second installation position.

[0032] Preferably, said locking means is a lock-off screw.

[0033] Preferably, the first aperture in the second fixing component is a slot; wherein the first aperture in the first moveable arm is substantially circular; wherein the first aperture in the second moveable arm is substantially circular; wherein the second aperture in the first moveable arm is slot-shaped and wherein the second aperture in the second moveable arm is slot-shaped.

[0034] Preferably, a notional central longitudinal axis of the slot of the first moveable arm is disposed at between 30° and 55° relative to a notional central longitudinal axis of the second aperture in the first moveable arm and wherein a notional central longitudinal axis of the slot of the second moveable arm is disposed at between 30° and 55° relative to a notional central longitudinal axis of the second aperture in the second moveable arm.

[0035] Preferably, the fenestration is four-sided, the aperture is four-sided and at least one hinging device is affixed to each side of the fenestration and each side of the aperture.

[0036] Preferably, the wall module is an open timber frame, a closed panel timber frame, a structurally insulated panel (SIP), a steel frame or a cross-laminated timber construction.

[0037] Preferably, the fenestration is any one of: a wooden, metal, plastics, glazed or un-glazed, fully-furnished, part-furnished or unfurnished, window or door.

[0038] Preferably, the wall module comprises more than one aperture, a fenestration for each aperture and one or more hinging devices for each fenestration, each of said fenestrations being attached to the wall module in the second installation position by said one or more hinging devices.

[0039] Preferably, a modular building construction comprises a plurality of wall modules assembled together, wherein the fenestrations of each wall module are permanently held by said one or more hinging devices in the second installation position.

[0040] Preferably the modular building construction comprises a wall module and comprising an exterior skin, which exterior skin is spaced by a cavity from an outer surface of the wall module and wherein said distance between the second installation position and the first stowed position is proportional to the depth of said cavity.

[0041] Preferably, the distance is one of: 50mm, 100mm, 150mm and 200mm.

[0042] According to another aspect of the present invention for which protection is sought, there is provided a method of constructing a modular building comprising:

- (i) using one or more hinging devices to attach an article to a wall module in a first stowed position wherein the article is disposed entirely within an aperture in the wall module; 5
- (ii) transporting said wall module to a building site; 10
- (iii) assembling said wall module into a final position; and
- (iv) applying a force to the article to cause the first and second moveable arms of the or each hinging device to pivot and cross-over the first fixing component of the or each hinging device and thereby move the article into a second, installation position wherein the article stands proud of an outer surface of the wall module. 15

[0043] Preferably, the method additionally comprises: 20

- (i) locking said one or more hinging devices before transporting said wall module;
- (ii) unlocking said one or more hinging devices after assembling the wall module into a final position; and 25
- (iii) re-locking said one or more hinging devices in the second, installation position to permanently attach the article to the wall module in the second installation position after applying a force to the article. 30

[0044] Within the scope of this application it is envisaged that the various aspects, embodiments, examples, features and alternatives set out in the preceding paragraphs and/or in the following description and drawings may be taken independently or in any combination thereof. For example, features described in connection with one embodiment are applicable to all embodiments unless there is incompatibility of features. 35

BRIEF DESCRIPTION OF THE DRAWINGS 40

[0045] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying Figures in which: 45

FIGURE 1 is a perspective view of a timber frame panel in which a first window is held by hinging devices according to the disclosure in a first, stowed position and in which a second window has been moved into and is held in a second, installation position, by hinging devices according to the disclosure; 50

FIGURE 2A is a plan view of a hinging device according to an embodiment of the disclosure wherein the hinging device is located in the first, stowed, position; 55

FIGURE 2B is an end view of the hinging device, wherein the hinging device is located in the first, stowed, position;

FIGURE 3A is an end view of a section through a window aperture of a wall module, wherein part of the profile of a window is disposed in a first stowed position within the aperture and is held there and attached to the wall module by the hinging device of Figures 2A and 2B;

FIGURE 3B is an end view of the hinging device, viewed as though from the outer side of a wall module, wherein the hinging device is located in a half-way position between its first stowed position and its second installation position;

FIGURE 4A is a plan view of the hinging device of Figure 1 wherein the hinging device is located in the second, installation, position;

FIGURE 4B is an end view of a section through a window aperture of a wall module, wherein part of the profile of a window is disposed in the second, installation, position standing proud of an outer surface of the wall module; the window is held in position and is attached to the wall module by the hinging device of Figures 2A-4A;

FIGURE 4C is an end view of the hinging device, wherein the hinging device is located in the second, installation, position;

FIGURE 5 is a perspective view of part of a wall module showing part of a window aperture of the wall module and showing part of a window. A hinging device according to the disclosure is shown affixing the window to the wall module and holding the window in a first, stowed position;

FIGURE 6 is a perspective view of the wall module of Figure 5, wherein the hinging device has facilitated the repositioning of the window relative to the wall module and the window is located in a position between the first, stowed position and second installation position;

FIGURE 7 is a perspective view of the wall module of Figure 6, wherein the hinging device has facilitated the further repositioning of the window further toward the second installation position;

FIGURE 8 is a perspective view of the wall module of Figure 7, wherein the hinging device has facilitated the complete repositioning of the window into the second, installation, position. A lock-off screw is not shown, but a lock off-screw is optionally used to secure the window in the second, installation, position;

FIGURE 9 is a view from above of a hinging device according to a second embodiment of the disclosure;

FIGURE 10 is a plan view of the hinging device of Figure 9 in a first intermediate position, wherein the hinging device is moving out of the first position and towards a second installation position;

FIGURE 11 is a plan view of the hinging device of Figure 9 in a second intermediate position, wherein the hinging device is moving out of the first intermediate position and towards the second installation position;

FIGURE 12 is a plan view of the hinging device of Figure 9 in a third intermediate position, wherein the hinging device is moving out of the second intermediate position and towards the second installation position;

FIGURE 13 is a view from above of the hinging device of Figure 9 in the second installation position;

FIGURE 14 is an end view through a cut section of a profile for a window attached to part of an aperture of a timber frame wall module, wherein the profile is disposed in the first stowed position entirely within the aperture of the timber frame wall module by the hinging device of Figure 9;

FIGURE 15 is an end view through the cut section of a profile for a window attached to part of an aperture of a timber frame wall module of Figure 14, wherein the profile and hinging device are in the second intermediate position wherein the profile is shown moving towards the second installation position;

FIGURE 16 is an end view through the cut section of a profile for a window attached to part of an aperture of a timber frame wall module of Figure 15, wherein the profile and hinging device are in the third intermediate position wherein the profile is shown moving towards the second installation position; and

FIGURE 17 is an end view through the cut section of a profile for a window attached to part of an aperture of a timber frame wall module of Figure 16, wherein the profile and hinging device are in the second installation position.

DETAILED DESCRIPTION

[0046] Detailed descriptions of specific embodiments of the hinging devices, wall modules, modular building systems, modular buildings and methods are disclosed herein. It will be understood that the disclosed embodiments are merely examples of the way in which certain

aspects of the invention can be implemented and do not represent an exhaustive list of all of the ways the invention may be embodied. As used herein, the word "exemplary" is used expansively to refer to embodiments that serve as illustrations, specimens, models, or patterns. Indeed, it will be understood that the hinging devices, wall modules, modular building systems, modular buildings and methods described herein may be embodied in various and alternative forms. The Figures are not necessarily to scale and some features may be exaggerated or minimised to show details of particular components. Well-known components, materials or methods are not necessarily described in great detail in order to avoid obscuring the present disclosure. Any specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the invention.

[0047] In the embodiments detailed herein, the term "hinging device" is used for the non-limiting purpose of referring to a device structured and arranged for securing a first article to a second article in a first position; for securing the first article to the second article in a second position; and for controlling the relative movement of the first and second articles from the first position to the second position whilst maintaining a secure attachment of the first and second articles. The hinging device to be described herein, is a mounting means or mounting bracket that is described in the context of modular buildings. The second article may be a fenestration product and the first article may be a wall module. In the first position (which may also be referred to as a "pre-installation position" or a "stowed position"), the fenestration product may be attached to the wall module and held completely within an aperture of the wall module such that no portion of the fenestration product projects beyond an outer surface of the wall module. In this way, the wall module and fenestration product are hinged together and can be manipulated as a unitary item for safe transportation from a factory to a building site. In the second position, (which may also be referred to as "an installation position") at least a portion of the fenestration product stands proud of an outer surface of the wall module. The movement of the fenestration product relative to the wall module between the stowed position and the installation position is achieved by the pivotal hinging movement of the hinging device.

[0048] Upon reading the foregoing, it will be recognised that the hinging device or mounting means described and illustrated herein may have many and various applications outside the specific context of modular building construction. It is contemplated that the teachings of the present disclosure can be applied to various first and second articles where it is required to control the relative positioning of first and second articles and required to secure those first and second articles together.

[0049] The term "first article" may be used for the non-limiting purpose of referring to a component of a modular

building system, for example, but not limited to a wall module, roof module, panel or frame. The terms "wall module", "panel" and "frame", are used for the non-limiting purpose of referring to components of modular building systems, for example, but not limited to, open and closed panel timber frames, structurally insulated panels (SIP), steel frames and cross-laminated timber constructions.

[0050] The terms "article" and "second article" may be used for the non-limiting purpose of referring to a component of a modular building system, for example, but not limited to: a fenestration, a window, a door (for example, a fire door, a patio door and a pair of French doors), a louvre, vent, skylight or roof light, any of which may be glazed or unglazed and any of which may be fully, partly or unfurnished (but preferably fully furnished) and any of which may be formed from plastics material (for example PVCu), metal (for example aluminium), timber (for example hardwood) or any other suitable material.

[0051] Referring to Figure 1, there is shown a perspective view of a timber frame panel 90. The timber frame panel 90 is shown with three apertures: a first window aperture 95, a door aperture 97 and a second window aperture 99. In the first window aperture 95, a first window 80a is shown being held by hinging devices 10 in a first, stowed position. The first window 80a has a maximum width that is less than the depth of the first window aperture 95 and is positioned, optionally, centrally within the first window aperture 95. The first window 80a is positioned such that the first window 80a is disposed fully within the first window aperture 95 such that no part of it, including the furniture provided for opening, closing and locking the window, projects beyond either outer surface 90a, 90b of the timber frame panel 90. A width of the first window 80a may be about 70mm, a depth of the first window aperture 95 may be about 140mm and the window 80a may be positioned such that about a 35mm space exists between each edge of the window 80a and each surface 90a, 90b of the timber frame panel 90.

[0052] Additionally in Figure 1, a second window 80b is shown. The second window 80b has been moved into a second, installed position 78 by hinging devices 10 that are disposed and affixed to either side of the second window 80b. The second window 80b is held in the second position by the hinging devices 10. In the installed position 78, at least a portion of the second window 80b stands proud of an outer surface 90b of the timber frame panel 90. Preferably, in the installed position 78, the second window 80b is moved fully clear of the outer surface 90b of the timber frame panel 90 (as shown in Figures 1 and 8). This provides space for a building cavity. In accordance with building regulations and/or specifications, the depth of the cavity may vary. For example, standard cavities are typically 50mm, 100mm, 150mm and 200mm. The hinging device 10 is structured and arranged to locate the second window 80b substantially centrally within the second window aperture 99 of the

timber frame panel 90 and then to locate the second window 80b, 50mm from the outer surface 90b of the timber frame panel 90. Brickwork or other exterior finishing 'B' is then laid up to and about the window 80b (only partly shown in Figure 1).

[0053] Hinging devices 10 may be provided on one or more or all sides of the profile or frame of the windows 80a, 80b. Preferably, at least one hinging device 10 is provided on each side edge of each window product 80a, 80b fixed within the timber frame panel 90. In Figure 1, the door aperture 97 is illustrated without a door being affixed therein in order to illustrate an aperture 97 within the timber frame panel 90 more clearly. However, it will be understood that in accordance with the invention, a wall module 90 typically would comprise a factory-fitted fenestration product, stowed within or associated with each of its apertures 95, 97, 99. It will also be understood that the number, position and type of fenestration product will vary dependent upon the building design.

[0054] Referring now to Figure 2A, there is shown a view from above of an upper side 15 of a hinging device 10. The hinging device 10 is formed from a suitable material of sufficient strength and robustness for its application. In the presently described embodiment, it is envisaged that the hinging device 10 is formed from austenitic grade stainless steel. However, it is to be understood that, as used herein, the term "suitable material" includes all manner of suitable materials such as, but not limited to, metal (including steel, stainless steel, aluminium and metal alloys, any of which may be coated or galvanised), plastic and suitable combinations thereof and the like.

[0055] Hinging device 10 comprises a second fixing component 25 (also referred to as a second article fixing plate 25) which is used to attach the hinging device 10 to a side of the article 80 (window, door etc.), which side is disposed adjacent to a reveal 90c of an aperture 95, 97, 99 of a wall module 90. The second fixing component 25 has a main member 20; integrally formed therewith are first and second leg portions 21, 23. The leg portions 21, 23 of the main member 20 are not in the same plane as the main member 20. Each leg portion 21, 23 comprises an aperture 62a, 62b.

[0056] In Figures 2A and 4A views from above of the hinging device 10 are provided. In Figure 3B an end view of the hinging device 10 is provided and in this Figure the shape of the second fixing component 25 can be more clearly seen. The main member 20 of the second fixing component 25 is dimensioned in correspondence with the dimension and shape of a portion of the side of the article 80 to which it is attached. In other words, the width and depth of the main member 20 may be selected so that the main member 20 fits within a channel shape of a PVCu profile forming the frame of a door or window 80. The length of the main member 20 may be determined in proportion to the distance between the first stowed position and the second installation position 78, which distance may be determined by the depth of cavity required.

[0057] The second article fixing component 25 comprises fixing means 34, 36. In this embodiment the fixing means 34, 36 takes the form of substantially circular apertures, through which fixing members 33, for example, but not limited to screws, can be placed to affix the second fixing component 25 to the profile of the second article 80 (see Figure 3A). Preferably the screws 33 extend into a metal reinforcement 53 (formed from, for example, aluminium or galvanised steel) within the profile of the window 80 (see Figures 3A and 4B). Thereby the second fixing component 25 is securely attached to the second article (i.e., the window 80). In other embodiments, the fixing means 34, 36 may take the form of slots to provide additional tolerance for the location of screws into the profile of the window 80.

[0058] The hinging device 10 comprises a first fixing component 24/66 (also referred to as first article fixing plate 24/66) which is used to attach the hinging device 10 to the outer surface 90b of the wall module 90 (first article). The first fixing component 24/66 is preferably "L"-shaped in cross-section (see Figures 3A, 2B, 4B and 5). The first fixing component 24/66 comprises an outer plate 66 that is for affixing the hinging device 10 to the outer surface 90b of the wall module 90 and an inner plate 24 that is for affixing the hinging device 10 to the reveal 90c of the window aperture 95, 99 of the wall module 90. The inner plate 24 also comprises an aperture 56 (which may be formed as a circle or slot) that accommodates a lock-off screw 'L' that is used to lock the hinging device 10 in either the first stowed position or the second installation position.

[0059] The outer plate 66 and inner plate 24 are integrally formed from the same sheet of steel material and a corner 26 interconnects the two. In other embodiments other affixing arrangements are envisaged. However, the first fixing component 24/66 being a unitary formed metal component provides strength and robustness to the hinging device 10. This, as is described below, is especially advantageous in applications where the cavity depth of the building construction requires the first article 80 to be extended 150mm or more beyond the outer surface 90b of the wall module 90 since the load imparted on the hinging device 10 may be significant and weaker hinge arrangements and/or weaker materials (such as plastic) may be of insufficient strength to support the window 80 in the second, installation, position 78.

[0060] The hinging device 10 comprises two or more fixing means for affixing the outer and inner plates 66, 24 of the first fixing component 24/66 to the outer surface 90b of the wall module 90 and to the reveal 90c of the window aperture 95, 99. The fixing means optionally comprises an aperture 68 formed in the outer surface 66 of the first article fixing plate 24/66. A screw or other suitable affixing means 70 is used to securely attach the outer surface 66 of the first fixing component 24/66 to the outer surface 90b of the wall module 90. Additionally the fixing means comprises an aperture 56 formed in the inner surface 24 of the first fixing component 24/66.

[0061] The hinging device 10 additionally comprises a first moveable arm 22a and a second moveable arm 22b. The first moveable arm 22a has a trailing end 45, a leading end 43 and an outer edge 40. Similarly, the second moveable arm 22b has a trailing end 49, a leading end 47 and an outer edge 42. The leading end 43 of the first moveable arm 22a is coupled to the leg portion 21 of the second fixing component 25 by means of a fastener 32a which may, for example, be a rivet, such as a blind rivet, that passes through the aperture 62a formed in the leg portion 21 and through an aperture 64a formed in the first moveable arm 22a. Similarly, the leading end 47 of the second moveable arm 22b is coupled to the leg portion 23 of the second fixing component 25 by means of a fastener 32b for example, a rivet that passes through the aperture 62b that is formed in the leg portion 23 and through an aperture 64b that is formed in the second moveable arm 22b. The first and second moveable arms 22a, 22b are not disposed in the same plane as one another. The first moveable arm 22a is at least partially disposed above, but substantially in face contacting relationship with, the second moveable arm 22b. Each trailing end 45, 49 of the first and second moveable arms 22a, 22b respectively, comprises a slot 54, 52 (also referred to as first slot 54 and second slot 52). The slots 54, 52 are shaped, sized and configured to overlap one another and to overlap an aperture 50 formed in the inner plate 24 of the first fixing component 24/66. The slots 54, 52 permit the moveable arms 22a, 22b to move relative to the first fixing component 24/66. The first fixing component 24/66 is fixed in its position relative to the wall module 90 by virtue of its being screwed to the wall module 90 by screw 70 (see Figure 3A). Movement of the moveable arms 22a, 22b translates into movement of the window 80 because the window 80 is screw-fixed to the main member 20 of the second fixing component 25.

[0062] A comparison of Figures 2A and 4A illustrates how the pivotal movement of the moveable arms 22a, 22b, at least in part due to the provision of first and second slots 54, 52, permits the second fixing component 25 to be moved relative to the first fixing component 24/66. In Figure 2A, the first and second moveable arms 22a, 22b form a "V" shape. A force applied to the second fixing component 25 in a direction toward the first fixing component 24/66, causes the moveable arms 22a, 22b to pivot and travel about the rivet 51, and move over one other such that they overlap to a greater degree. The "V"-shaped previously formed by the first and second moveable arms 22a, 22b is contracted and at a mid-way point in the hinging action of the pivotal hinge 10, the first and second moveable arms 22a, 22b are substantially aligned in an overlaying relationship; this is illustrated in Figure 3B. The continuing application of force 'F' (which may for example be achieved by pushing against the window 80 from the inside of the wall module 90 (i.e. from inner surface 90a toward outer surface 90b)), causes the moveable arms 22a, 22b to further pivot and travel about the rivet 51, and move over one other such that together

they form an inverted "V"-shape (see Figure 4A). At this point the second fixing component 25 has been moved over and beyond the first fixing component 24/66. The window 80 that is attached to the second fixing component 25 has also thereby been moved and the second, installation position 78 that is then adopted by the window 80 is illustrated in Figure 4B.

[0063] A locking means, such as a lock-off screw 'L', is optionally used to lock the hinging device 10 in the first, stowed position. In the first stowed position, a first aperture 56 in the first fixing component 24/66 is partially overlapped with first aperture 58b in the second moveable arm 22b and partially overlapped with first aperture 58a in the first moveable arm 22a such that the lock-off screw 'L' can be passed through the first apertures 56, 58b, 58a in each of the first fixing component 24/66, the second moveable arm 22b and the first moveable arm 22a and into the reveal 90c of the wall module 90. This is illustrated in Figures 2A, 2B, 3A, 4B and 5 albeit, the lock-off screw 'L' is not actually shown in all of them. The first aperture 56 in the first fixing component 24/66 is preferably formed as a slot so that the first aperture 56 can accommodate the lock-off screw 'L' for locking the hinging device 10 in both the first, stowed, position and the second, installation, position. Optionally, the first apertures 58a, 58b in the first and second moveable arms 22a, 22b are circular.

[0064] Similarly the locking means, such as a lock-off screw 'L', is optionally used to lock the hinging device 10 in the second installation position 78. In the second installation position 78, slot 56 (first aperture 56) of the first fixing component 24/66 is partially overlapped with a second aperture 46 in the second moveable arm 22b and partially overlapped with a second aperture 48 in the first moveable arm 22a such that the lock-off screw 'L' can be passed through the first aperture 56 of the second fixing component 24/66 and the second apertures 48, 46 in each of the second moveable arm 22b and the first moveable arm 22a and into the reveal 90c of the wall module 90. This is illustrated in Figures 4A, 4B and 8, (albeit, the lock-off screw 'L' is not actually shown in Figures 4A and 8). Optionally the second apertures 48, 46 in the first and second moveable arms 22a, 22b may be slotted to provide an additional tolerance in locating the lock-off screw 'L' once the window 80 has been moved into the second installation position 78.

[0065] A notional central longitudinal axis of the slot 54 in the first moveable arm 22a is optionally disposed at between about 30° and about 55° relative to a notional central longitudinal axis of the second aperture 48 in the first moveable arm 22a. Similarly, a notional central longitudinal axis of the slot 52 in the second moveable arm 22b is disposed at between about 30° and about 55° relative to a notional central longitudinal axis of the second aperture 46 in the second moveable arm 22b.

[0066] The perspective views of Figures 5 to 8 further illustrate how the hinging device 10 is used to move a window 80 relative to a wall module 90. In Figure 5, a section of a window 80 is illustrated in the first, stowed,

position relative to a section of a wall module 90. The window 80 is securely fixed and held entirely within an aperture of a wall module 90 by a hinging device 10. Preferably, the window 80 is positioned substantially centrally of the window aperture 95, 99 formed in the wall module 90. The window aperture 95, 99 is illustrated having a depth 'D' (see Figure 5). It can be seen that the leading edge of the window 80 is spaced inwardly of the outer surface 90b of the wall module 90 by a distance 'S1' and that the trailing edge of the window 80 is spaced inwardly of the other outer surface 90a of the wall module 90 by a distance 'S2'. Preferably 'S1' is about equal to 'S2'.

[0067] In Figures 4B and 8, the section of the window 80 is disposed in the second, installation position, relative to the timber panel 90, wherein the window 80 is securely fixed and held in an extended position by the hinging device 10. The window 80 projects beyond the outer surface 90b of the timber frame by a predetermined distance. The distance may be determined by: the length of the moveable arms 22a, 22b, the length of the slots 54, 52, and the end-to-end length of the first article fixing means 25 between legs 21 and 23. The working length of the first moveable arm 22a may be defined as the distance between the centre of rivet 32a and the centre of rivet 51. Similarly, the working length of the second moveable arm 22b may be defined as the distance between the centre of rivet 32b and the centre of rivet 51.

[0068] It is expected that for a wall module 90 of known depth, several hinging devices 10 will be configured, as required, to provide the appropriate fixed distance of travel from the stowed position to the installation position taking account of the desired cavity, which may be about 50mm, about 100mm, about 150mm, about 200mm or more, or less as required.

[0069] A second embodiment of the invention will now be described with reference to Figures 9 to 17 in which like reference numerals have, where appropriate, been used to denote like features, albeit with the addition of '100' to illustrate that these features belong to the second embodiment. To avoid repetitious description, generally only the differences between the hinging device 110 of the second embodiment and the hinging device 10 of the first embodiment will be described in detail.

[0070] The general structure of the hinging device 110 is best viewed in Figures 9 and 13. Movement of the hinging device 110 is shown in Figures 10 to 12, wherein the hinging device 110 is illustrated moving from the first, stowed, position (which is shown in Figure 9) through a series of intermediate positions to the second installation position (which is shown in Figure 13).

[0071] Referring to Figures 9 and 13 together, it can be seen that the hinging device 110 comprises a first fixing component 166/124 and a second fixing component 125. Similarly to the first embodiment, the first fixing component 166/124 is a formed single piece of steel, which is again for securely attaching the hinging device 110 to a second article 190 (such as a timber frame 190).

The first fixing component 166/124 comprises an inner plate 124 and an outer plate 166 and again has a substantially "L"-shaped cross-section. In this arrangement, the outer plate 166 is again provided with a single aperture 168, which is optionally slot-shaped. However, the inner plate 124 comprises only a single aperture which receives a rivet 132c for pivotally coupling the first fixing component 124/166 to the first moveable arm 122a.

[0072] The second fixing component 125 is again provided for securely attaching the hinging device 110 to a second article, in this embodiment to a fenestration 180. The second fixing component comprises a main member 120 and a single slot 152 is formed in the main member 120. The main member 120 is substantially planar and comprises two leg portions 121, 123, each unitarily formed with the main member 120 and formed at opposite ends of the main member 120. Each of the two leg portions 121, 123 is disposed in a plane offset from the plane of the main member 120. The two leg portions 121, 123 are disposed in the same plane as one another. Each leg portion 121, 123 comprises a slot-shaped aperture 134, 136 through which a fixing means, such as a screw, can pass to securely attach the hinging device 110 to the second article 180. Preferably, the width of the two leg portions 121, 123 and the width of the main member 120 are selected to ensure that the hinging device 110 can fit within a recess within a profile section of the fenestration 180. The width of the two leg portions 121, 123 and the width of the main member 120 are optionally the same; in other envisaged embodiments the widths are not the same. In yet further envisaged embodiments the leg portions and/or main member are differently shaped, non-rectangular and may include one or more recessed or castellated portions and/or tapered portions.

[0073] In Figure 9 it can be seen that the hinging device 110 comprises a first moveable arm 122a and a second moveable arm 122b. The inner plate 124 of the first fixing component 166/124 is pivotally coupled to the first moveable arm 122a. The inner plate 124 of the first fixing component 166/124 and the main member 120 of the second fixing component 125 are disposed in parallel planes. By virtue of the pivotal connection between the inner plate 124 of the first fixing component 124/166 and the first moveable arm 122a, when the hinging device 110 is in use and the inner plate 124 of the first fixing component 124/166 is securely attached to a first article 190, and the second fixing component 125 is attached to a second article 180, the outer plate 166 of the first fixing component 124/166 and the main member 120 of the second fixing component 125 are maintained in substantially orthogonal planes relative to one other.

[0074] Each of the first and second moveable arms 122a, 122b is substantially planar and at least a portion of the first moveable arm 122a rests in a different plane to the plane in which the second moveable arm 122b rests. As can be seen, the first moveable arm 122a comprises a bend or kink 201 such that the first moveable arm 122a has two planar sections at slightly different el-

evations. The end of the first moveable arm 122a that is coupled to the first fixing component 166/124 is at a highest elevation and rests in a plane above (as viewed in Figure 9) the plane of the second moveable arm 122b. The end of the first moveable arm 122a that is coupled to the second fixing component 125 is at a lower elevation and rests in the same plane as the second moveable arm 122b (as viewed in Figure 9).

[0075] The first and second moveable arms 122a, 122b are positionable between the inner plate 124 of the first fixing component 124/166 and the substantially planar main member 120 of the second fixing component 125 (see Figure 11). To achieve this degree of articulation and pivotal movement, the first moveable arm 122a comprises a first aperture and a first rivet 132a, which first rivet 132a pivotally couples the first moveable arm 122a to the second fixing component 125 via said single slot 152 formed in the main member 120. The first moveable arm 122a can also move linearly, which movement is controlled in part by the first rivet 132a being guided within the (elongate, "race-track" shaped) slot 152. The first moveable arm 122a additionally comprises a second aperture and a second rivet 132b. The second rivet 132b provides a means for pivotally coupling the first moveable arm 122a to the second moveable arm 122b. The first moveable arm 122a also comprises a third aperture and a third rivet 132c. The third rivet 132c as discussed above, pivotally couples the first moveable arm 122a to the inner plate 124 of the first fixing component 124/166. As can be seen in Figures 9 to 13, the second moveable arm 122b has a length between the fourth and fifth apertures that is shorter than a length of the first moveable arm 122a between the first aperture and the third aperture.

[0076] Again as best viewed in Figure 9, the second moveable arm 122b comprises a fourth aperture and a fourth rivet 132d. The fourth rivet 132d pivotally couples the second moveable arm 122b to the main member 120 of the second fixing component 125. The second moveable arm 122b comprises a fifth aperture which receives the second rivet 132b for pivotally coupling the first moveable arm 122a to the second moveable arm 122b. The first and second moveable arms 122a, 122b are pivotally coupled to one another and thereby provide a moveable connection between the first and second fixing components 124/166, 125. In this way, the first and second moveable arms 122a, 122b are configured to partially cross over one another. The slot 152 controls movement of the first and second moveable arms 122a, 122b and enables the second fixing component 125 to linearly move past the first fixing component 124/166. The hinging device 110 is thereby structured and arranged for attaching a fenestration 180 to a timber frame 190 and is able to move the fenestration 180 relative to the timber frame 190 from a first, stowed position (see Figures 9 and 14) to a second, installation, position (see Figures 13 and 17). The second installation position is linearly spaced from the first position by a distance. This distance

can be determined in accordance with the application for the hinging device 110 as discussed above in relation to the first embodiment may change in dependence upon the cavity depth required by the build. The slot 152 assists with controlling the relative linear movement of the first and second articles 180, 190 between the first and second positions.

[0077] The hinging device 110 is structured and arranged to provide a robust, strong and reliable mechanism for moving a window or other fenestration 180 relative to an aperture within a timber frame panel 190.

[0078] It can be appreciated that various changes may be made within the scope of the present invention, for example, the size and shape of the panels and apertures may be adjusted to accommodate articles of differing size or shape.

[0079] It will be recognised that as used herein, directional references such as "top", "bottom", "front", "back", "end", "side", "inner", "outer", "upper" and "lower" do not necessarily limit the respective components to such orientation, but may merely serve to distinguish these components from one another.

Claims

1. A hinging device (10; 110) for use in a modular building construction and comprising:

- (i) a first fixing component (24/66; 124/166) for securely attaching the hinging device to a first article (90), the first fixing component comprising an inner plate (24; 124) and an outer plate (66; 166) and having a substantially "L"-shaped cross-section;
- (ii) a second fixing component (25; 125) for securely attaching the hinging device to a second article (80), the second fixing component comprising a main member (20; 120) that is substantially planar and which comprises at least one leg portion (21, 23; 121, 123) unitarily formed with the main member and disposed in a plane offset from the plane of the main member;
- (iii) a first moveable arm (22a; 122a);
- (iv) a second moveable arm (22b; 122b);
- (v) at least one slot (54, 52; 152) formed in at least one of: the main member of the second fixing component, the first moveable arm and the second moveable arm; and
- (vi) means (50/54/52; 132b) for pivotally coupling the first and second moveable arms to one another,

the first and second moveable arms thereby providing a moveable connection between the first and second fixing components and being configured to partially cross over one another and the slot controlling relative movement of the first and second moveable

arms for enabling the second fixing component to linearly move past the first fixing component, the hinging device thereby being structured and arranged for securing the first article to the second article in a first position; for securing the first article to the second article in a second position linearly spaced from the first position; and for controlling the relative linear movement of the first and second articles between said first and second positions.

2. A hinging device according to claim 1 wherein the second fixing component comprises two leg portions, each unitarily formed with the main member and formed at opposite ends of the main member, wherein each of the two leg portions is disposed in a plane offset from the plane of the main member, and wherein the two leg portions are in the same plane as one another.
3. A hinging device according to claim 2 wherein each leg portion comprises a slot-shaped aperture (134, 136) through which fixing means can pass to securely attach the hinging device (10; 110) to a second article (80).
4. A hinging device according to claims 1, 2 or 3 wherein each of the first and second moveable arms is substantially planar and at least a portion of the first moveable arm rests in a different plane to the plane in which the second moveable arm rests.
5. A hinging device according to any preceding claim wherein the inner plate (24; 124) of the first fixing component is pivotally coupled to at least one of the first and second moveable arms and wherein the inner plate of the first fixing component and the main member of the second fixing component are disposed in parallel planes.
6. A hinging device according to claim 5 wherein, by virtue of the pivotal connection between the inner plate of the first fixing component and the first and/or second moveable arm, when the hinging device is in use and the inner plate of the first fixing component is securely attached to a first article and the second fixing component is attached to a second article, the outer plate (66; 186) of the first fixing component and the main member of the second fixing component are maintained in substantially orthogonal planes relative to one other.
7. A hinging device according to any preceding claim wherein the at least one slot comprises a single slot (152) formed in the main member (120).
8. A hinging device according to claim 7 wherein the first moveable arm (122a) comprises a first aperture and a first rivet (132a), which first rivet pivotally cou-

ples the first moveable arm to the second fixing component (125) via said single slot (152) formed in the main member (120); wherein the first moveable arm comprises a second aperture and a second rivet (132b), which second rivet pivotally couples the first moveable arm to the second moveable arm (122b); and wherein the first moveable arm comprises a third aperture and a third rivet (132c), which third rivet pivotally couples the first moveable arm to the inner plate (124) of the first fixing component.

9. A hinging device according to claim 8 wherein the second moveable arm (122b) comprises a fourth aperture and a fourth rivet (132d), which fourth rivet pivotally couples the second moveable arm to the main member (120) of the second fixing component (125), and wherein the second moveable arm comprises a fifth aperture which receives said second rivet (132b) for pivotally coupling the first moveable arm to the second moveable arm.
10. A hinging device according to claim 9 wherein the second moveable arm has a length between the fourth and fifth apertures that is shorter than a length of the first moveable arm between the first aperture and the third aperture.
11. A hinging device according to any of claims 1 to 6 wherein the at least one slot comprises two slots (54, 52), a first slot (54) formed in the first movable arm (22a) and a second slot (52) formed in the second moveable arm (22b), and wherein the first moveable arm is pivotally mounted to the second fixing component; and the second moveable arm is pivotally mounted to the second fixing component, wherein the first and second moveable arms are pivotally coupled via said first and second slots to the first fixing component (24/66) and to one another and wherein a first rivet (51) passing through an aperture (50) in the first fixing component, passing through the first slot (54) of the first moveable arm (22a) and passing through the second slot (52) of the second moveable arm (22b) couples the first fixing component (24/66) to each of the first and second moveable arms and couples the first and second moveable arms to one another.
12. A hinging device according to claim 11 wherein the first moveable arm, second moveable arm and first fixing component each comprise a first aperture (56, 58a, 58b) and in said first position, the first apertures in each of the first moveable arm, second moveable arm and first fixing component overlap to a sufficient degree such that a single locking means can releasably secure the first article to the second article in said first position.
13. A wall module (90) comprising an aperture, a fenestration (80) and one or more hinging devices (10;

110) according to any of claims 1 to 12, the one or more hinging devices for maintaining a secure attachment of the fenestration to the wall module; for releasably securing the fenestration to the wall module in a first position wherein the fenestration is stowed entirely within the aperture; for permanently securing the fenestration to the wall module in a second installation position wherein at least a portion of the fenestration stands proud of an outer surface of the wall module, the second installation position being linearly spaced from the first position by a distance; and for controlling the linear movement of the fenestration relative to the wall module from the first, stowed, position to the second, installation, position.

14. A modular building construction comprising a plurality of wall modules according to claim 13 assembled together, wherein the fenestrations of each wall module are permanently held by said one or more hinging devices (10; 110) in the second installation position.

15. A method of constructing a modular building, the method comprising:

- (i) using one or more hinging devices according to any of claims 1 to 12 to attach an article (80) to a wall module (90) in a first stowed position wherein the article is disposed entirely within an aperture in the wall module;
- (ii) transporting said wall module to a building site;
- (iii) assembling said wall module into a final position; and
- (iv) applying a force to the article to cause the first and second moveable arms of the or each hinging device to pivot and cross-over the first fixing component of the or each hinging device and thereby move the article into a second, installation position wherein the article stands proud of an outer surface of the wall module.

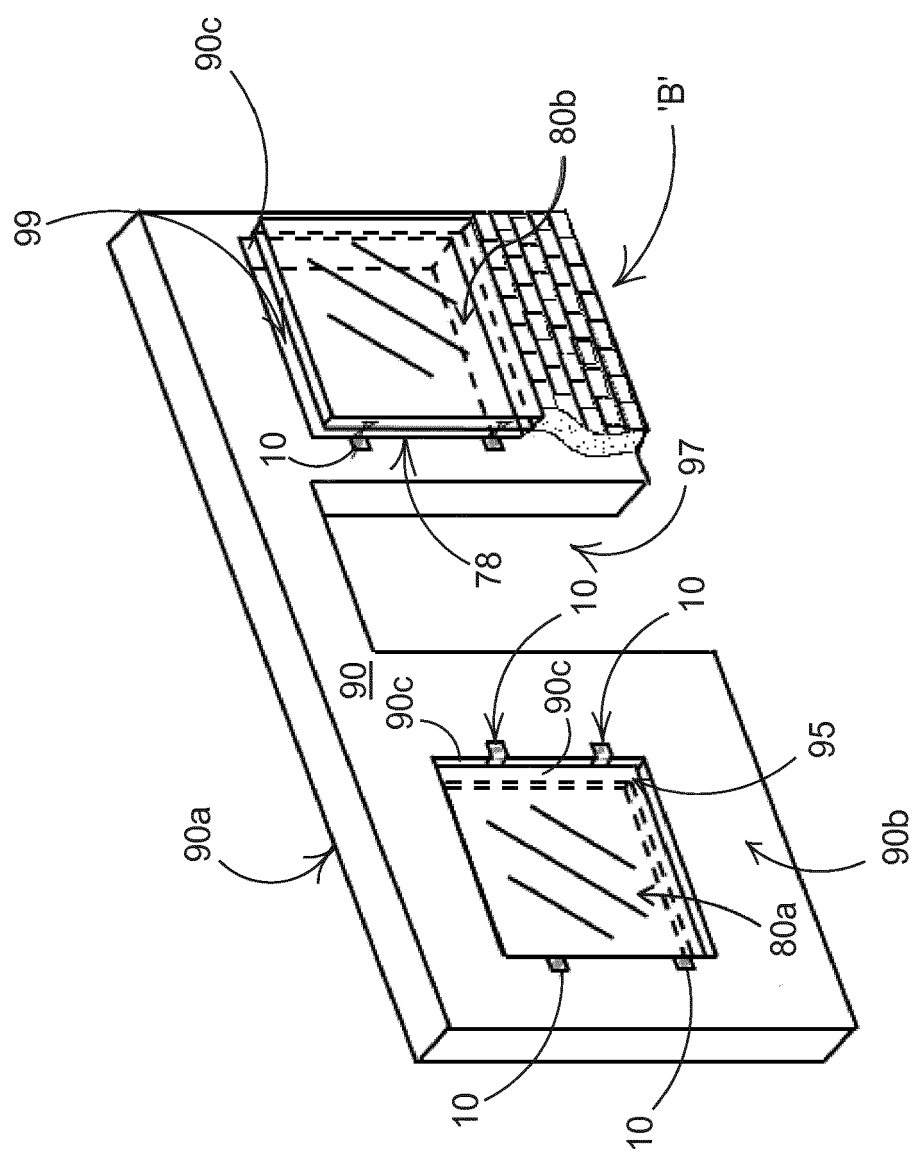
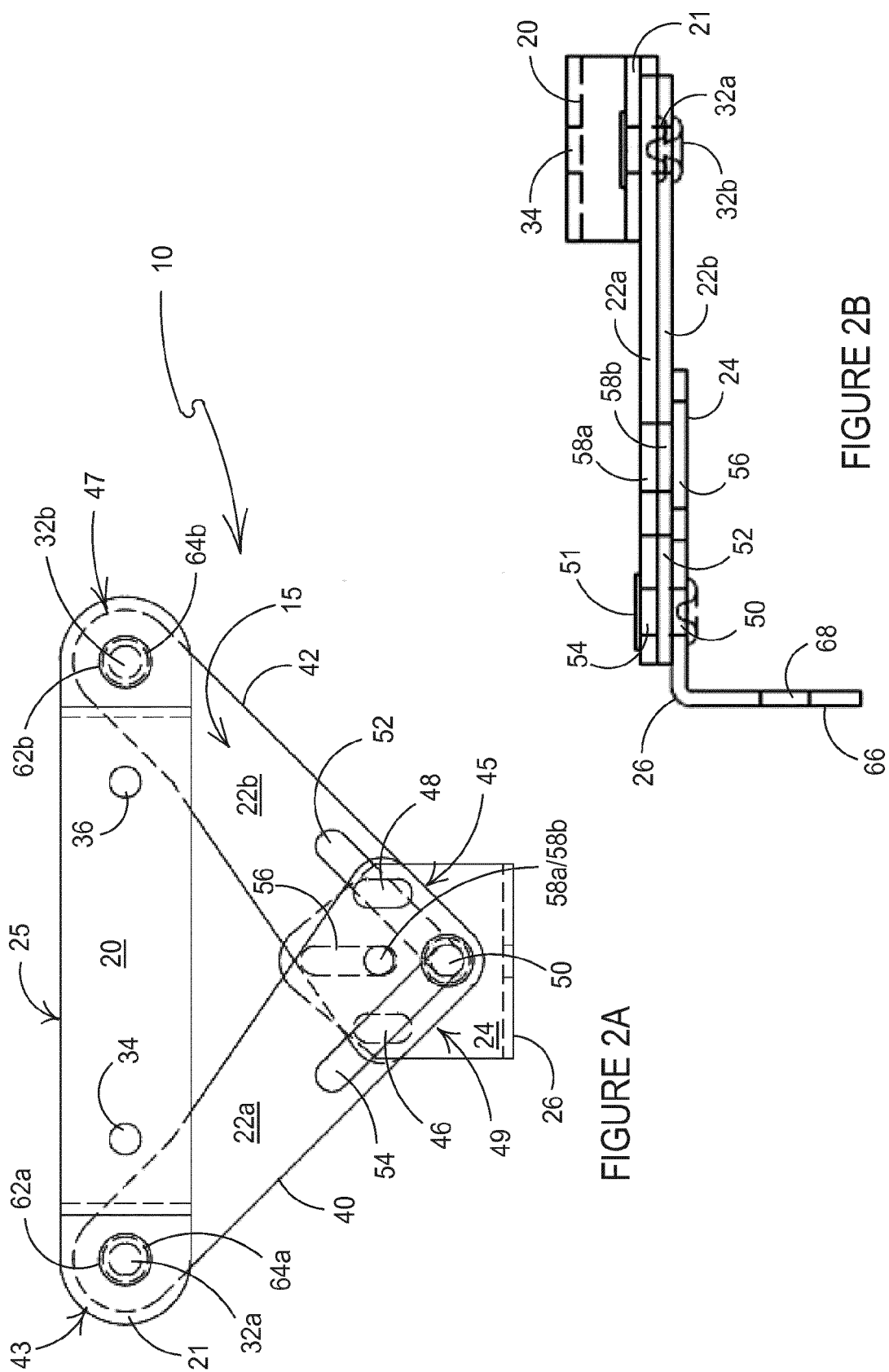
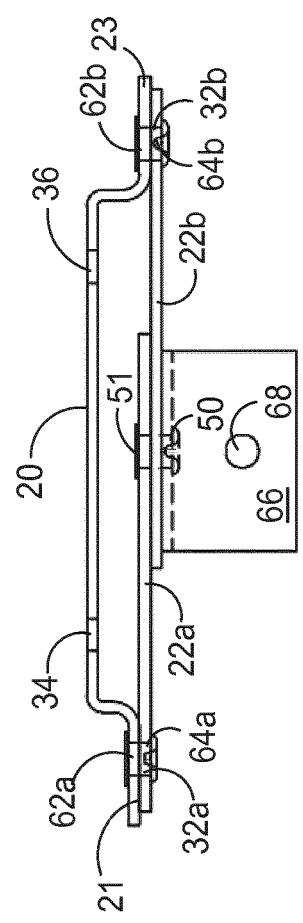
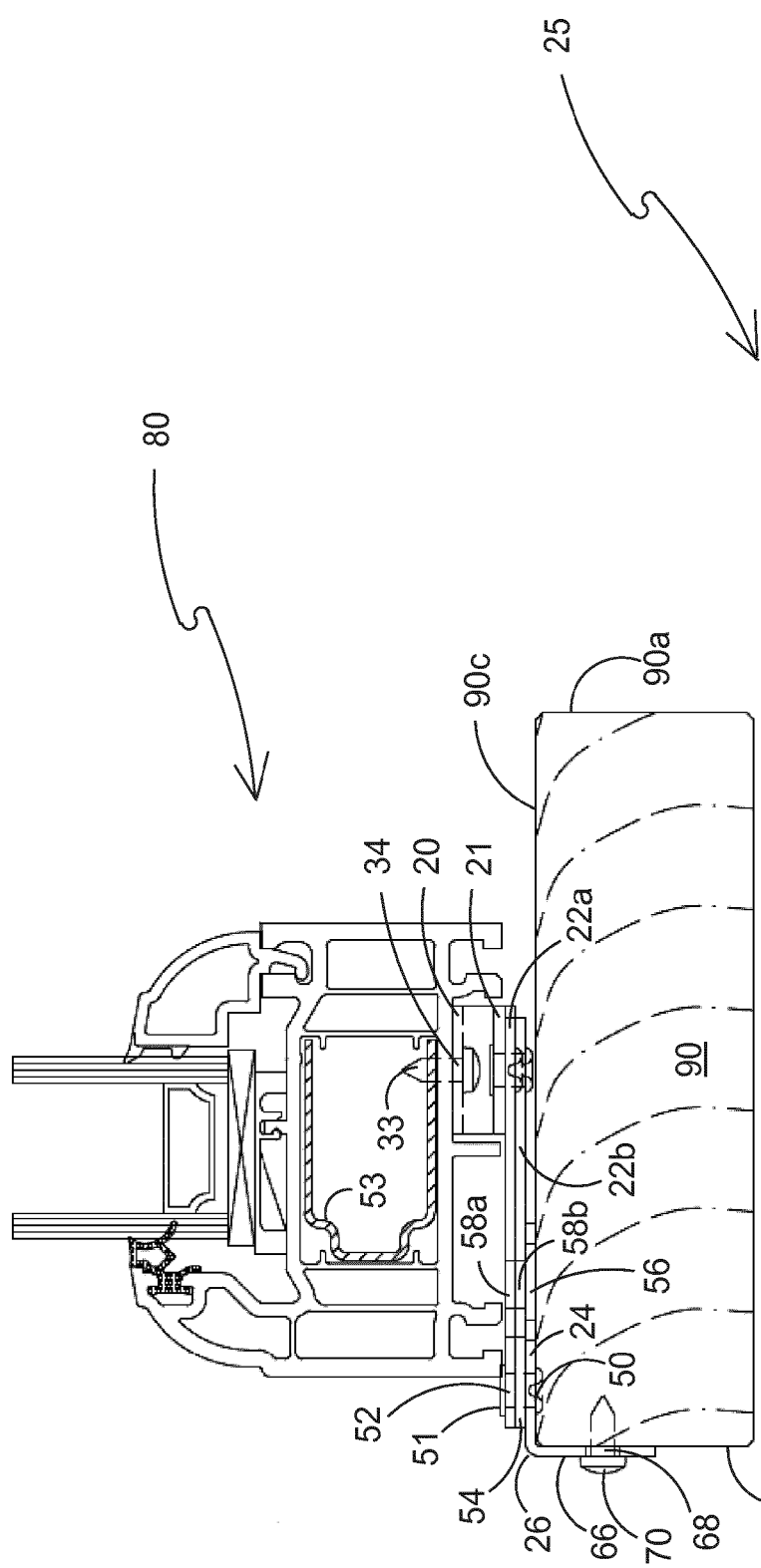
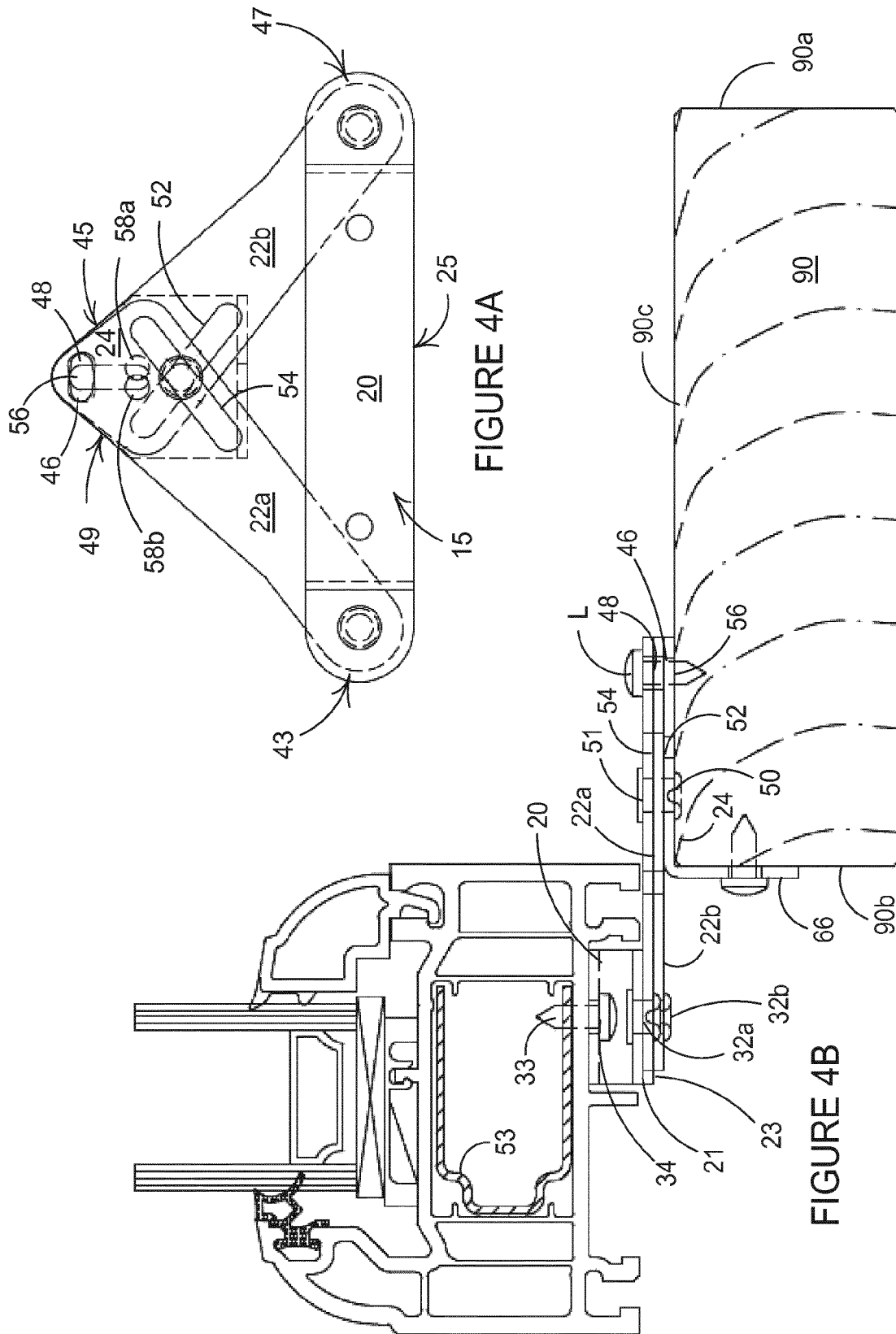


FIGURE 1







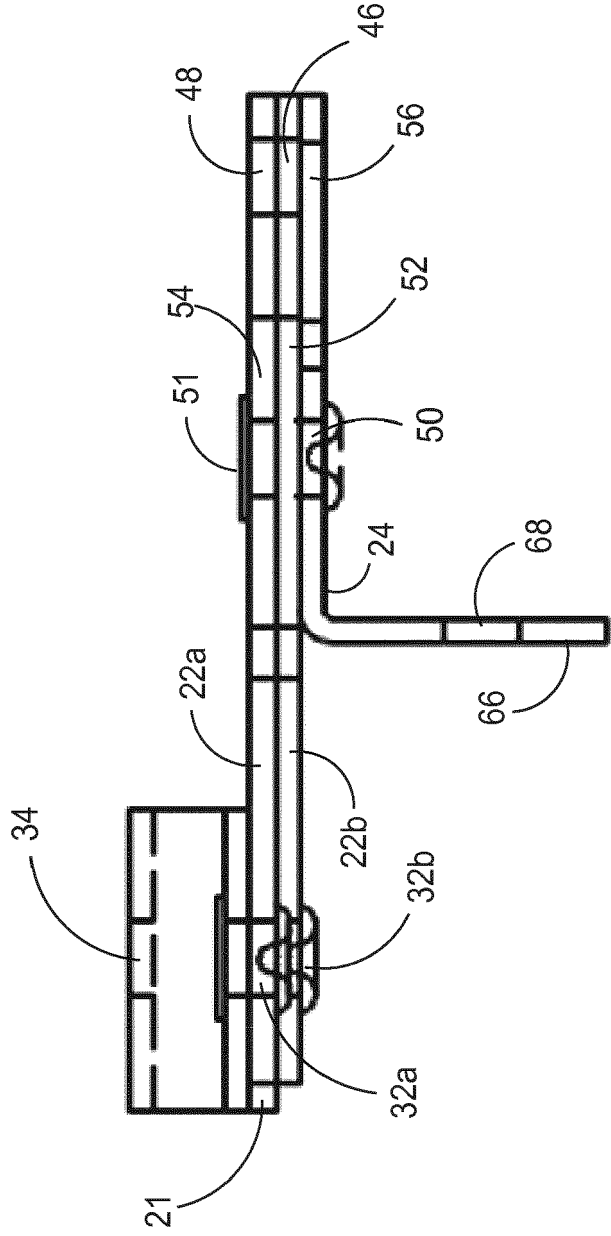
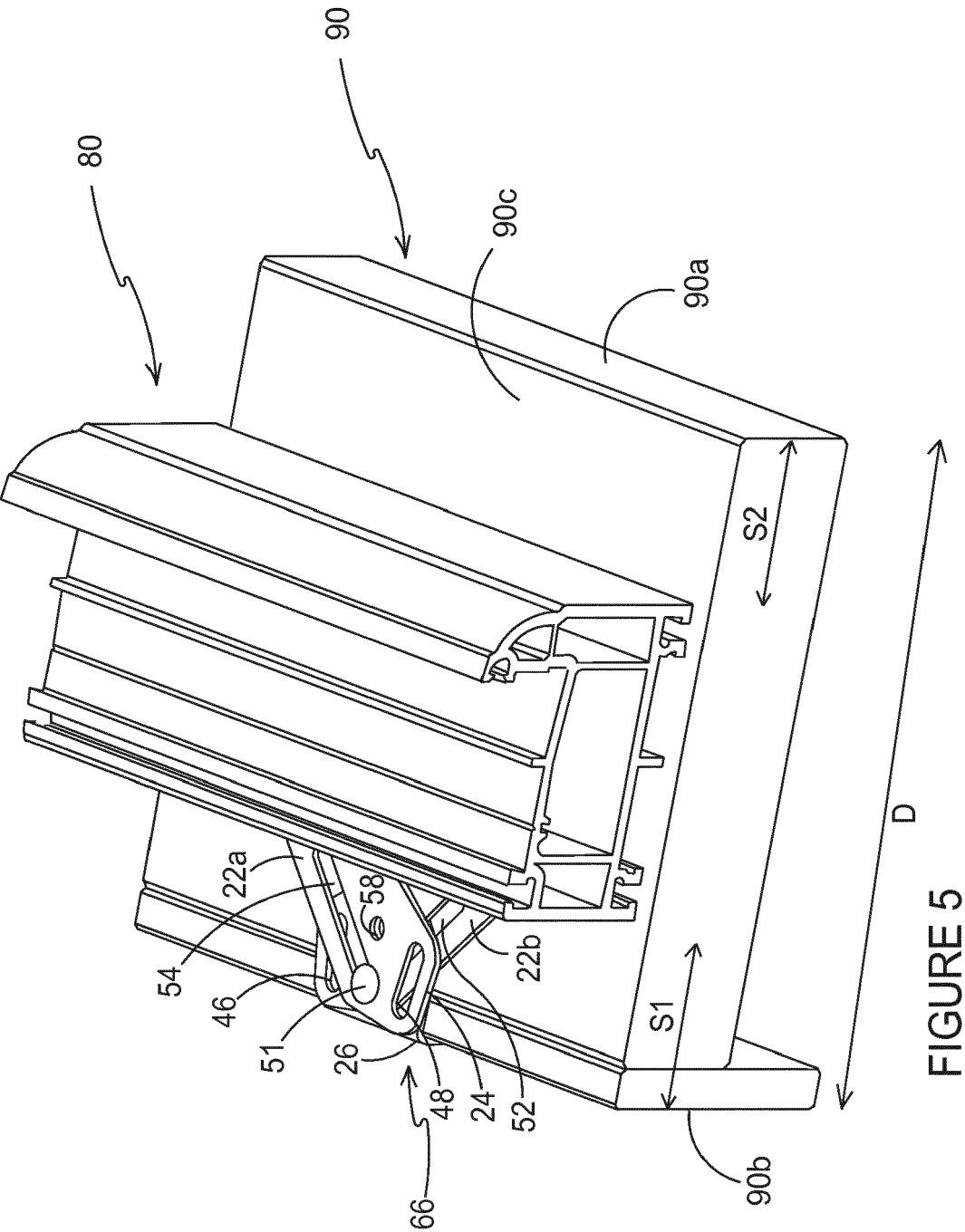
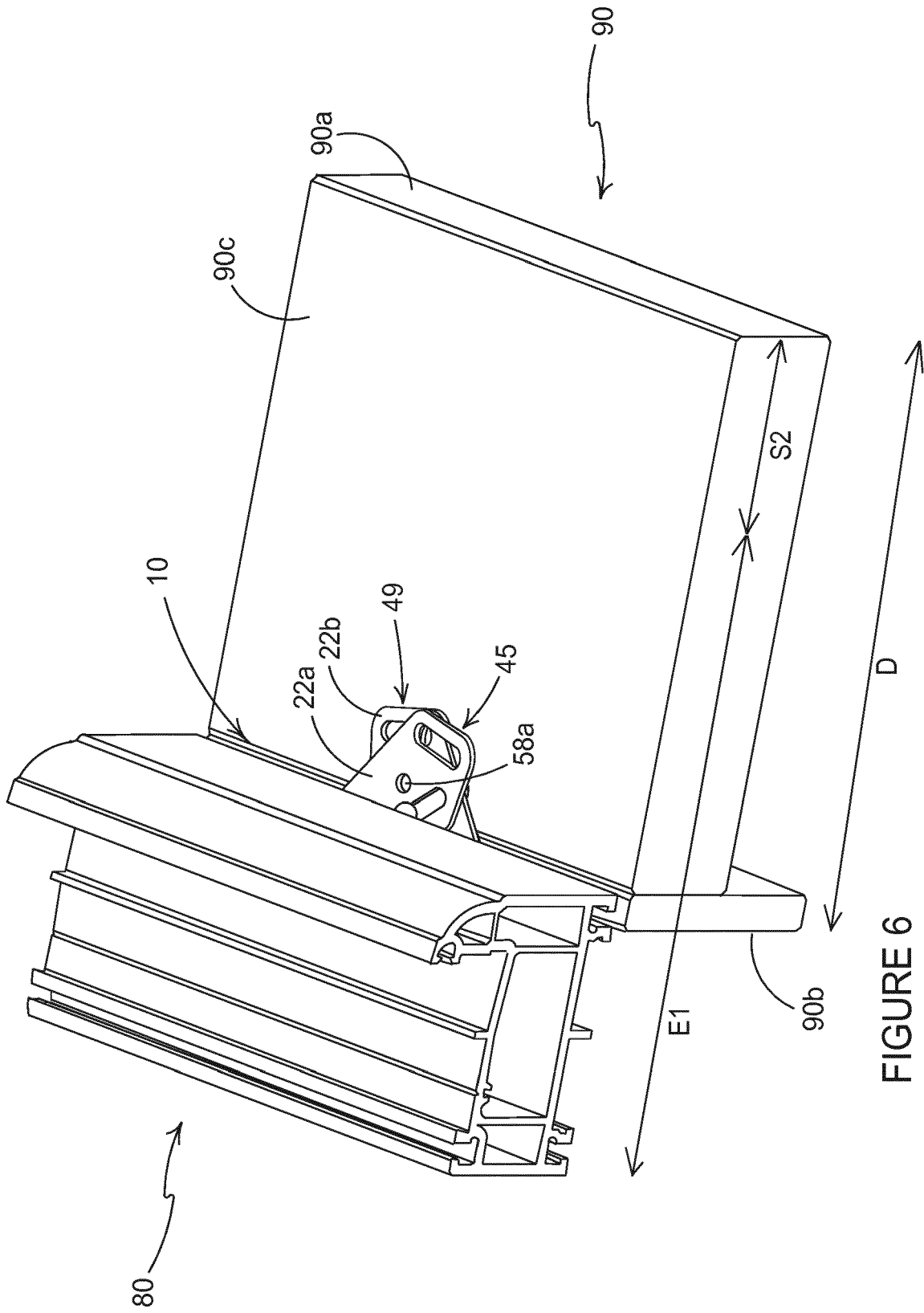


FIGURE 4C





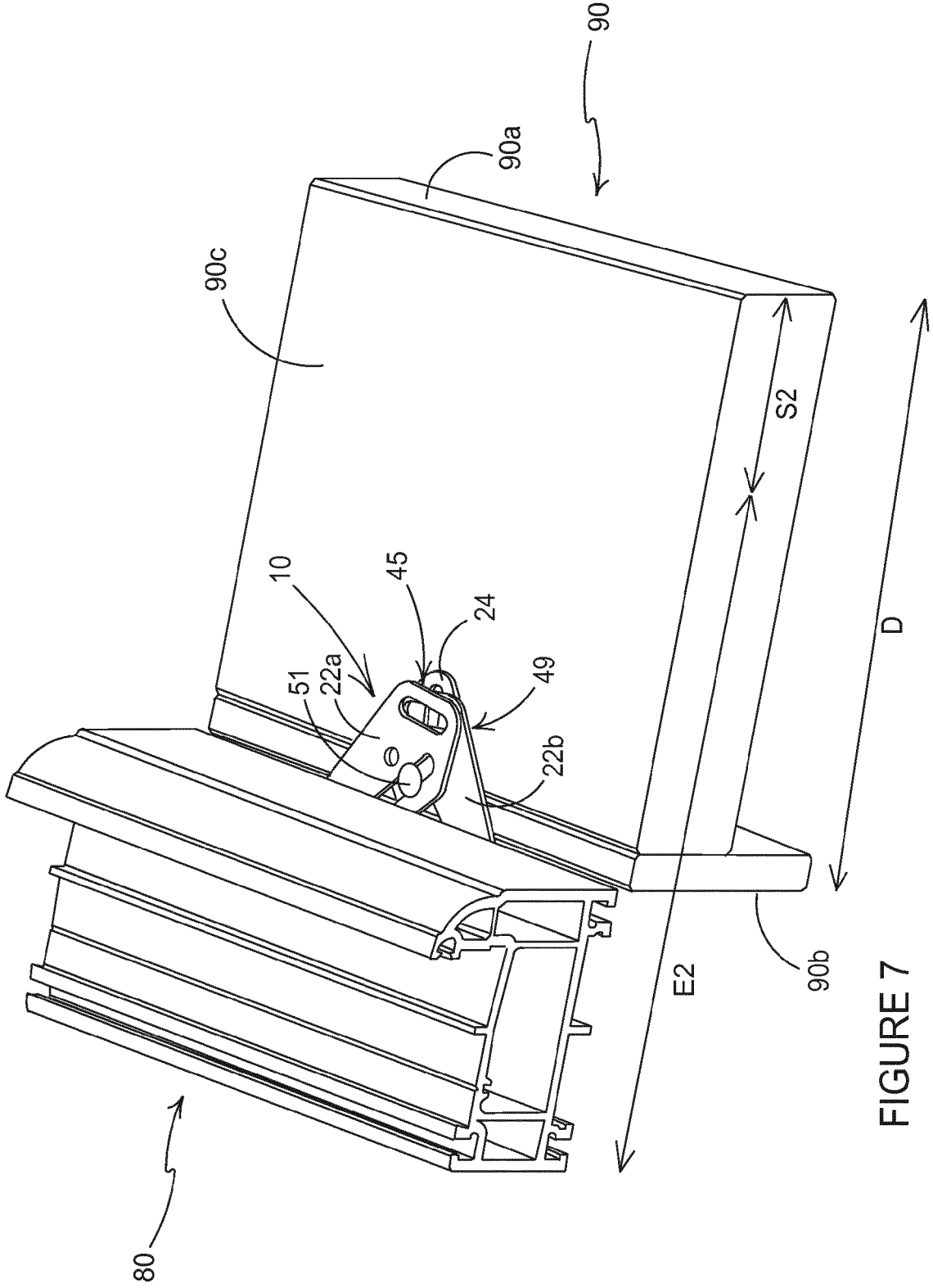
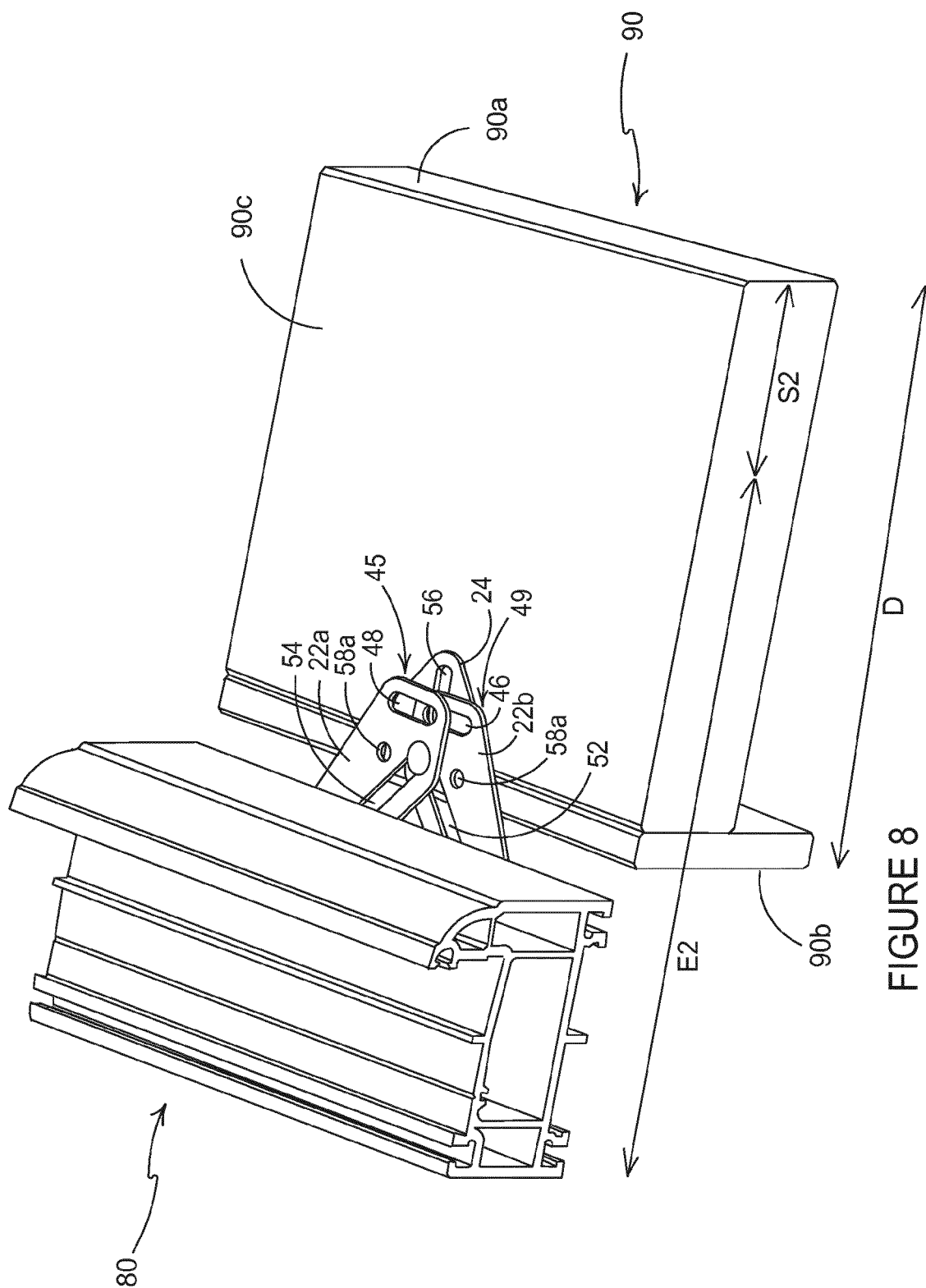
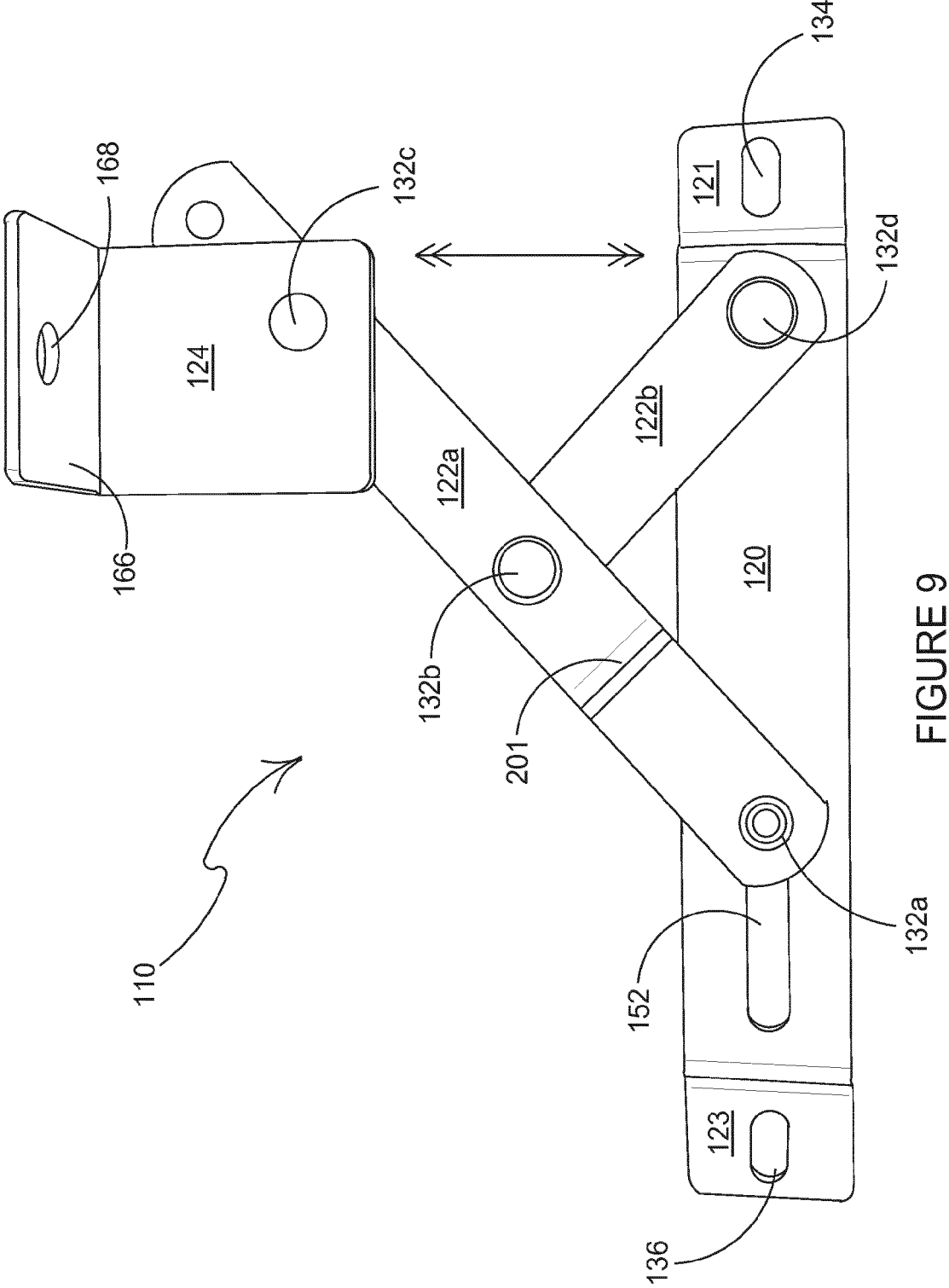


FIGURE 7





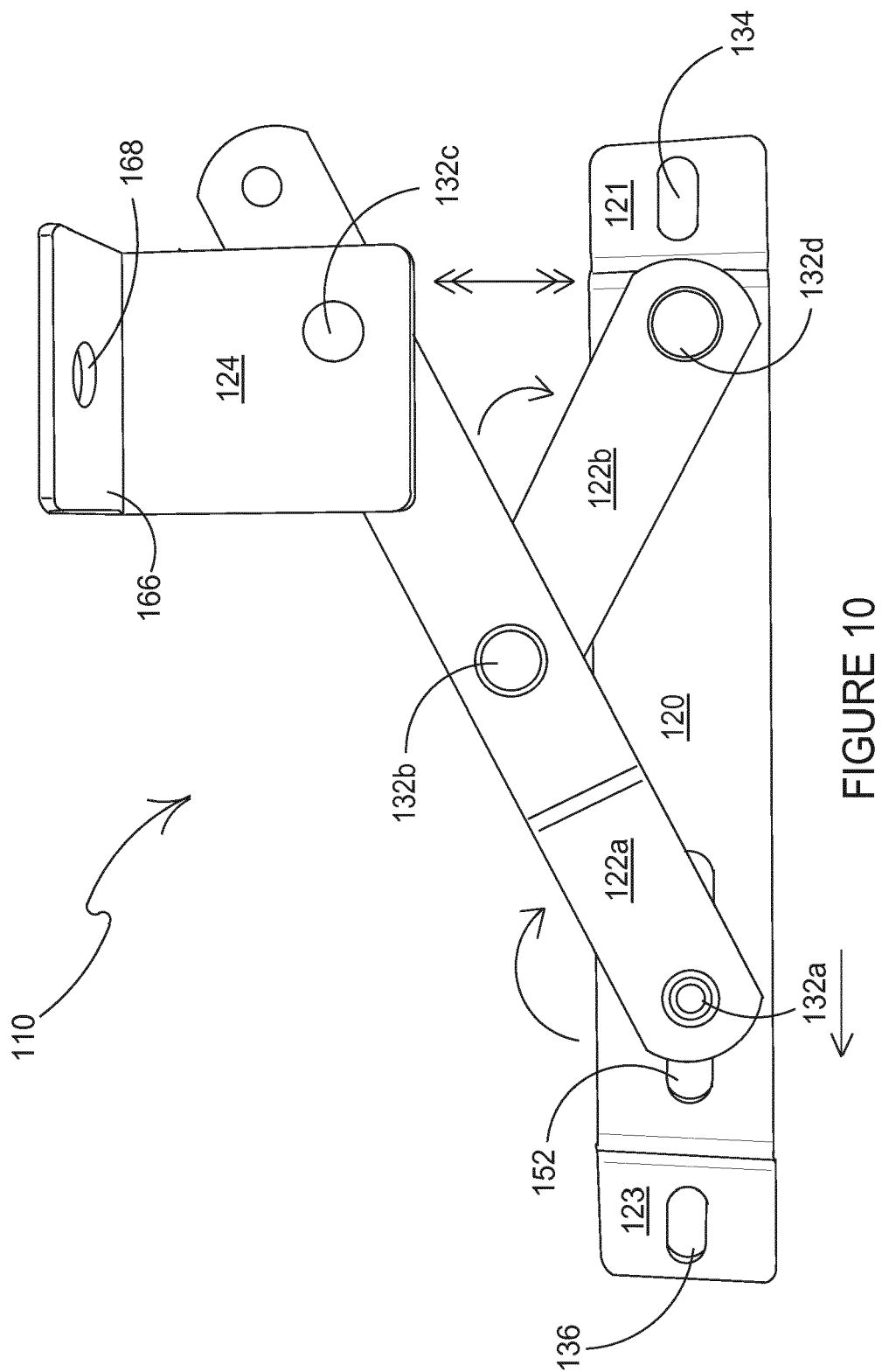


FIGURE 10

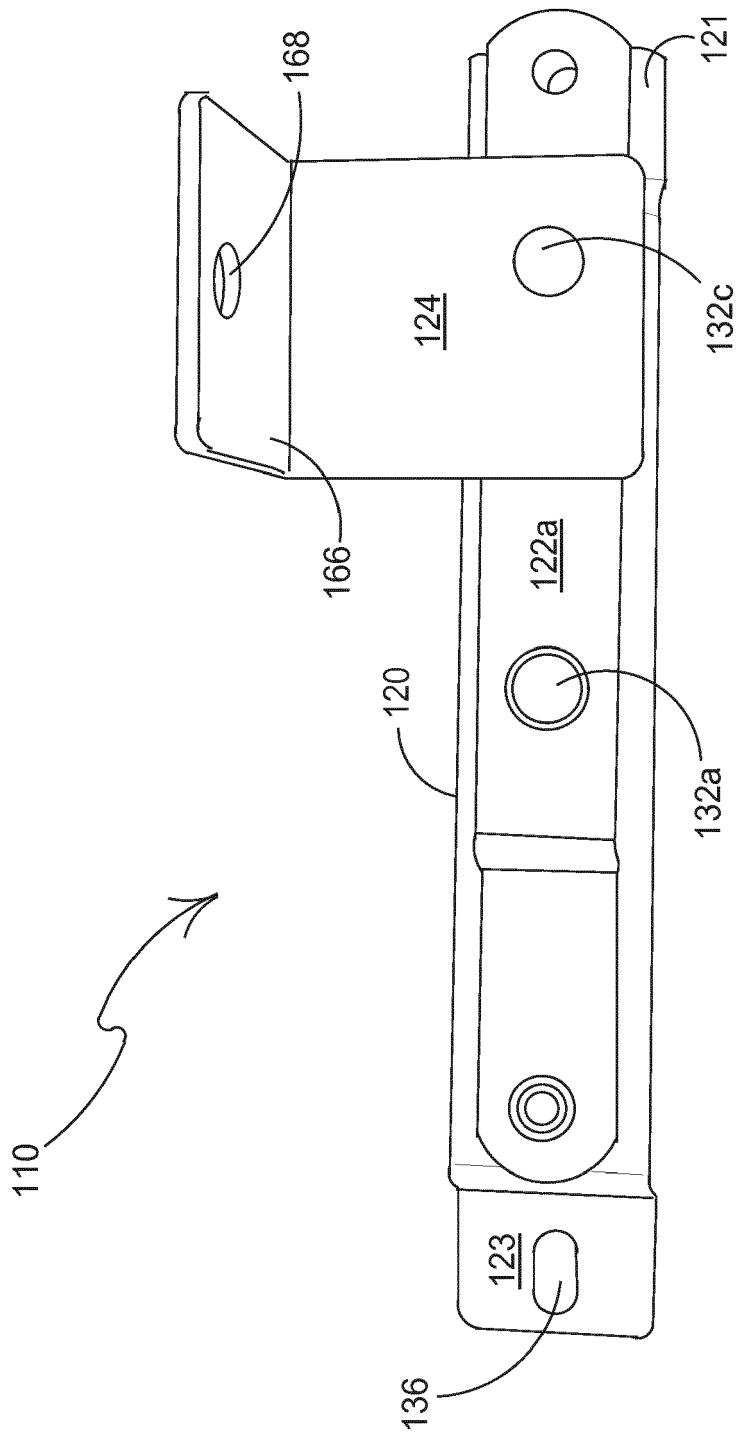


FIGURE 11

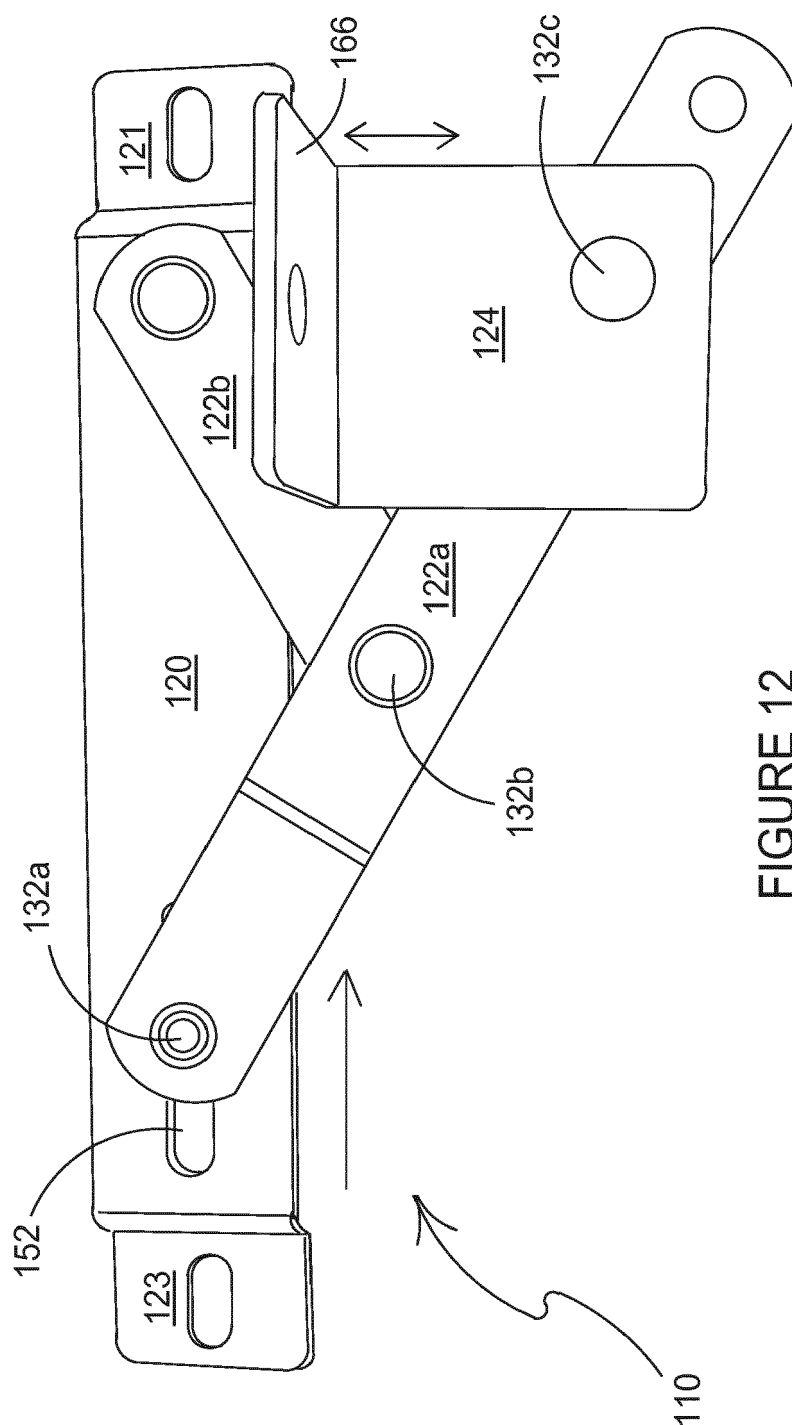
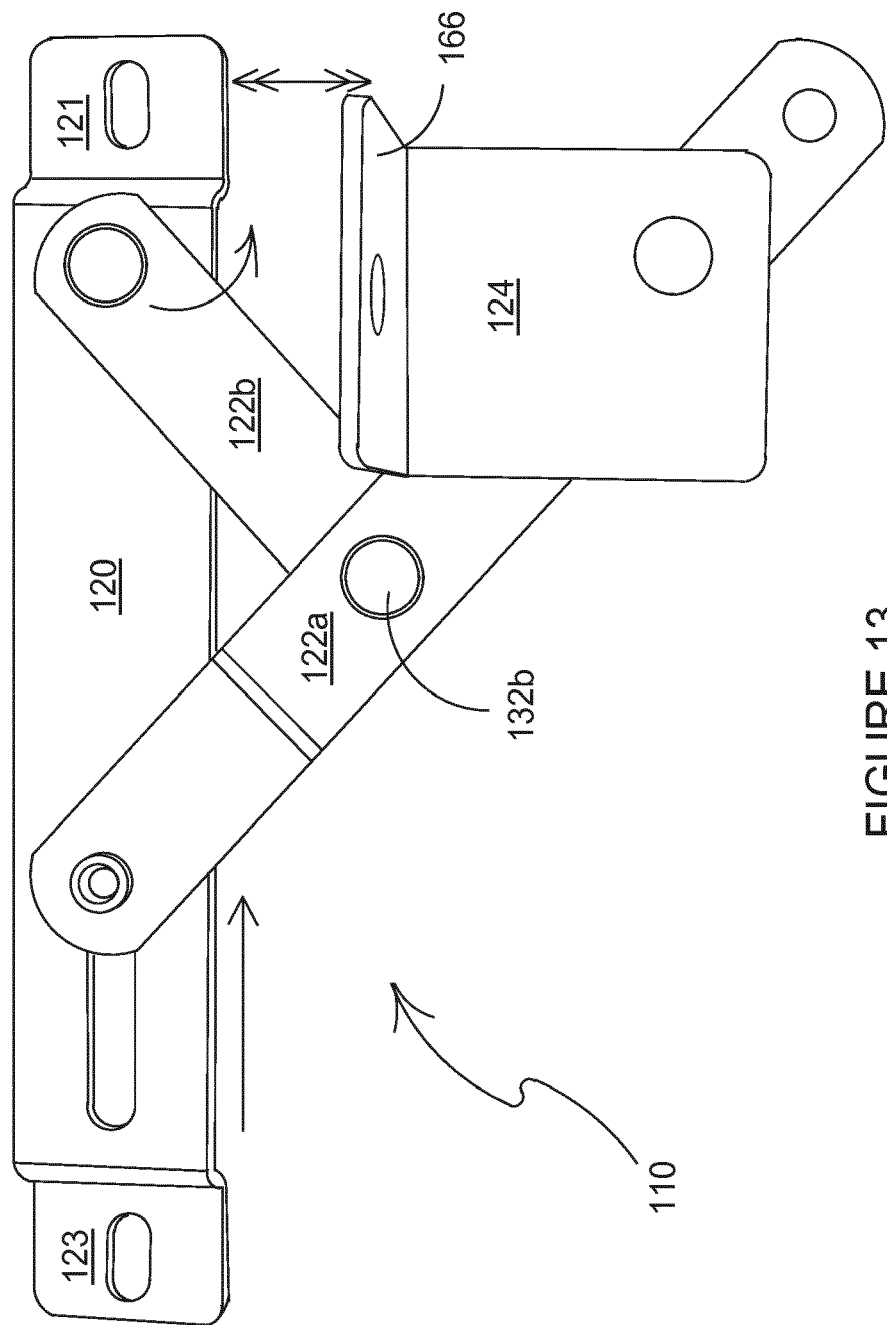
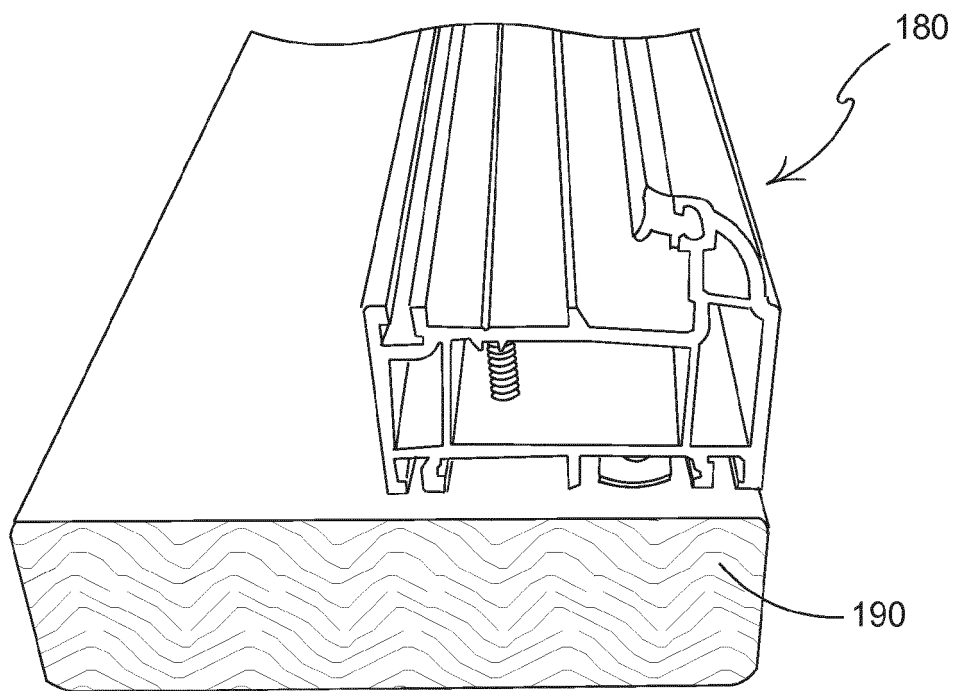
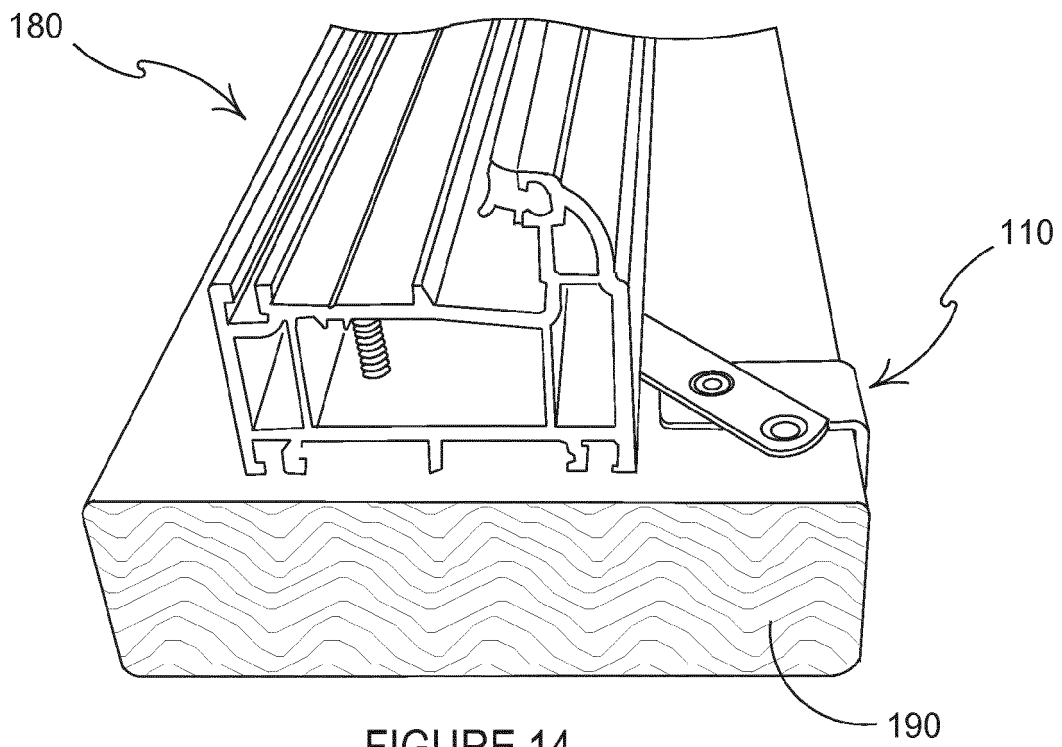


FIGURE 12





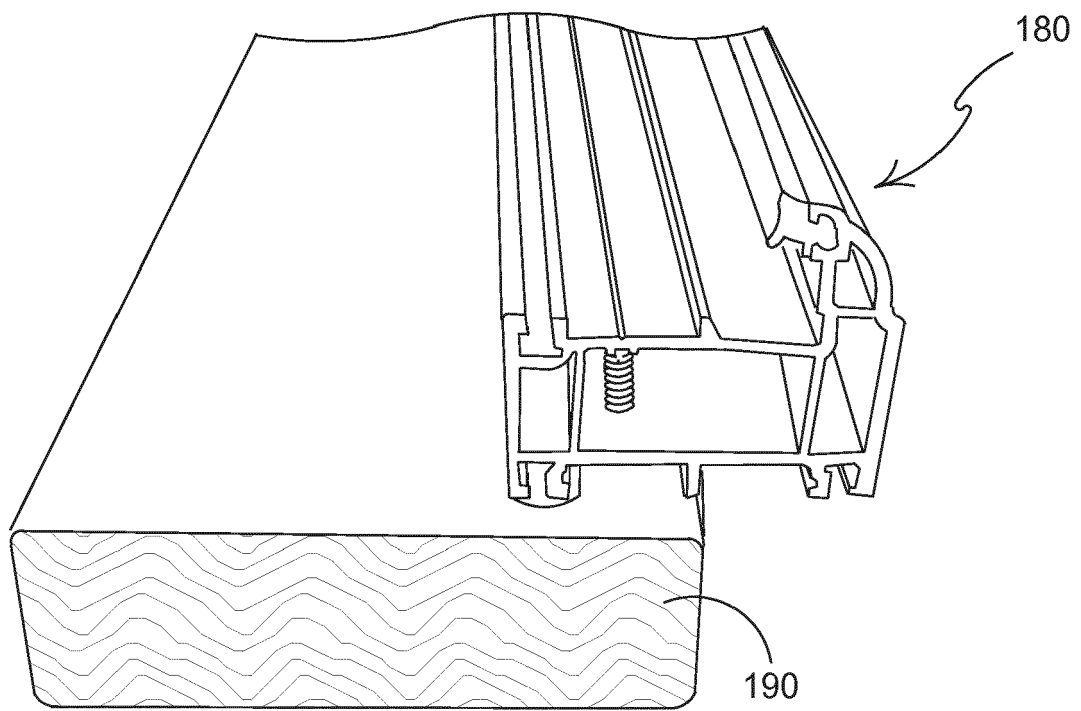


FIGURE 16

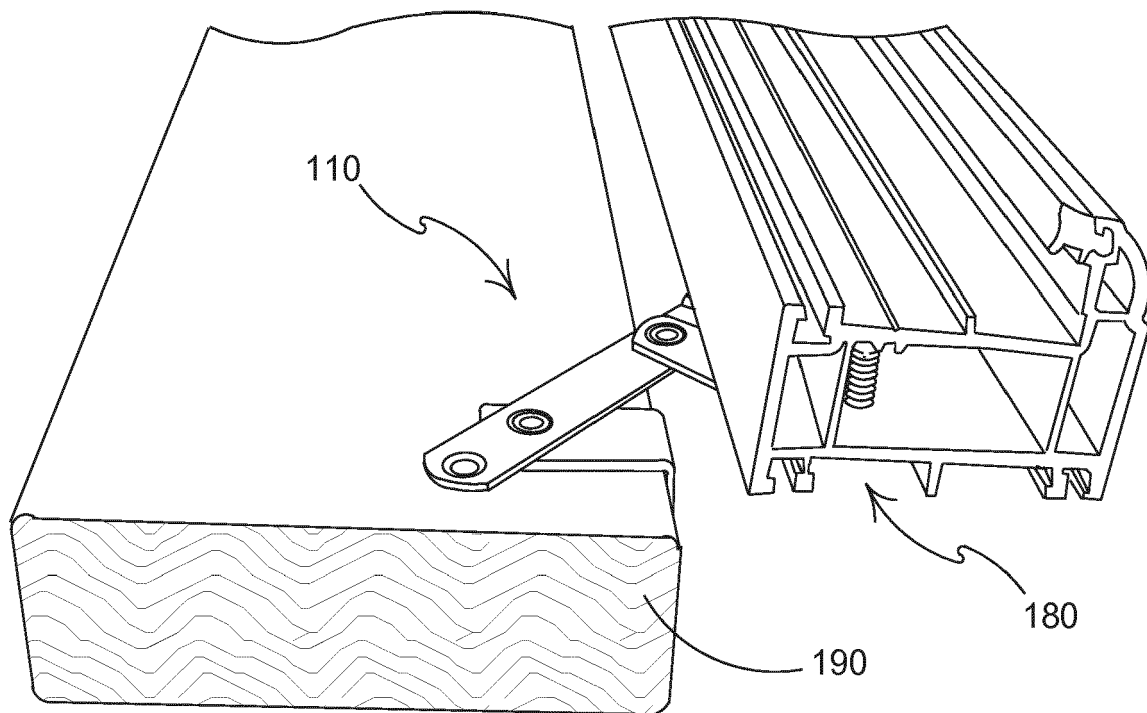


FIGURE 17



EUROPEAN SEARCH REPORT

Application Number
EP 14 16 3907

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 20 2012 002148 U1 (SCHLECHTENDAHL & SOEHNE WILH [DE]) 13 April 2012 (2012-04-13) * the whole document * -----	1-15	INV. E06B1/60
			TECHNICAL FIELDS SEARCHED (IPC)
			E05D E04F E06B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 July 2014	Examiner Cobusneanu, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

