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(54) **ROOF WINDOW WITH A LOCKING ASSEMBLY**

(57) A lock assembly 2 for a roof window 4. The roof window 4 has a sash 14 and frame 16, wherein the sash 14 is pivoted to the frame 16. The lock assembly 4 has lock members 6a, 6b that are movable between a locked position wherein the sash 14 is locked to the frame 16 and an unlocked position wherein sash 14 is unlocked to move relative to the frame 16. The lock members 6a,

6b have a first part 8a, 8b which is movably fixed to the sash 14, and a second part 10a, 10b, that is adapted to strike a strike plate 12a, 12b during use. The first and second parts 8a, 8b, 10a, 10b are movably connected to one another. This reduces friction between the lock member 6a, 6b and strike plate 12a, 12b as it moves between the locked and unlocked positions.

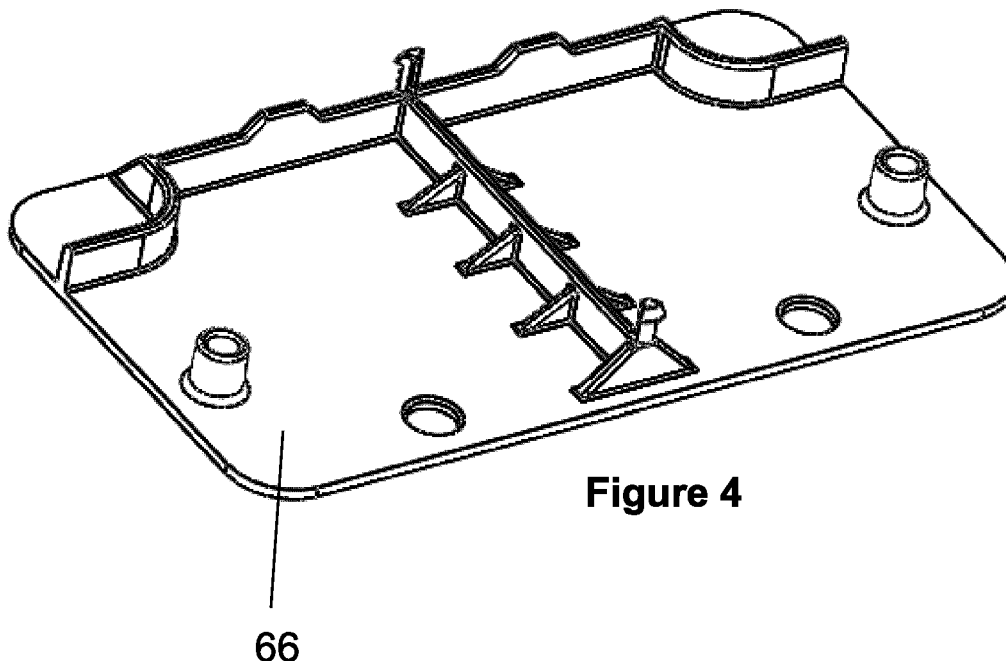


Figure 4

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Description

[0001] The present invention relates to a lock assembly for a roof window, and in particular to a lock assembly for releasably locking the sash of the roof window to the frame.

[0002] Roof windows differ from vertical windows in that they are designed and optimised to be installed in the sloped surface of a roof. Whereas vertical windows are typically located inset relative to the surrounding wall in which they are installed, and therefore relatively sheltered from weather, roof windows are, in contrast, outset relative to, or at least flush with, the surrounding roof structure. Roof windows are therefore considerably more exposed to weather than vertical windows, and additional considerations in weather proofing, such as flashings, apply to roof windows. Further, because a roof window is installed in a sloped surface, additional consideration must be given to how the sash is opened. The sash may be pivoted to the frame at the side, bottom or top of the frame. One popular arrangement is to pivot the sash to the frame partway between the top and bottom frame members. When the sash is opened in such roof windows, the top of the sash pivots into the room, and the bottom of the sash pivots out of the roof, and the sash may even be pivoted through almost 180° to enable the outer surface of the glazing to be accessed and cleaned from the room below the roof window.

[0003] Yet further consideration is given to how opening of the sash can be actuated. A handle may be placed at the bottom of the sash that, when rotated, unlocks the sash from the frame and the opener can then push the sash outwards to open the window. One popular roof window involves a ventilation flap that is pivotally fixed at the top of the sash, and an elongate handle is in turn fixed to the ventilation flap (or the handle and ventilation flap may be integrally formed). The flap can be pulled inwards to allow air to flow through a gap located at the top of the sash to ventilate the room below the roof window. When the ventilation flap is pulled further it unlocks the sash from the frame and allows the sash to be rotated into the room. To lock the roof window the steps are simply reversed.

[0004] These roof windows typically have a lock assembly fitted to the top of the sash that has a pair of pawls that are rotatably movable between a locked position and an unlocked position. There is then a pawl housing with a strike plate fitted to the underside of the top frame member. The movement of the pawls is controlled by a bar that extends from the lock assembly and is connected to the ventilation flap. When the ventilation flap is in the closed position, the pawls are in the locked position, and when the ventilation flap is pivoted to the open position, the pawls are in the unlocked position. The pawl housing on the frame prevents substantial movement of the pawls when they are in the locked position, thereby locking the sash to the frame. As the pawls are moved from the locked position to the unlocked position, they rotate out

of the housing, and this frees the sash to move relative to the frame.

[0005] During the locking motion, it is typical for the pawls to abruptly abut the strike plate of the housing, and this can further urge the pawls into the locked position. This can result in the person closing the window experiencing sudden feedback at the handle as the handle will be pulled towards the window when the pawls strike the strike plate. In addition, the force of the pawl hitting the strike plate inevitably results in wear of the lock assembly and the strike plate and, over time, component parts of the lock will be likely to fail. Finally, the noise of the pawls hitting the strike plate is undesirable.

[0006] It is an object of the invention to obviate or mitigate the above-mentioned problems associated with the locking of roof windows.

[0007] According to an aspect of the invention there is provided a lock assembly for a roof window, the lock assembly comprising a lock member movable between a locked position and an unlocked position, the lock member comprising a first part and a second part, wherein the second part is adapted to strike a strike plate during use, and wherein the first and second parts are movably connected to one another.

[0008] By "movably connected", we mean that the first part is connected to the second part but can move relative to the second part, or that the second part is connected to the first part but can move relative to the first part. The locked position corresponds to when the lock assembly is fitted on a roof window and the sash is locked to the frame by the lock assembly, and the unlocked position corresponds to when the sash is unlocked to move relative to the frame. Advantageously, when the lock member strikes the strike plate during operation of the lock, the second part can move away from the direction of the movement of the lock member as it strikes the strike plate, thereby reducing the overall friction experienced by the lock member as it strikes the strike plate.

[0009] The first and second parts may be loosely connected to one another, for example, wherein the second part is simply set onto the first part, or the connection may be secure to prevent the second part from being easily removed from the first part. Ideally, the second part is arranged on the first part.

[0010] Most preferably, the second part can rotate relative to the first part.

[0011] Ideally, the first part is movably fixed, either directly or indirectly, to the sash when the lock assembly is fitted to a roof window.

[0012] Ideally, the lock assembly comprises a casing adapted to be fixed on the sash of a roof window. Preferably, the lock member is movably connected to the casing. Most preferably, the lock member is pivotally connected to the casing. Ideally, the lock member can move relative to the casing between the locked position and the unlocked position. Ideally, the first part of the lock member is connectable to or is connected to the casing of the lock assembly.

[0013] Ideally, the lock member extends out of the casing. Ideally, the second part is at least partially located outside of the casing. Ideally, the second part is entirely located outside of the casing. Ideally, the first part extends out of the casing to engage with the second part.

[0014] Ideally, the first part comprises an axle and the second part can rotate about the axle. Preferably, the second part is a roller arranged on the axle. The roller may be cylindrical or oblate or other suitable shape. The second part may be formed from metal, rubber, plastic or composite material, or other suitable material. The second part may be formed from two or more materials. The second part may have a cushioned outer surface. Advantageously, the cushioned outer surface reduces noise and/or wear and/or friction when the second part hits the strike plate. The cushioned outer surface may be provided by the second part being formed from rubber, or other substance of similar flexibility, or having at least an outer surface formed from rubber or other substance of similar flexibility. The cushioned outer surface may be arranged around an inner structure. The inner structure may be formed from a different material to the cushioned outer surface. The inner structure may have a greater rigidity than the material used to form the cushioned outer surface.

[0015] The outer surface may be adapted to grip the strike plate. The outer surface may have a surface pattern that increases grip and/or it may be formed from a material that forms a high coefficient of friction between the second part and the strike plate when the second part strikes the strike plate. Advantageously, if the outer surface is formed from rubber, a rubber outer surface provides grip so that the second part engages and grips the strike plate.

[0016] Ideally, the lock member comprises a securing means for securing the second part on the first part so that the second part cannot easily be removed from the first part.

[0017] Preferably, the securing means prevents substantial movement of the second part along the longitudinal axis of the axle, most preferably, in both directions along the longitudinal axis of the axle.

[0018] Preferably, the axle has a wide portion that prevents movement of the second part as it abuts the second part when the second part is moved along the axle. The wide portion is wider relative to a part of the axle that extends through the second part.

[0019] Ideally, the axle has an upper wide portion and a lower wide portion.

[0020] Ideally, the second part has a groove or grooves to accommodate the wide portion or portions of the axle. Advantageously, the groove can be arranged such that there is a flush upper surface of the lock member, defined by the upper surface of the axle and the upper surface of the second part when the second part is abutting the upper wide portion. Ideally, the axle comprises an upper groove and a lower groove to accommodate upper and lower wide portions of the axle respectively.

[0021] The wide portion or portions of the axle may be integrally formed with the axle, or they may be provided by an additional element that widens the axle. The wide portion may be provided by a retaining ring that it is inserted over the axle. In one embodiment, the axle has a groove to accommodate an element to widen the axle, wherein ideally the element is a retaining ring. Ideally, the retaining ring is an elastic retaining ring. Ideally, the lower wide portion of the axle is provided by a retaining ring. Ideally, the upper wide portion of the axle is integrally formed with the axle. Advantageously, during manufacture, the second part can be inserted over the axle and the retaining ring can then be placed over the axle such that it engages the groove on the axle, thereby retaining the second part on the axle. The retaining ring may be a closed ring, or it may have an incision extending through the ring or it may have an opening. An opening or incision can enable it to be placed laterally around the axle.

[0022] Ideally, the first part comprises a portion that is connected to the casing, and the axle is then connected to said portion.

[0023] Ideally, the portion connected to the casing is a planar portion. Once the second part has been retained on the axle, the axle may then be fixed to the portion of the first part that is connected to the casing.

[0024] Ideally, the lock assembly comprises a pair of lock members. Most preferably, the pair of lock members are symmetrically arranged, and are ideally functionally symmetrical. The lock assembly thereby has a left-hand side and right-hand side, with a left-hand lock member and right-hand lock-member.

[0025] Preferably, the lock assembly comprises an actuator. Ideally, the actuator is operable to move the lock member between the locked and unlocked positions. Advantageously, the operator can move the actuator to lock or unlock the roof window.

[0026] Ideally, the actuator is connectable to a handle, or a ventilation flap. When the actuator is connected to a ventilation flap, the opening or closing of the ventilation flap can also operate the locking or unlocking of the sash to the frame.

[0027] Preferably, the actuator converts linear motion into rotational motion of the lock member.

[0028] Ideally, the actuator comprises a linear-motion component adapted to move linearly. Ideally, the linear-motion component is arranged within the casing of the lock assembly, and ideally a part of the linear-motion component extends through a slot on the lock casing.

[0029] Preferably, the actuator further comprises a linkage member for linking the linear-motion component to the lock member.

[0030] Ideally, the actuator comprises a biasing means to bias the lock member towards the locked and/or unlocked position.

[0031] Ideally, the lock member is biased towards the unlocked position.

[0032] Ideally, the biasing means comprises one or more springs. Most preferably, one or more leaf springs

or wire springs.

[0033] Ideally, one part of the linkage member is pivotally connected to the linear-motion component. Preferably, another part of the linkage member is pivotally connected to the lock member.

[0034] Ideally, the linkage member is located underneath the casing when the lock assembly is installed.

[0035] Ideally, in the unlocked position, the linear-motion component is located distal to the pivot point of the lock member. Preferably, during the locking action, the linear-motion component is brought towards the pivot point of the lock member thereby resulting in the linkage member urging the lock member to pivot about the pivot point towards the locked position.

[0036] Preferably, in the locked position, the linkage member is parallel with or almost parallel with respect to a long side of the casing, and in the unlocked position the linkage member is diagonal with respect to said long side of the casing.

[0037] Ideally, the biasing means comprises two springs per lock member. Ideally, one spring is fixed to the casing. Ideally, the casing is adapted with a spring-receiving member to which the spring is fixed. Ideally, the spring that is fixed to the casing is further fixed to the lock member. Preferably, said spring is fixed to the lock member at a part of the lock member distal to the pivot point of the lock member. Preferably, said spring is arranged to bias the lock member towards the unlocked position.

[0038] Ideally, one spring is fixed to the linear-motion component. Ideally, said spring is further fixed to the linkage member. Ideally, the linkage member as adapted to accommodate the spring. Ideally, the linkage member has an opening to receive the spring. Preferably, the spring is arranged to bias the linkage member to the unlocked position.

[0039] Ideally, when the lock assembly is in the locked position, the arrangement of the linear-motion component, linkage member and lock member relative to one another retains the lock member in the locked position against the biasing force of the biasing means. When the linear-motion component is moved during unlocking, this releases the lock member, and the biasing means then operates to urge the lock member to the unlocked position.

[0040] Ideally, the arrangement of the lock member and actuator is symmetrically arranged with a second lock member on the lock assembly.

[0041] Preferably, the linear-motion component is connected to or is connectable to, most preferably pivotally, to a bar. Ideally, the bar is in turn connectable, most preferably pivotally, to a handle or ventilation flap. The bar thereby translates the movement of the handle or ventilation flap into movement of the linear-motion component, which thereby locks or unlocks the roof window.

[0042] Ideally, the lock assembly comprises a base for the casing that connects to the casing to enclose the component parts of the lock assembly. Ideally, the casing

and the base are connected by one or more fixing members and/or adhesive.

[0043] According to an aspect of the invention there is provided a lock assembly for a roof window, the lock assembly comprising a lock member movable between a locked position and an unlocked position, wherein the lock member is adapted to strike a strike plate during use and wherein the lock member comprises a friction-reduction means to reduce friction between the lock member and the strike plate when the lock member strikes the strike plate during use.

[0044] In one embodiment, the friction-reduction means involves a part of the lock member being configured to move relative to another part of the lock member.

[0045] In another embodiment, the friction-reduction means involves the part of the lock member that strikes the strike plate having a friction-reducing coating. The friction-reducing coating may also be present in the embodiment wherein part of the lock member moves relative to another part of the lock member.

[0046] According to an aspect of the invention there is provided a roof window, the roof window comprising a lock assembly, the lock assembly comprising a lock member movable between a locked position and an unlocked position, the lock member comprising a first part and a second part, wherein the second part is adapted to strike a strike plate during use, and wherein the first and second parts are movably connected to one another.

[0047] Ideally, the roof window comprises a sash and a frame, the sash being connected to the frame and also being movable relative to the frame. Ideally, the sash is pivotally connected to the frame.

[0048] Preferably, the frame has a top and bottom member, and side members extending therebetween. Ideally, the frame is quadrangular or substantially quadrangular. Preferably, the sash has a top and bottom member and side members extending therebetween. Ideally, the sash is quadrangular or substantially quadrangular.

[0049] Ideally, the sash is pivoted the frame at the side of the sash and frame. Most preferably, the pivot between the sash and frame is located approximately halfway between the top and bottom members of the frame.

[0050] Ideally, the sash comprises a handle for opening and closing the roof window. Ideally, the sash comprises a ventilation flap. Preferably, the handle is connected to, or is uniformly formed with, the ventilation flap. Ideally, the sash comprises a ventilation module disposed on the top member of the sash. Ideally, movement of the handle/ventilation-flap can operate the lock assembly.

[0051] Preferably, the lock assembly is fixed on the top member of the sash. The lock assembly may be located centrally on the top member of the sash, or it may be off-centre. The roof window may have two or more lock assemblies.

[0052] Ideally, a bar connects the ventilation flap and/or handle to the linear-motion component of the actuator.

[0053] Ideally, the lock assembly, most preferably the lock assembly casing, is fixed to the sash by one or more fixing members and/or adhesive.

[0054] Ideally, the roof window further comprises a housing for the lock member of the lock assembly. Preferably, the housing is located on the top member of the frame, most preferably on the underside of the frame. Ideally, the housing and the lock assembly are arranged such that when the roof window is closed, the housing and lock assembly are mutually opposing and are engageable with one another.

[0055] Preferably, the housing is arranged to receive the lock member, most preferably, the second part of the lock member, as it moves in an arcuate motion as the sash is being closed, and as the lock member moves from the unlocked to the locked position.

[0056] Ideally, the housing comprises a strike plate that is arranged to be struck by the lock member as the sash is being closed. Ideally, the strike plate has an arcuate or sloped face that urges the lock member towards the locked position when it strikes the strike plate.

[0057] Preferably, the housing has a locking face that, when the lock member is in the locked position, is located behind the lock member to prevent the sash from being opened, as any attempt to urge the sash open will result in the lock member abutting the locking face. The sash may only therefore be opened by first moving the lock member to the unlocked position. This may be done by operating the actuator of the lock assembly.

[0058] Ideally, the locking face and strike plate oppose one another. Ideally, the locking face and strike plate define a channel that accommodates and may encourage movement of the lock member into the locked position as the sash is closed.

[0059] According to an aspect of the invention there is provided a roof window, the roof window comprising a lock assembly, the lock assembly comprising a lock member movable between a locked position and an unlocked position, wherein the lock member is adapted to strike a strike plate during use and wherein the lock member or the strike plate comprises a friction-reduction means to reduce friction between the lock member and the strike plate when the lock member strikes the strike plate during use.

[0060] According to an aspect of the invention there is provided a lock member of a lock assembly for a roof window, wherein the lock member comprises a first part, and a second part that is adapted to strike a strike plate during use, and wherein the first parts and second parts are movably connected to one another.

[0061] According to an aspect of the invention there is provided a method of manufacturing a lock assembly for a roof window, the method comprising manufacturing a lock member by providing a first part and a second part of the lock member and arranging the second part on the first part and configuring the lock member so that the second part can move relative to the first part.

[0062] Most preferably, the method involves configur-

ing the second part so that it can rotate relative to the first part.

[0063] The invention will now be described, by way of example only, with reference to the accompanying drawings in which: -

Figure 1 is a perspective view of the exterior side of a roof window having a lock assembly according to the invention.

Figure 2 is a perspective view of the interior side of the roof window of Figure 1.

Figure 3 is an enlarged view of Figure 2.

Figure 4 is an exploded view of the lock assembly according to the invention.

Figure 5 is an underside view of the lock assembly of Figure 4.

Figure 6 is a view of the underside of the casing of the lock assembly of Figure 4, and a view of the base of the casing.

Figure 7 is a top view of the lock assembly of Figure 4, the casing is illustrated as being translucent for illustrative purposes only, to provide visibility of the underlying components.

Figure 8 is a perspective view of the lock assembly of Figure 4, further illustrated is a part of the housing that houses the lock member of the lock assembly in use.

Figure 9 is a further perspective view from an alternative angle of Figure 8.

Figure 10 is a perspective view of the lock assembly, with a cross-section extending through the lock member.

Figure 11 is an expanded view of one of the lock members.

Figure 12 is a cross-section of the lock member.

[0064] In the drawings there is shown a lock assembly according to the invention, indicated generally by reference numeral 2. The lock assembly 2 is adapted to be installed on a roof window 4, as shown in Figures 1 to 3. The lock assembly has two lock members 6a, 6b that are each movable between a locked position (see Figure 9) and an unlocked position (see Figure 4). The pair of lock members 6a, 6b are symmetrically arranged, and are functionally symmetrical. The lock assembly 2 thereby has a left-hand side and right-hand side, with a left-hand lock member 6a and right-hand lock-member 6b. The lock members 6a, 6b each have a first part 8a, 8b, and a second part 10a, 10b see Figure 10. The second part 10a, 10b is adapted to strike a strike plate 12a, 12b during use, see Figure 9. The first part 8a, 8b of each lock member 6a, 6b is movably connected to the second part 10a, 10b.

[0065] The illustrated roof window 4 has a sash 14 and a frame 16, and the locked position of the lock assembly 2 corresponds to when the sash 14 is locked to the frame 16 by the lock assembly 2, and the unlocked position corresponds to when the sash 14 is unlocked to move

relative to the frame 16. The second part 10a, 10b of each lock member 6a, 6b is arranged on the first part 8a, 8b and is secured thereto, to prevent the first part 8a, 8b from being easily removed from the second part 10a, 10b. The second part 10a, 10b can rotate relative to the first part 8a, 8b. The movement of the second part 10a, 10b of the lock members 6a, 6b relative to the first part 8a, 8b is a means for reducing friction between the lock member 6a, 6b and the strike plate 12a, 12b as the lock member 6a, 6b strikes the strike plate 12a, 12b during use. The lock assembly 2 further involves a casing 18 which is fixed to the sash 14 of the roof window 4. The casing 18 is a metal casing, and it has an upper plate 20, with a skirt 22 that depends downwardly from the upper plate 20 and engages with the surface of the sash 14. The sash 14 has an upper frame member 24, lower frame member 26, and side frame members 28a, 28b defining a quadrangular frame; and the frame 16 has an upper frame member 30, lower frame member 32 and side frame members 34a, 34b defining a quadrangular frame. The lock assembly 2, and lock assembly casing 18, are located on the upper frame member 24 of the sash 14.

[0066] The lock members 6a, 6b are pivotally connected to the casing 18 and the lock members 6a, 6b can move relative to the casing 18 between the locked position and unlocked position. In particular, it is the first part 8a, 8b of each lock member 6a, 6b that is connected to the casing 18. The lock member 6a, 6b then extends out of the casing 18. The second part 10a, 10b is located outside of the casing 18 in the illustrated embodiment. It is feasible that, in other embodiments, part of the second part may be located within the casing, and part of it outside of the casing. The first part 8a, 8b then extends out of the casing 18 to engage with the second part 10a, 10b. The first part 8a, 8b comprises an axle 78 that extends out of the casing 18, and the second part 10a, 10b is disposed on and can rotate about the axle 78. The second part 10a, 10b is thereby a roller arranged on the axle 78 of the first part 8a, 8b. In the illustrated embodiment, the roller is a cylindrical shape, but other shapes are also feasible, such as oblate, for example. The first part 8a, 8b has an elongate member. In particular, it has an elongate part and a planar part. One end of the first part 8a, 8b is engaged with the casing 18, and an opposing end is engaged with the second part 10a, 10b. In particular, one end is pivotally engaged with the casing 18, and the other end is engaged with the second part 10a, 10b. The axle 78 is fixed at or about one end of the first part 8a, 8b. The first part 8a, 8b has a planar portion 76a, 76b, that is movably and preferably pivotally connected to the casing. The axle 78 is connected to the planar portion 76a, 76b and extends perpendicularly to the planar portion 76a, 76b of the first part 8a, 8b. The axle is a rod that is fixed to the planar part of the first part 8a, 8b. The planar portion 76a, 76b has an aperture for receiving the second part 10a therethrough.

[0067] The lock members, 6a, 6b each comprise a securing means for securing the second part 10a, 10b on

the first part 8a, 8b so that the second part 10a, 10b cannot easily be removed from the first part 8a, 8b. The securing means prevents substantial movement of the second part 10a, 10b along the longitudinal axis of the axle 78, most preferably, in both directions along the longitudinal axis of the axle 78. The axle 78 has a wide portion 80a, 80b that prevents movement of the second part 10a, 10b as it abuts the second part 10a, 10b when the second part 10a, 10b is moved along the axle 78. Specifically, the axle 78 has an upper wide portion 80a and a lower wide portion 80b.

[0068] The second part 10a, 10b has grooves 82a, 82b to accommodate the wide portions 80a, 80b of the axle 78. The groove 82a is arranged such that there is a flush upper surface of the lock member 6a, 6b, defined by the upper surface of the axle 78 and the upper surface of the second part 10a when the second part 10a is abutting the upper wide portion 80a. In further detail, the axle 78 has an upper groove 82a and a lower groove 82b to accommodate upper and lower wide portions 80a, 80b of the axle 78 respectively.

[0069] In the illustrated embodiment, the upper wide portion 80a is integrally formed with the axle 78. The lower wide portion 80b is provided by an additional element that widens the axle 78. Specifically in this embodiment, the wide portion 80b is provided by a retaining ring 84 that is inserted over the axle 78. The axle 78 has a groove 84 to accommodate the retaining ring 84. The retaining ring 84 is an elastic, rubber retaining ring 84. The retaining ring 84 has an opening and it is not therefore a closed ring. During manufacture, the second part 10a can be inserted over the axle 78 and the retaining ring 84 can then be placed over the axle 78 such that it engages the groove 86 on the axle, thereby retaining the second part 10a on the axle 78.

[0070] The lock assembly 2 has an actuator 36 which, when operated, can move the lock members 6a, 6b between the locked and unlocked positions. In the illustrated embodiment, the actuator 36 is connected to a ventilation flap 38. The ventilation flap 38 is pivotally connected to the top frame member 24 of the sash 14. Also located on the top frame member 24 of the sash 14 is a ventilation module 40. The ventilation module 40 traverses the width of the sash 14, has openings therethrough, and can engage with the underside of the top frame member 30 of the frame 16 to form a seal. By opening the ventilation flap 38, air can travel through the roof window 4 by passing through the openings of the ventilation module 40. The ventilation flap 38 is uniformly formed with a handle 40. In other embodiments, the actuator may be directly connected to handle, or the ventilation flap 38 and handle 40 could be formed as separate components which are then joined. The opening and closing of the ventilation flap 38 results in operation of the actuator 36 which thereby results in the locking or unlocking of the sash 14 to the frame 16.

[0071] The actuator 36 operates by converting linear motion from the ventilation flap 38 or handle 40, into ro-

tational motion of the lock members 6a, 6b. In particular, the actuator involves a linear-motion component 42 which moves linearly and which is arranged within the casing 18 of the lock assembly 2. The casing 18 has a slot 44 to accommodate the linear-motion component 42, which extends partially through the slot 44. The actuator 36 further comprises two linkage members 46a, 46b for linking the linear-motion component 42 to each of the lock members 6a, 6b. The linkage members 46a, 46b have an aperture for receiving the second part 10a of the lock member 6a, 6b therethrough. The second part 10a, 10b is further arranged with a channel 88 that extends around the circumference of the second part 10a for accommodating the linkage member 46a, 46b. The channel 88 has a width just large enough to accommodate the thickness of the linkage member 46a, 46b. This prevents substantial movement of the linkage member along the longitudinal axis of the second part 10a, 10b. In addition, the second part 10a, 10b is wider on the lower side of the channel 88 than on the upper side. This serves to retain the connection between the linkage member 46a, 46b and the second part 10a, 10b. The planar portion 76a, 76b of the first part 8a, 8b rests on the surface of the linkage member 46a, 46b.

[0072] The actuator 36 further involves a biasing means 48 to bias the lock members 6a, 6b towards the locked or unlocked position. In particular, in the illustrated embodiment, the biasing means 48 functions to bias the lock members 6a, 6b towards the unlocked position, thereby making it easier for the operator to unlock the sash 14 from the frame 16. The biasing means 48 further involves four springs 50a, 50b, 52a, 52b, arranged as two springs per lock member 6a, 6b. The springs 50a, 50b, 52a, 52b are wire springs in the illustrated embodiment but other forms of spring may be used such as leaf springs.

[0073] One part 54a, 54b of the linkage member 46a, 46b is pivotally connected to the linear-motion component 42, and another part 56a, 56b is pivotally connected to the lock member 6a, 6b. The linkage members 46a, 46b are located underneath the casing 18 when installed, and are therefore out of sight in normal use. In the unlocked position, as shown in Figure 4, the linear-motion component 42 is located distal to the pivot point 58a, 58b of the lock member 6a, 6b. During the locking action, the linear-motion component 42 is brought towards the pivot point 58a, 58b of the lock member 6a, 6b thereby resulting in the linkage member 46a, 46b urging the lock member 6a, 6b to pivot about the pivot point 58a, 58b towards the locked position (see Figure 6). In the locked position, as shown in Figure 6, the linkage member 46a, 46b is parallel with or almost parallel with respect to a long side of the casing 18, and in the unlocked position the linkage member 46a, 46b is diagonal with respect to said long side of the casing 18.

[0074] Referring back to the biasing means 48, one spring 50a, 50b per each lock member 6a, 6b is fixed to the casing 18. The casing 18 is adapted with a spring-

receiving member 60a, 60b. The spring 50a, 50b is then fixed to the lock member 6a, 6b and can therefore bias the location of the lock member 6a, 6b relative to the spring-receiving member 60a, 60b. The spring 50a, 50b is fixed to the lock member 6a, 6b at a part of the lock member 6a, 6b distal to the pivot point 58a, 58b of the lock member 6a, 6b. Said spring 50a, 50b is arranged to bias the lock member 6a, 6b towards the unlocked position.

[0075] A further spring 52a, 52b is fixed to the linear-motion component 42 and then further fixed to the linkage member 46a, 46b and can therefore bias the location of the linkage member 46a, 46b relative to the linear-motion component 42. The linkage member 46a, 46b is adapted to accommodate the spring 52a, 52b by having an opening 62a, 62b to receive the spring 52a, 52b. The spring 52a, 52b is arranged to bias the linkage member 46a, 46b to the unlocked position.

[0076] When the lock assembly 2 is in the locked position as shown in Figure 6, the arrangement of the linear-motion component 42, linkage members 46a, 46b and lock members 6a, 6b relative to one another retains the lock members 6a, 6b in the locked position against the biasing force of the biasing means 48. When the linear-motion component 42 is moved during unlocking, this releases the lock member 6a, 6b, and the biasing means 48 then operates to urge the lock members 8a, 8b to the unlocked position.

[0077] The linear-motion component 42 is pivotally connected to a bar 64 which is in turn pivotally connected to the ventilation flap 38. The bar 64 thereby translates the movement of the handle 40 or ventilation flap 38 into movement of the linear-motion actuator 42, which thereby locks or unlocks the roof window 4. The lock assembly 2 further comprises a base 66 for the casing 18, that connects to the casing 18 to enclose the component parts of the lock assembly 2. The casing 18 and the base 66 are connected by one or more fixing members and/or adhesive.

[0078] Referring now to the roof window 4 as shown in Figures 1 to 3, the sash 14 is pivoted to the frame 16 at the side of the sash 14 and frame 16. In particular, the pivot between the sash 14 and frame 16 is approximately halfway between the top and bottom members of the frame 30, 32. A hinge 68 is disposed on the side members 28a, 28b, 34a, 34b of the sash 14 and frame 16. In the illustrated embodiment there is a single lock assembly 2, but two or more lock assemblies could be fitted to the roof window if desired. The lock assembly 2 is fixed to the sash 14 by screws, and there are screw holes 70a, 70b in the casing 18 to accommodate the screws.

[0079] The roof window 4 further has a housing 72 for the lock members 6a, 6b of the lock assembly 2. The housing 72 is located on the top member 30 of the frame 16, and in particular on the underside of the frame top member 30. The housing 72 and the lock assembly 2 are arranged such that when the roof window 4 is closed, the housing 72 and lock assembly 2 are mutually opposing

and are engageable with one another. The housing 72 is arranged to receive the lock members 6a, 6b and, in particular, the second part 10a, 10b of the lock members 6a, 6b as it moves in an arcuate motion as the sash 14 is being closed, and as the lock members 6a, 6b moves from the unlocked to the locked position. The housing 72 comprises a strike plate 12a, 12b that is arranged to be struck by the lock member 6a, 6b as the sash 14 is being closed. The strike plate 12a, 12b has an arcuate or sloped face that urges the lock member 6a, 6b towards the locked position when it strikes the strike plate 12a, 12b.

[0080] The housing 72 further has a locking face 74a, 74b that, when the lock member 6a, 6b is in the locked position, is located behind the lock member 6a, 6b to prevent the sash 14 from being opened, as any attempt to urge the sash 14 open will result in the lock member 6a, 6b abutting the locking face 74a, 74b. The sash 14 may only therefore be opened by first moving the lock member 6a, 6b to the unlocked position. This may be done by operating the actuator 36 of the lock assembly 2. The locking face 74a, 74b and strike plate 12a, 12b oppose one another. The locking face 74a, 74b and strike plate 12a, 12b define a channel that accommodates and encourages movement of the lock member 6a, 6b into the locked position as the sash is closed.

[0081] In use, to unlock the sash 14 from the frame 16, the user grips the handle 40 and pulls the handle 40 towards the interior of the room below where the roof window 2 is installed. This causes the ventilation flap 38 to pivot open and the bar 64 to move with the ventilation flap 38. After sufficient movement, the linear-motion component 42 slides along the slot 44 in the casing 18. This results in the linkage members 46a, 46b moving from a position where they are substantially parallel with the sides of the casing 18 to a position where they are diagonal with respect to the sides of the casing 18. In doing so, this releases movement of the lock members 6a, 6b. The biasing means 18 then functions to urge the lock members 6a, 6b towards the unlocked position. As the user continues to pull the handle 40, the sash 14 will begin to pivot inwards. The second part 10a, 10b may abut the locking faces 74a, 74b of the housing 72 and will be urged arcuately towards the unlocked position. When abutting the locking faces 74a, 74b, the second part 10a, 10b can rotate relative to the first part 8a, 8b thereby reducing friction and noise. When the lock member 6a, 6b is in the unlocked position, it is clear of the locking faces 74a, 74b and the sash 14 is free to pivot relative to the frame 16.

[0082] To lock the sash 14 to the frame 16 the steps are simply reversed. When closing the sash 14, the second part 10a, 10b of the lock members 6a, 6b strikes the strike plate 12a, 12b and can rotate relative to the first part 8a, 8b as the sash 14 is locked. This thereby reduces friction and noise. The biasing force of the biasing means 48 is overcome when the lock assembly 2 is moved to the locking position, and the relative arrangement of the linear-motion component 42, linkage members 46a, 46b

and lock members 6a, 6b results in the lock members 6a, 6b being retained in the locked position, when the ventilation flap 40 is closed.

[0083] The skilled person will appreciate that all preferred or optional features of the invention described with reference to only some aspects or embodiments of the invention may be applied to all aspects of the invention.

[0084] It will be appreciated that optional features applicable to one aspect of the invention can be used in any combination, and in any number. Moreover, they can also be used with any of the other aspects of the invention in any combination and in any number. This includes, but is not limited to, the dependent claims from any claim being used as dependent claims for any other claim in the claims of this application.

[0085] In relation to the detailed description of the different embodiments of the invention, it will be understood that one or more technical features of one embodiment can be used in combination with one or more technical features of any other embodiment where the transferred use of the one or more technical features would be immediately apparent to a person of ordinary skill in the art to carry out a similar function in a similar way on the other embodiment.

[0086] The features disclosed in the foregoing description or the following drawings, expressed in their specific forms or in terms of a means for performing a disclosed function, or a method or a process of attaining the disclosed result, as appropriate, may separately, or in any combination of such features be utilised for realising the invention in diverse forms thereof as defined in the appended claims.

Claims

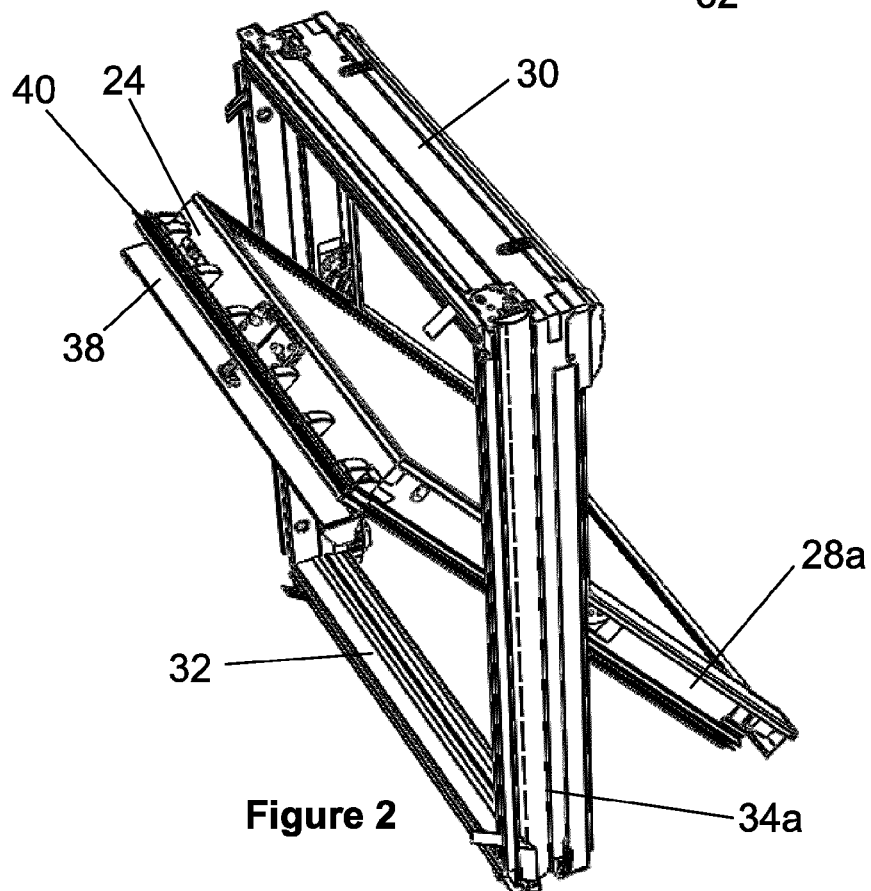
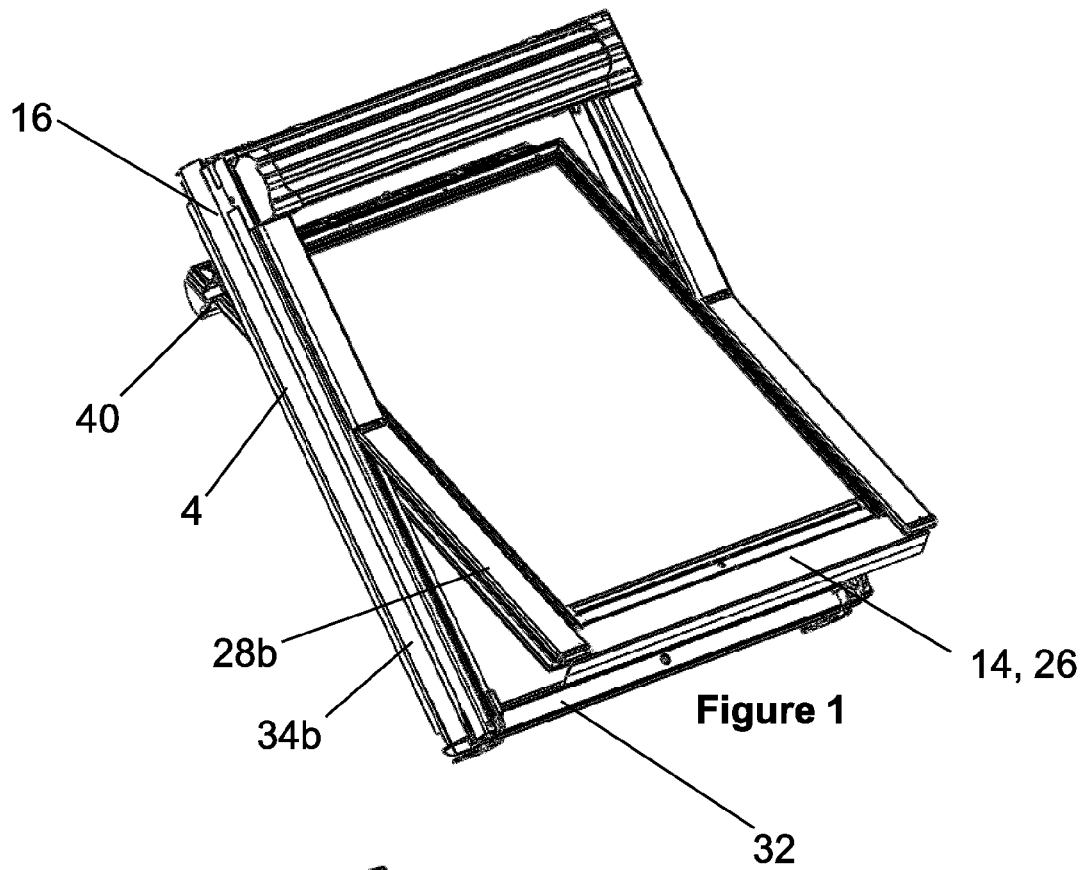
1. A roof window comprising a sash and a frame, wherein the sash is pivotally connected to the frame, the roof window further comprising a lock assembly, the lock assembly comprising a lock member movable between a locked position wherein the sash is locked to the frame by the lock assembly and an unlocked position wherein the sash is unlocked to move relative to the frame, the lock member comprising a first part which is movably fixed, either directly or indirectly, to the sash, and a second part, that is adapted to strike a strike plate during use, and wherein the first and second parts are movably connected to one another.
2. A roof window as claimed in claim 1, wherein the frame has a top and bottom member, and side members extending therebetween and the sash has a top and bottom member and side members extending therebetween, and wherein at least part of the lock assembly is fixed on the top member of the sash.
3. A roof window as claimed in claim 2, wherein the

sash comprises a handle for opening and closing the roof window and a ventilation flap and wherein movement of the handle or ventilation flap operates the lock assembly.

4. A roof window as claimed in any preceding claim, wherein the second part can rotate relative to the first part.
5. A roof window as claimed in any preceding claim, wherein the lock assembly comprises a casing fixed on the sash of the roof window and wherein the lock member is movably connected to the casing, and wherein the first part of the lock member is movably connectable to or is movably connected to the casing of the lock assembly.
6. A roof window as claimed in claim 5, wherein the second part is at least partially located outside of the casing and wherein the first part extends out of the casing to engage with the second part.
7. A roof window as claimed in any one of the preceding claims, wherein the first part comprises an axle and the second part can rotate about the axle, and wherein the second part is a roller arranged on the axle.
8. A roof window as claimed in claim 7, wherein the lock member comprises a securing means for securing the second part on the first part so that the second part cannot easily be removed from the first part, wherein the securing means prevents substantial movement of the second part along the longitudinal axis of the axle, and wherein the axle has a wide portion that prevents movement of the second part as it abuts the second part when the second part is moved along the axle.
9. A roof window as claimed in any one of the preceding claims, wherein the lock assembly comprises a pair of symmetrically arranged lock members.
10. A roof window as claimed in any one of the preceding claims, wherein the second part may have a cushioned outer surface for reducing noise and/or wear and/or friction when the second part engages the strike plate.
11. A roof window as claimed in claim 10, wherein the cushioned outer surface may be provided by the second part being formed from rubber, or other substance of similar flexibility, or having at least an outer surface formed from rubber or other substance of similar flexibility.
12. A roof window as claimed in claim 10 or 11, wherein the cushioned outer surface may be arranged around an inner structure, the inner structure being

formed from a different material to the cushioned outer surface.

13. A roof window as claimed in claim 10 to 12, wherein the inner structure may have a greater rigidity than the material used to form the cushioned outer surface.
14. A roof window as claimed in any one of the preceding claims, wherein the lock member is adapted to strike a strike plate during use and wherein the lock member and/or strike plate comprises a friction reducing means to reduce friction between the lock member and the strike plate when the lock member strikes the strike plate during use.
15. A roof window as claimed in any one of the preceding claims, wherein the movement of the second part of the lock members relative to the first part is a means for reducing friction between the lock member and the strike plate as the lock member strikes the strike plate during use.



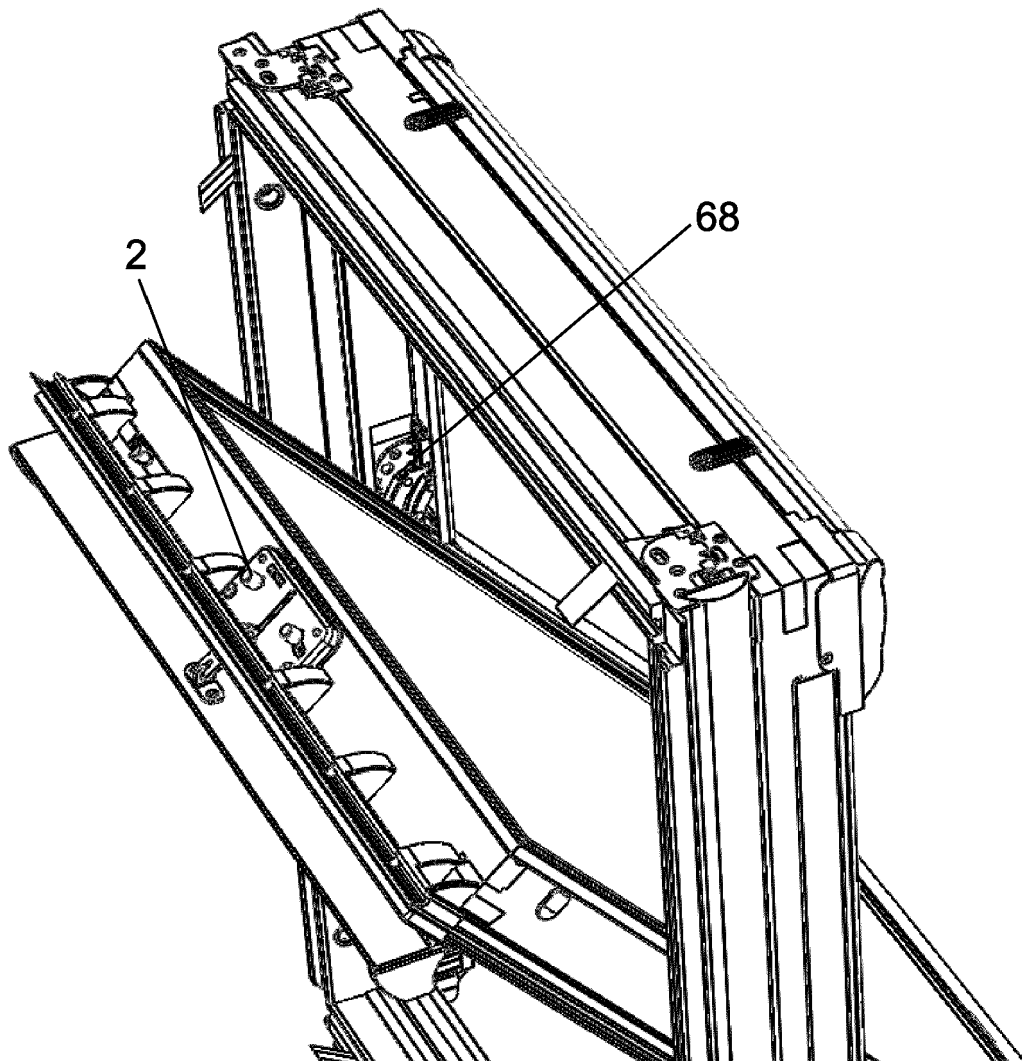
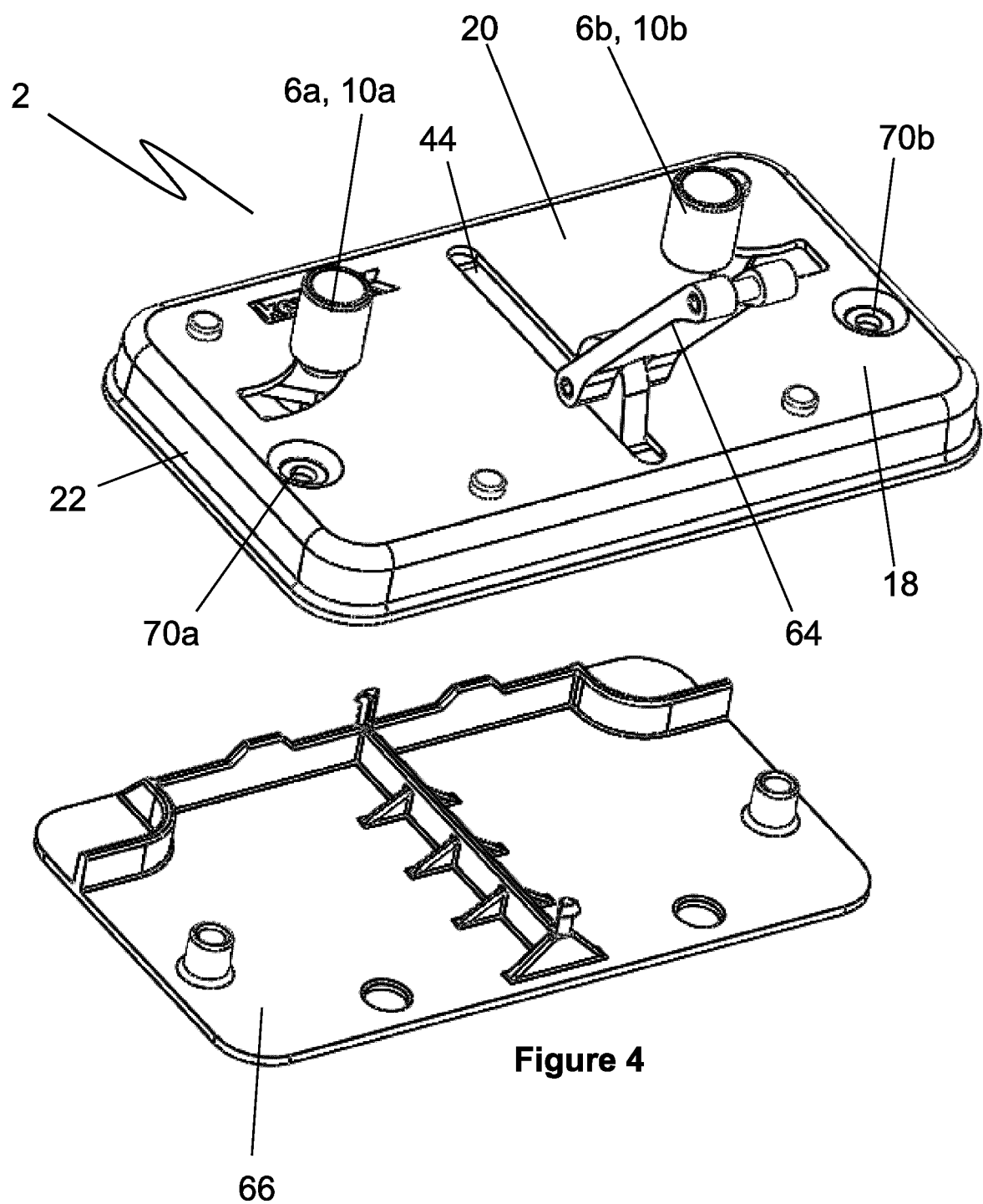


Figure 3



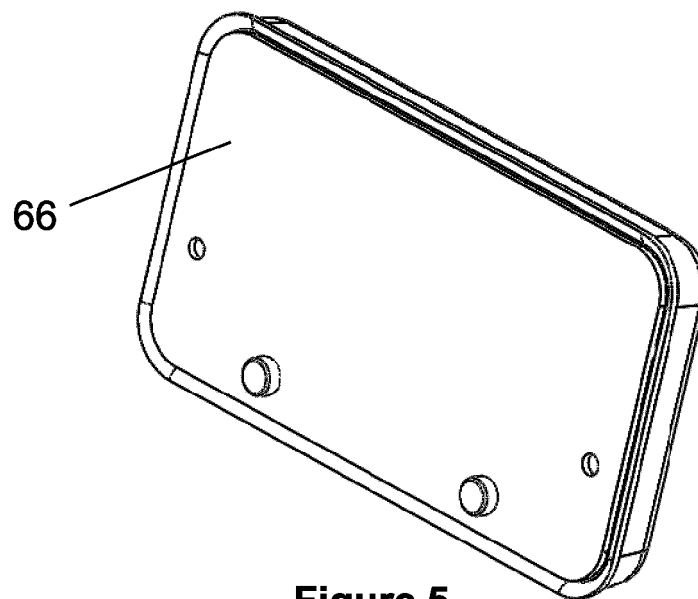


Figure 5

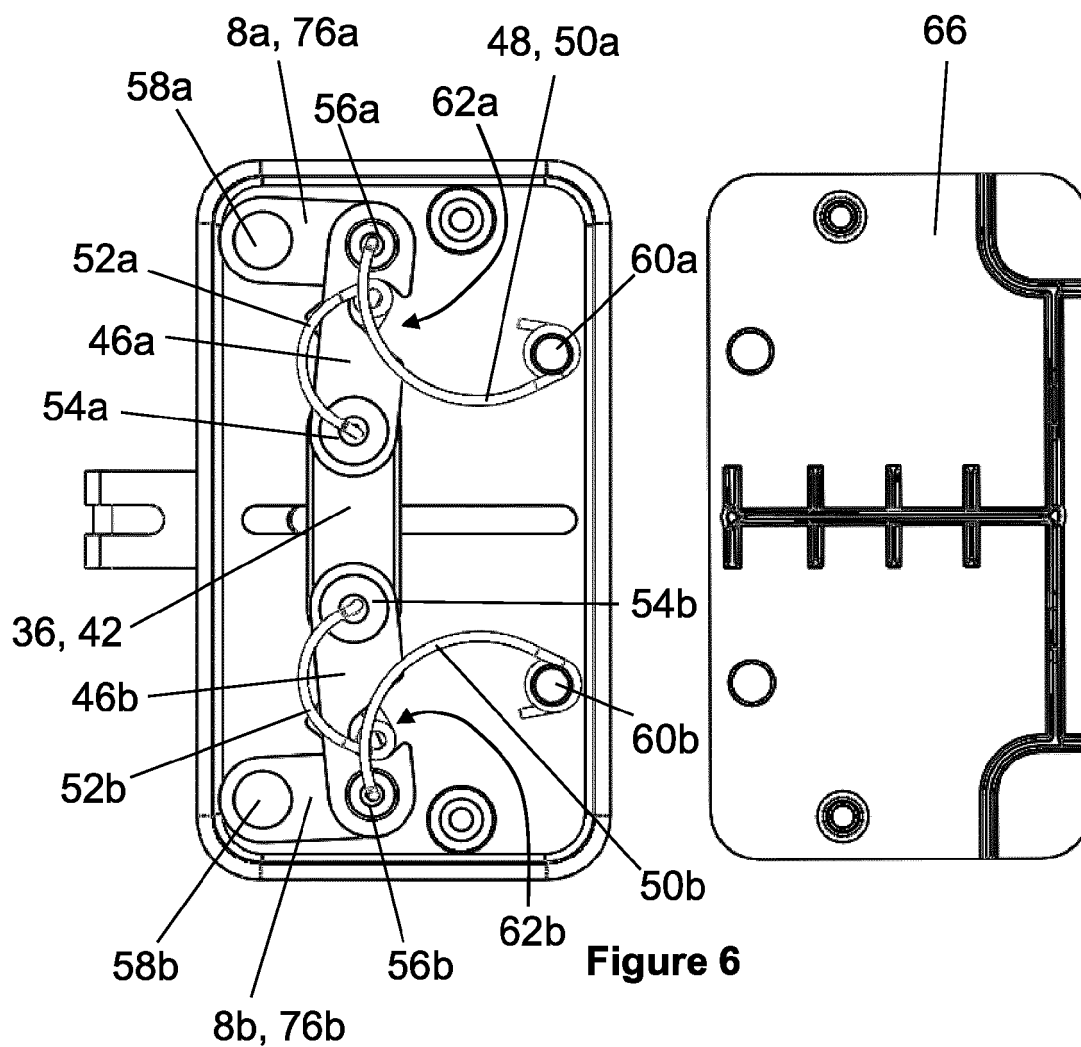


Figure 6

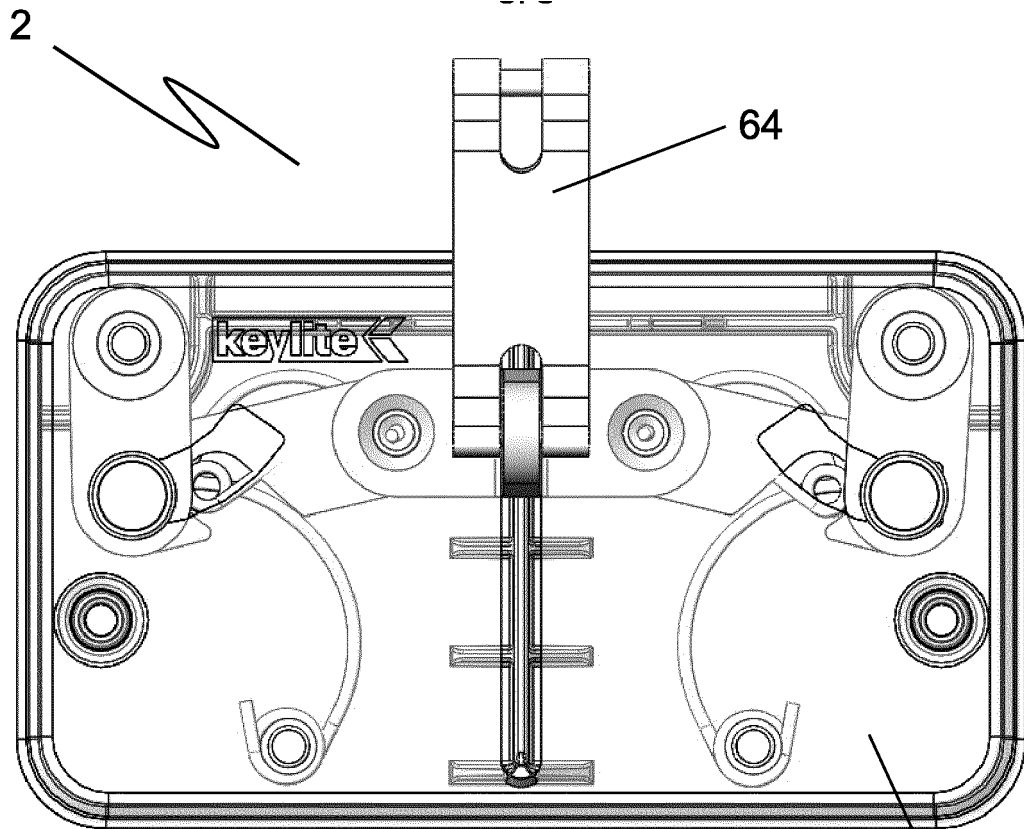


Figure 7

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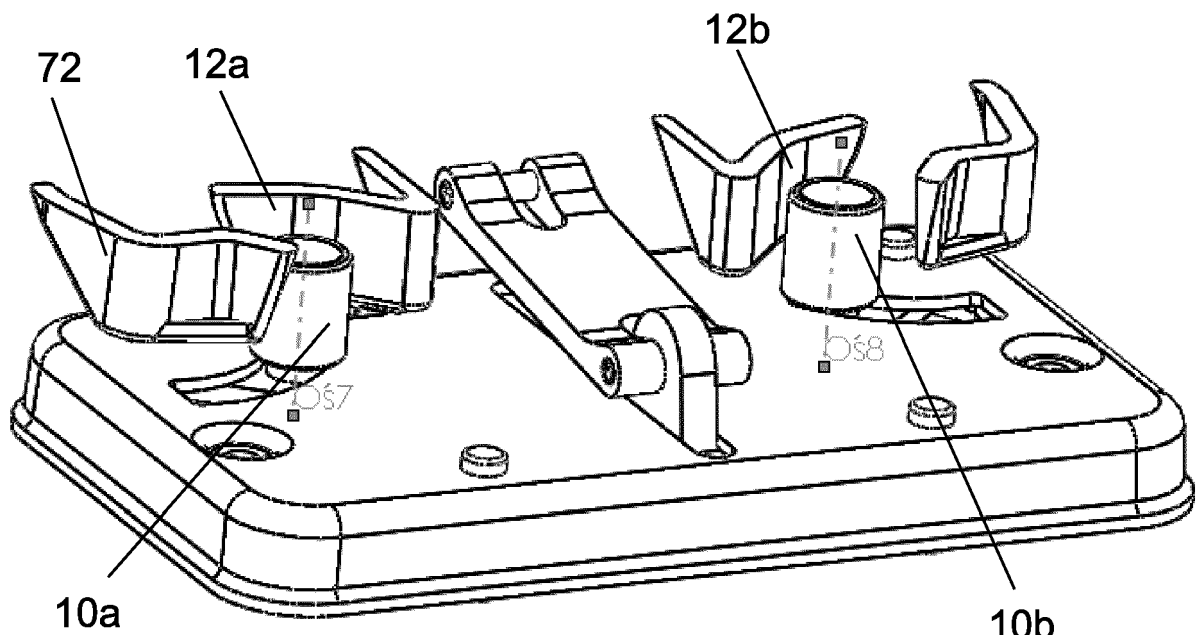


Figure 8

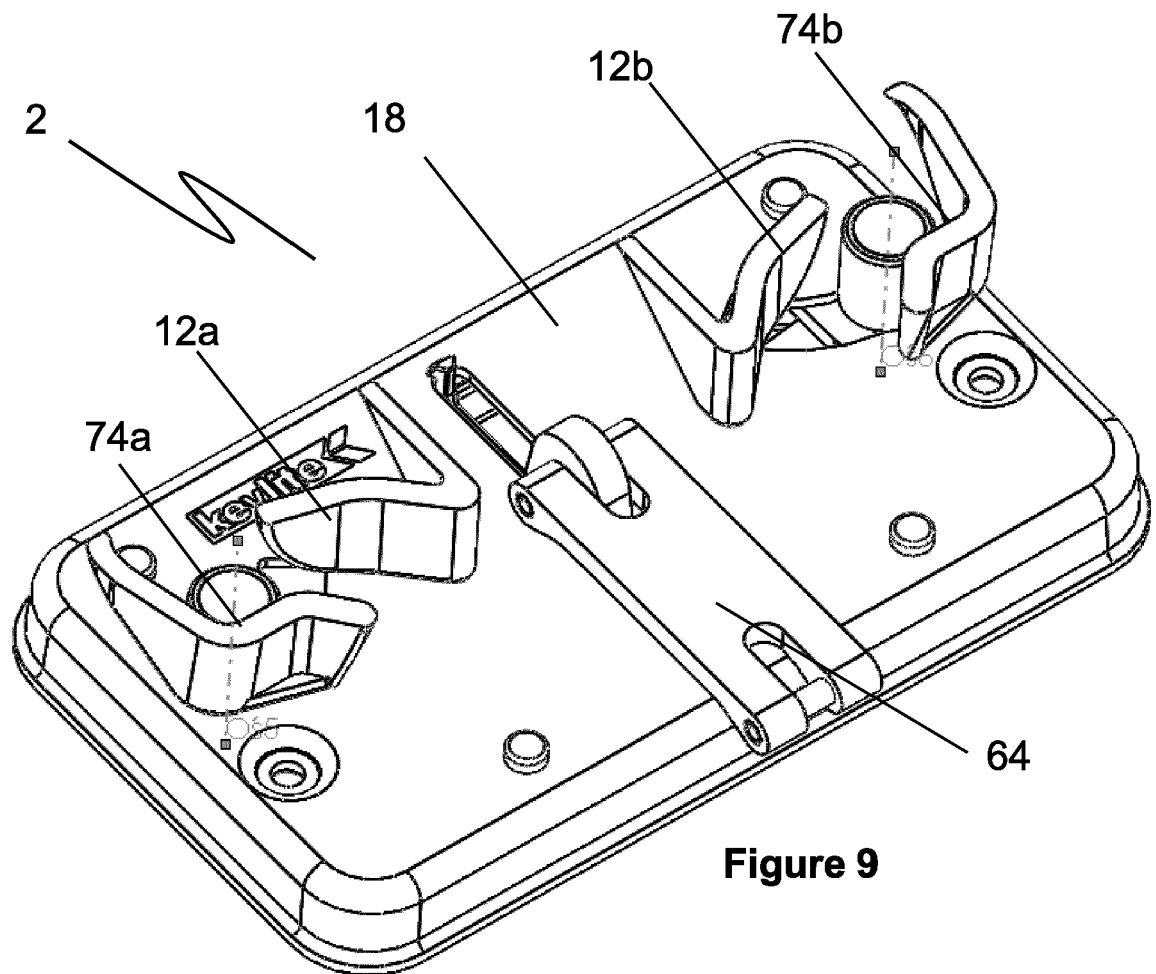
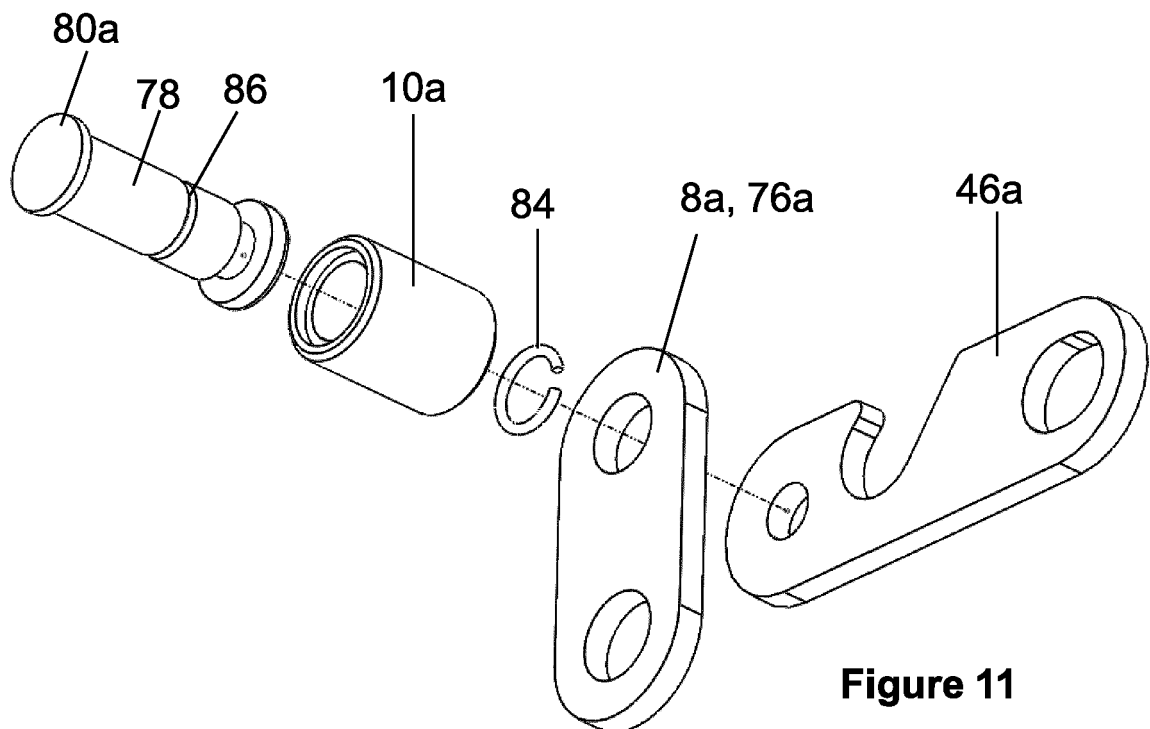
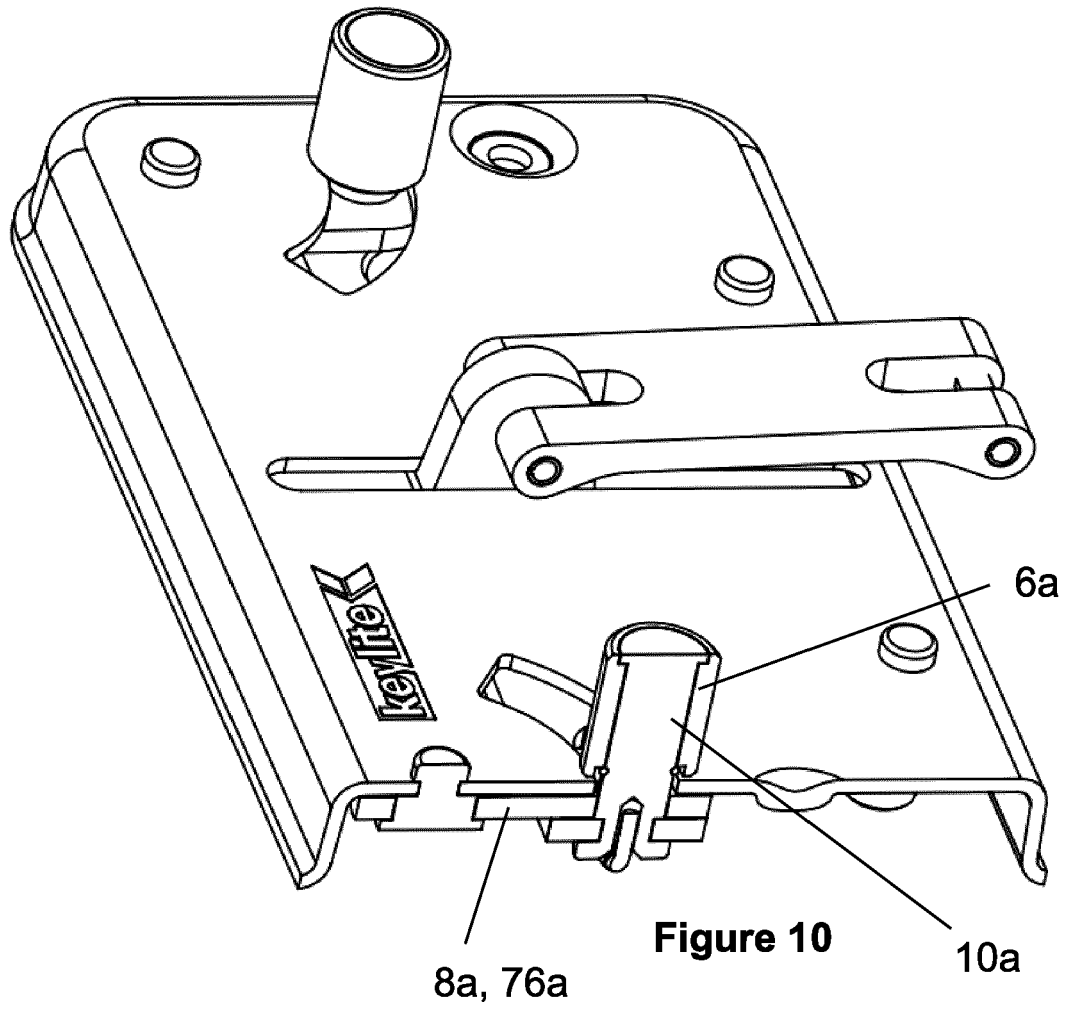


Figure 9



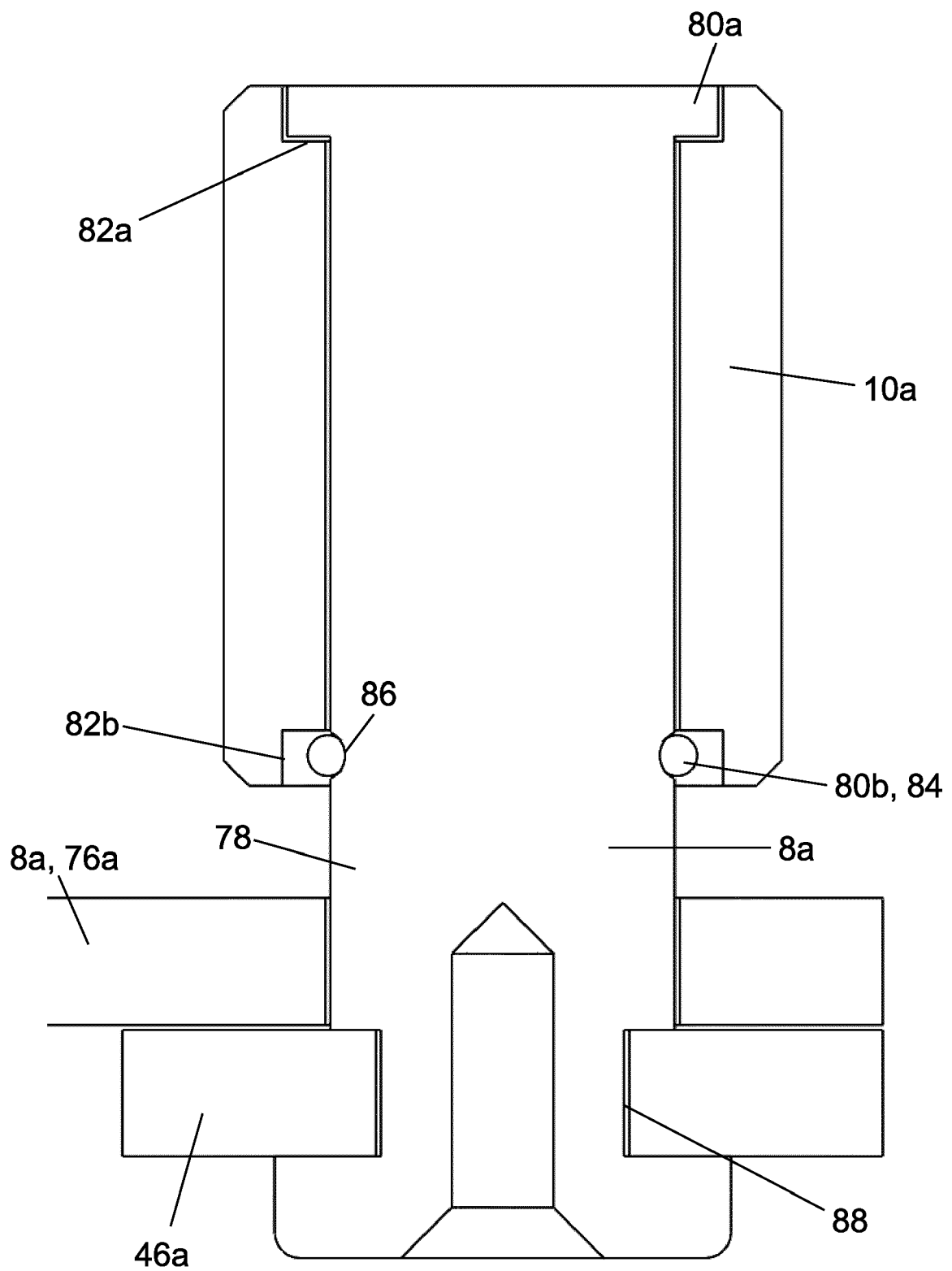


Figure 12



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