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- **Kornerup, Klaus**
DK-3460, Birkerød (DK)
- **Tipsmark, Henrik**
DK-4000, Roskilde (DK)
- **Westh, Kristian Mossin**
DK-2950, Vedbæk (DK)

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(74) Representative: **Rohde, Vibeke Warberg**
Internationalt Patent-Bureau A/S
Rigsgade 11
1316 Copenhagen K (DK)

(71) Applicant: **VKR Holding A/S**
2970 Hørsholm (DK)

- (72) Inventors:
- **Friis, Charlotte Benedicte Lindeschouw**
DK-2765, Smørum (DK)
 - **Jensen, Bent Kirk**
DK-2000, Frederiksberg (DK)

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(54) **A noise reducing locking assembly for a ventilating window**

(57) The invention relates to a locking assembly for a ventilating window having a sash arranged to be openable with respect to a main frame by pivotal movement about a pivot axis parallel to a pair of opposed sash members. The locking assembly comprises a strike plate secured to the main frame member and a casing secured to the sash member opposite the strike plate. At least one pawl member is arranged in the casing to be movable between a locking position, in which it is in locking engagement with a stationary locking member of the strike plate, and an unlocked position, in which it is released

from said locking engagement. A locking control mechanism controls the movement of the pawl member(s) and is operable by an operator member accessible from the inside of the window via at least one actuator slide. According to the invention the locking assembly comprises a first and a second part where at least one of these first and second parts are moveable in relation to the other with a first surface of the first part facing a second surface of the second part, where at least the first part of the locking assembly is made from a non-metallic material, preferably plastic.

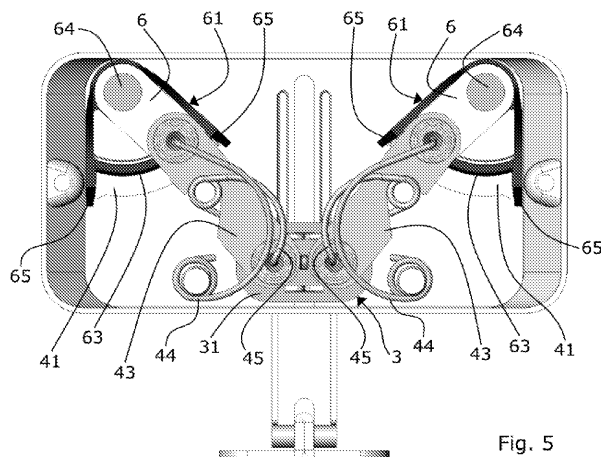


Fig. 5

Description

[0001] The present invention relates to a locking assembly for a ventilating window having a sash arranged to be openable with respect to a main frame by pivotal movement about a pivot axis parallel to a pair of opposed sash members, said locking assembly comprising:

- a strike plate with at least one stationary locking member secured to a main frame member opposite one of said pair of sash members,
- a casing secured to said one sash member opposite the strike plate,
- at least one pawl member arranged in said casing to be movable between a locking position, in which it is in locking engagement with said stationary locking member and an unlocked position, in which it is released from said locking engagement to allow opening of the window, the pawl member moving along first guide means in the casing,
- a locking control mechanism arranged in said casing to control the movement of the pawl between said locking and unlocked positions,
- said locking control mechanism being operable by an operator member accessible from the inside of the window via at least one actuator slide displaceable in second guide means in the casing from a first end position defining the unlocked position of the pawl member to a second end position defining the locking position of the pawl member and vice versa,
- the operator member being connected with the actuator slide to occupy two distinct positions corresponding to the end positions of the actuator slide.

[0002] A locking assembly of the abovementioned type is disclosed in DK-C-114 046. An actuator slide protruding through the casing connects the operator member with the locking mechanism, said actuator slide having a first unlocked position, a second locked position and a third intermediate position where the window is slightly open to achieve ventilation. Also protruding through slots in the casing are two pawl members. When closing the window the pawl members comes into engagement with the fixed strike plate whereby they are forced to the sides and the actuator slide is pressed into its second end position. For the purpose of ventilation, the actuator slide is pulled half way back towards the first position by use of the operator member without the pawl members being displaced.

[0003] The locking assembly described above is made entirely from metal, which entails a good resistance to wear and has a well-proven reliability even after many years of use and exposure to different environmental factors. However, the movement of the pawl members and the actuator slide between their different positions gives rise to noise, particularly in the form of sharp sounds when the moveable parts reach their end positions. Even though users have not indicated these sounds as being

a problem and possibly have not even consciously perceive these noises as being a source of irritation, the removal of such noise can be relieving. In other technical fields such as vacuum cleaners and car engines a lot of effort have been put in improving the sound of the engine to make it less irritating and even make it a part of the company brand. However, in the field of roof windows the problem has not previously been recognised. On the contrary, the noise has in many cases been seen as an advantage as it functions as an indication, that the window has been properly closed.

[0004] Having realised that the problem of noise reduction does also apply to the field of locking assemblies for windows it is the object of the invention to provide a locking assembly, which generates less noise during operation.

[0005] The object is achieved with a locking assembly comprising a first part, which is moveable in relation to a second part of the locking assembly with a first surface of the first part facing a second surface of the second part, where at least the first part of the locking assembly is made from a non-metallic material, preferably plastic. Thereby a liner may be said to be integrated in the first part making the use of separate liners superfluous. It is, however, to be understood that liners may still be used as a supplement e.g. serving as wearing parts.

[0006] Plastics are preferred materials because they are generally cheap, each to form and generate relatively moderate sounds when struck. It is, however, to be understood that other materials such as ceramics or composites may also be used as long as they entail some advantages over the commonly used metals.

[0007] Many different parts of the locking assembly may constitute first and second part, but in a preferred embodiment the first part is constituted by the strike plate, which is made entirely from plastic. Alternatively or as a supplement the casing may be made entirely from plastic. This latter embodiment is particularly advantageous when sounds originating from resonance are to be avoided.

[0008] A further advantage of making different parts of the locking assembly entirely from plastic is that it may be made by simple moulding, thus saving expenses both for the material itself and for the manufacture.

[0009] Other parts of the locking assembly may also be made entirely from plastic. However, as some kinds of plastic will tend to melt or get soft when affected by the heat of a fire, the parts made from plastic and the kind of plastic used must be chosen with care. As an example the forces acting on the actuator slide during opening of the window would cause it to break if softened by heat, thus making it impossible to open the window for use as an emergency exit.

[0010] The object of the invention is further achieved with a locking assembly comprising a first part, which is moveable in relation to a second part of the locking assembly with a first surface of the first part facing a second surface of the second part, where at least the first surface

is provided with a liner preventing direct contact between the first and second surfaces.

[0011] The lack of direct contact between first and second parts prevents the generation of the characteristic hard or sharp sounds of metal against metal. The liner material may be said to muffle the sound.

[0012] In a preferred embodiment the first guide means in the casing constitutes a first part and the pawl member a second part and/or the actuator slide constitutes a first part and the second guide means a second part, the contacting surfaces of the first and second part(s) being provided with one or more liners preventing direct contact between the actuator slide and the associated guide means and/or between the pawl member(s) and the casing. The lining of these particular parts of the locking assembly has been found to give a relatively large improvement of the sound pattern of the locking assembly. This is assumed to be due to the fact, that the pawl member (s) and the actuator slide moves intermittently between predefined positions giving rise to impact sounds and other similarly abrupt sounds.

[0013] It is to be understood, that even though the actuator slide and the portion of the casing surrounding the first guide means has been indicated as the first parts and thus as being provided with a liner, the locking assembly may also be configured with a liner at the second guide means and on the pawl member corresponding to a substitution of the first and second parts. That is to say, that the allocation of the indications first and second parts are only to be considered a preferred embodiment and not as limiting the scope of the invention.

[0014] In a preferred embodiment the operator member is connected to the actuator slide via an operator arm, where the operator member constitutes a first part and the operator arm a second part and/or where the actuator slide constitutes a first part and the operator arm a second part, the contacting surfaces of the first and second part (s) being provided with one or more liners preventing direct contact between the operator member and the operator arm and/or between the operator arm and the actuator slide. This means a lining of the part of the locking assembly, which transmits the force applied by the person operating the window and which are therefore likely to be relatively irregular. Such liners may even smooth the force transmitted, as the relatively flexible liner material will in many cases be able to absorb some of the irregularities.

[0015] The movement of the pawl member(s) is normally achieved by attaching each pawl member to the casing via a fastening pin, which may be arranged in a hole in the casing. The pawl member then rotates about the fastening pin and a part of the pawl member projects through a slot in the casing, which slot constitutes the first guide means. In that case the casing constitutes a first part and the fastening pin and/or the pawl member a second part, the contacting surfaces of the first and second part(s) being provided with one or more liners preventing direct contact between the casing and the fas-

tening pin and/or pawl member. This not only cushions the sound caused by the contact but may also wholly or partly substitute the use of a lubricant.

[0016] In a particularly preferred embodiment the liner used between the fastening pin and the casing and the liner used between the pawl member and the casing are formed as one common liner. This decreases the number of separate parts needed for the locking assembly, and the interconnection may help keep the two liner portions in place as they are affected by the rotational movement of the pawl member.

[0017] Conventional locking assemblies are designed such that the first guide means through which the pawl member projects is formed as a slot in the casing, said slot having the shape of a circular section with the same radius of curvature and the same length as the path of the pawl member. This among others has the advantage, that the attachment of the pawl member via the fastening pin is hidden and protected inside the casing. In such cases it is advantageous that the common liner has the overall shape of an isosceles triangle, where the apex envelopes the fastening pin, the angle between the two legs projecting from the apex corresponding to the angle of the circular section covered by the slot in the casing, where these two legs extends beyond the third side of the triangle, the two extensions lining the end sides of the slot, and where the third side of the triangle is curved with the same radius of curvature as the slot, lining the side surface of the slot facing the apex.

[0018] To keep the common liner secured in relation to the fastening pin, the liner may have one or more retaining members projecting towards the inside of the triangle or a connecting member connecting the two legs projecting from the apex, the area enclosed by the triangle and the retaining or connecting member(s) corresponding in size and shape substantially to the size and cross sectional shape of the fastening pin. Thus no separate fastening means are necessary.

[0019] The liners may be made from any suitable material having a sufficient strength and resistance to wear. It is, however, preferred that the liners are made from a plastic material such as polyethylene (PE), polypropylene (PP) or polyoxymethylene (POM), as such materials do not corrode and are relatively cheap. Depending on the number and place of use of the liners there may be two or more types of liners, each liner type being made from a different material depending on the forces acting on them. Similarly, it might be advantageous to use a liner made from a combination of two or more types of material, preferably from two kinds of plastic having different resistance to wear, such as polyoxymethylene (POM) and polypropylene (PP) softened with a ethylene-propylene-diene-monomer (EPDM). This may for instance be the case with the common liner described above.

[0020] Each of the liners mentioned above may consist of one or more separate parts that are fastened to the locking assembly in a releasable manner. In this way is possible to replace liners that are worn down or possibly

even provide existing locking assemblies with liners.

[0021] Further aspects of the invention include:

1. A locking assembly for a ventilating window having a sash arranged to be openable with respect to a main frame by pivotal movement about a pivot axis parallel to a pair of opposed sash members, said locking assembly comprising a strike plate with at least one stationary locking member secured to a main frame member opposite one of said pair of sash members, a casing secured to said one sash member opposite the strike plate, at least one pawl member arranged in said casing to be movable between a locking position, in which it is in locking engagement with said stationary locking member and an unlocked position, in which it is released from said locking engagement to allow opening of the window, the pawl member moving along first guide means in the casing, a locking control mechanism arranged in said casing to control the movement of the pawl member(s) between said locking and unlocked positions, said locking control mechanism being operable by an operator member accessible from the inside of the window via at least one actuator slide displaceable in second guide means in the casing from a first end position defining the unlocked position of the pawl member to a second end position defining the locking position of the pawl member and vice versa, the operator member being connected with the actuator slide to occupy two distinct positions corresponding to the end positions of the actuator slide, the operator member being connected to the top sash member by means of a hinge comprising two hinge members interconnected by a pivot, wherein a first part of the hinge is moveable in relation to a second part of the hinge with a first surface of the first part facing a second surface of the second part, where at least the first surface is provided with a liner preventing direct contact between the first and second surfaces.
2. A locking assembly according to aspect 1, wherein the hinge is provided with a liner preventing direct contact between the hinge members connected to the operator member and the top sash member, respectively, and the pivot.
3. A locking assembly according to aspects 1 or 2, wherein a pair of mutually contacting surfaces of the hinge are both provided with a liner.
4. A locking assembly according to any of the preceding aspects, wherein the liner(s) is/are made from a plastic material such as polyethylene (PE), polypropylene (PP) or polyoxymethylene (POM).
5. A locking assembly according to any of the preceding aspects, wherein at least two types of liners are provided, each liner type being made from a different material.
6. A locking assembly according to any of the preceding aspects, wherein at least one liner is made

from a combination of two types of material, preferably from two kinds of plastic having different resistance to wear, such as poly-oxy-methylene (POM) and poly-propylene (PP) softened with a ethylene-propylene-diene-monomer (EPDM).

7. A locking assembly according to any of the preceding aspects, wherein at least one liner is in the form of a coating on the corresponding hinge part.

[0022] The invention will now be described in detail with reference to the accompanying drawing, in which

Fig. 1 is a sectional view of the upper part of a ventilating window, where the locking assembly is in its closed position,

Fig. 2 is a sectional view corresponding to the one in Fig. 1, but where the locking assembly is in its open position,

Fig. 3 is a plan view of a part of the locking assembly shown in Fig. 1 seen from above,

Fig. 4 is a plane view of the strike plate shown in Fig. 1 seen from below,

Fig. 5 is a plan view of a part of the locking assembly shown in Figs. 1 and 3 seen from below,

Fig. 6 is a perspective view of a liner for the actuator slide,

Fig. 7 is a perspective view of a pawl liner,

Fig. 8 is a perspective view of a hinge for connecting the operator member to the sash, and

Fig. 9 is plan view seen from the side of the hinge shown in Fig. 8.

[0023] In Fig. 1 and 2 the locking assembly is shown in a ventilation window. An operator member 1 is located on the inside of the window in connection with the top sash member 2. When pulling on the operator member to open the window, as indicated by the arrow A, an actuator slide 3 that protrudes through a slot (not shown) in the casing 4 of the locking assembly is moved towards the inside of the window (to the right in Figs. 1 and 2), the operator member 1 and actuator slide 3 being connected via an operator arm 5. Simultaneously, pawl members 6 (only one is visible in Fig. 1 and 2) are being shifted to the positions shown in Fig. 3 from positions at the other ends of slots 41 in the casing 4, the pawl members being connected to the actuator slide 3 via a locking control mechanism (not shown) consisting of a system of link joint arms inside the casing 4 as will be explained later. The pawl members are thereby brought out of engagement with the stationary locking members 71 (only one is visible in Fig. 1 and 2) projecting from a strike plate 7, which may be seen more clearly in Fig. 4, said strike plate being fixed to the top frame member 8.

[0024] The slots 41, 42 in the casing through which the pawl members 6 and actuator slide 3 protrudes serves as first and second guide means, respectively.

[0025] The operator member 1 is connected to the top sash member 2 by means of a hinge 9. The resulting

pivot movement of the operator members (indicated by the arrow A) necessitates pivot connections both between the operator member 1 and the operator arm 5 and between the operator arm 5 and the actuator slide 3.

[0026] When closing the window, the pawl members 6 to come into engagement with the stationary locking members 71 of the strike plate 7 and are thereby forced to the sides, moving along the first guide means 41 to the position opposite the one shown in Fig. 3. The movement of the pawl members are transmitted to the actuator slide 3 via the locking control mechanism 43,44,45 and the actuator slide is pulled back from the position shown in Fig. 2 to the position shown in Fig. 1. The pattern of movement of the pawl members in relation to the strike plate is indicated with the arrows B in Fig. 4. The pawl members are now located behind the stationary locking members 71 of the strike plate 7 thereby locking the window.

[0027] To achieve ventilation with only a limited loss of heat a window with a locking assembly as the one shown in the drawing may be opened slightly by placing the actuator slide 3 in an intermediate position (not shown). The pawl members 6 are not affected by the moving of the actuator slide 3 between its locked position and its ventilating position. As may be seen from Fig. 5, the actuator slide 3 and pawl members 6 are interconnected via the locking control mechanism, which consists of a system of spring-loaded arms 43, which forces the actuator slide to move stepwise between three predetermined positions as described above, while the pawl members moves between only two positions. Other configurations of the arms 43 and springs 44,45, and other means of interconnection may be devised, but the embodiment shown has proven its worth over decades of use. Similarly it is to be understood that the a locking assembly functioning with only two positions of the actuator slide, i.e. with no ventilating position is also within the scope of the invention.

[0028] The movement of the pawl members 6 and actuator slide 3 in relation to the casing 4 as well as the contact between the pawl members and the stationary locking members 71 of the strike plate 7 inevitably gives rise to friction and both the actuator slide and the pawl members may further hit against the end edges of the slots 41,42 in the casing. This gives rise to several kinds of sound, not only impact sounds and frictional sounds, but possibly also resonance in different parts of the locking assembly, particularly the casing.

[0029] At present the different parts of practically all commercially available locking assemblies are made from metal, as such materials posses both the necessary strength and wearability and have in general proven well suited for the purpose. This choice of material, however, increases the problem of sound generation. Especially the generation of resonance may be a problem.

[0030] To moderate the generation of sound during operation of the locking assembly it is, according to the invention, provided with one or more liners, which cushions

the contact between the different parts of the locking assembly thereby cushioning the sound.

[0031] Fig. 6 shows a slide liner 31, which prevents the actuator slide 3 from coming into direct contact with the casing 4, the spring-loaded arms 43 and the operator arm 5. The slide liner has a base 311, which abuts against the spring-loaded arms as may be seen in Fig. 5, a projecting edge 312, which serves as a contact surface with the casing, a pair of projections 313 protruding trough the slot 42 in the casing as may be seen in Fig. 3, and a connecting piece 314 projecting into the actuator slide and preventing contact with the operator arm 5 as may also be seen in Fig. 3. To make room for the liner 31, the slot 42 may be made slightly wider than in the traditional locking assembly so that the effective width of the slot is approximately the same.

[0032] Fig. 7 shows a pawl liner 61 intended to isolate the pawl members from the casing, said pawl liner serving as a common liner as described in the introductory part of the description. The pawl liner may be said to have the overall shape of a triangle, where the apex 62 is rounded and the opposite leg 63 curved. As may be seen in Figs. 3 and 5, the liner 61 is arranged with its apex at the fastening point 64 of the pawl member 6, and with the curved leg 63 projecting into the slot 41 in the casing. The apex thus lines the pivot connection between the pawl member and the casing and the curved leg lines the slot against the part 6' of the pawl member projecting there trough.

[0033] In the embodiment shown, the apex 62 is provided with a semicircular connecting piece 66, which together with the apex forms a circular member surrounding the connection between the pawl member 6 and the casing 4 all way round. The connecting piece may, however be left out or replaced with a retaining member (not shown) projecting from the side of the triangle to prevent the liner 61 from getting dislocated without surrounding the connection entirely.

[0034] The pawl liner 61 is further provided with a pair of projecting corner pieces 65, which may be said to be extensions of the two legs meeting at the apex 62. As for the curved leg 63, the corner pieces has an increased height seen in the direction perpendicularly to the plane of the triangle, which allows them to project trough the slot 41. The corner pieces thus functions as a liner for the end edges of the slot, preventing the pawl member from hitting against the casing when being moved between its two positions as may be seen in Figs. 3 and 5.

[0035] The height of the pawl liner 61 in the direction perpendicular to the plane of the triangle is shown to decrease from a maximum at the apex 62 to a minimum at or by the third leg 63. At present, this design is considered to be the one providing the best manageability during assembly of the locking assembly, but other designs may be preferable in consideration of other factors.

[0036] Figs. 8 and 9 shows the hinge 9 connecting the operator member 1 to the top sash member 2. Traditionally this hinge have consisted of two hinge parts 91 and

92, which is connected to the operator member and the top sash member respectively and which are interconnected by means of a pivot 93 projecting through bend back edges 94,95 of the two hinge parts. According to the present invention the pivot 93 have now been provided with a plastic coating 96 preventing direct contact between the pivot and the hinge parts 91,92.

[0037] To minimise the efforts and expenses it might be considered to make the pivot 93,94 or possibly even the entire hinge 9 entirely from plastic. Again, this should, however, be done with care as some kinds of plastic would quickly deteriorate in the event of fire, making it impossible to open the window.

[0038] Even though not shown in the drawing, the hinge 9 may further be provided with liners preventing direct contact between the bend back edges 94,95 of the two hinge parts 91,92 at the points marked by 97 in Fig. 8.

[0039] Finally the strike plate 7, which is shown in Fig. 4, is preferably made entirely from plastic, preferably moulded in one piece. Regardless of the material chosen it may, however, also be provided with liners (not shown) on the stationary locking members 71, these liners serving to deaden sound and/or as wearing parts. The drawbacks of using only plastic mentioned above in relation to i.a. the hinge 9 does not apply to the strike plate, as a melted strike plate would only make it easier to open the window.

[0040] The pawl liner 61 is preferably made from a plastic material, which is resistant to impact loads. An example of such a material is Hytrel®, which is polypropylen softened by the addition of a ethylene-propylene-diene-monomer. The same applies to any all-plastic parts of the locking assembly affected by impact loads.

[0041] Other liners and parts of the locking assembly, which are not subject to impact loads, such as the slide liner 31 and the strike plate 7, should in stead be made from a material, which is more resistant to frictional loads caused by the movement of the actuator slide 3 and pawl members 6 in relation to the casing 4 and strike plate 7. An example of such a material is polyoxymethylen, known as POM.

[0042] The noise reduction may further be improved by an appropriate configuration of the strike plate 7. Traditionally the strike plate have been provided with a raised edge or projection at the point marked with 72 in Fig. 4, the purpose of the edge being to force the pawl member to the side when closing the window and to keep it there. It has, however, surprising been discovered that, in particular when making the strike plate from plastic, the raised edge is unnecessary for the functioning of the locking assembly, and that a locking assembly with a strike plate as the shown in Fig. 4 gives rise to less noise. It is therefore preferred that the shape of the inner side of the stationary locking members of the strike plate of the locking assembly describes a smooth, continuous advancing curve.

[0043] In addition to the liners described above, there may be other liners such as at the connection between

the operator member 1 and the operator arm 5. Such liners may be designed in any appropriate way and from any appropriate material as long as they meet the object of making the operation of the locking assembly generate less or more agreeable sound.

[0044] In the above, only one of each pair of mutually contacting surfaces is provided with a liner. It is, however, to be understood that a double lining protecting both surfaces may be preferable, for example to achieve an effect corresponding to a lubrication of the two surfaces.

[0045] It is further to be understood, that in addition to the embodiments described above, the object of the invention may be achieved in several other ways. For example the number of separate liners may be increased or decreased, the liners may be employed in different places or have a different shape, some parts of the locking assembly may be made entirely from a plastic material etc. Similarly, the overall construction of the locking assembly may be varied by e.g. using only one pawl member.

Claims

1. A locking assembly for a ventilating window having a sash arranged to be openable with respect to a main frame by pivotal movement about a pivot axis parallel to a pair of opposed sash members, said locking assembly comprising:

a strike plate (7) with at least one stationary locking member (71) secured to a main frame member (8) opposite one of said pair of sash members (2),

a casing (4) secured to said one sash member opposite the strike plate,

at least one pawl member (6) arranged in said casing to be movable between a locking position, in which it is in locking engagement with said stationary locking member and an unlocked position, in which it is released from said locking engagement to allow opening of the window, the pawl member moving along first guide means (41) in the casing,

a locking control mechanism (43,44,45) arranged in said casing to control the movement of the pawl member(s) between said locking and unlocked positions,

said locking control mechanism being operable by an operator member (1) accessible from the inside of the window via at least one actuator slide (3) displaceable in second guide means (42) in the casing from a first end position defining the unlocked position of the pawl member to a second end position defining the locking position of the pawl member and vice versa, the operator member being connected with the actuator slide to occupy two distinct positions

corresponding to the end positions of the actuator slide,

the operator member being connected to the top sash member (2) by means of a hinge (9) comprising two hinge members (91,92) inter-connected by a pivot (93), 5

characterized in that

a first part (91,92,93) of the hinge (9) is moveable in relation to a second part (91,92,93) of the hinge with a first surface of the first part facing a second surface of the second part, where at least the first part of the hinge is made from a non-metallic material, preferably plastic. 10

2. A locking assembly according to claim 1, **characterized in that** the pivot is made from a non-metallic material, preferably plastic. 15

3. A locking assembly according to claim 1 or 2, **characterized in that** the hinge members are made from a non-metallic material, preferably plastic. 20

4. A locking assembly according to any of claims 1-3, **characterized in that** the non-metallic material is a plastic material such as polyethylene (PE), polypropylen (PP) or polyoxymethylen (POM). 25

5. A locking assembly according to any of the claims 1-4, **characterized in that** different hinge parts are made from different non-metallic materials. 30

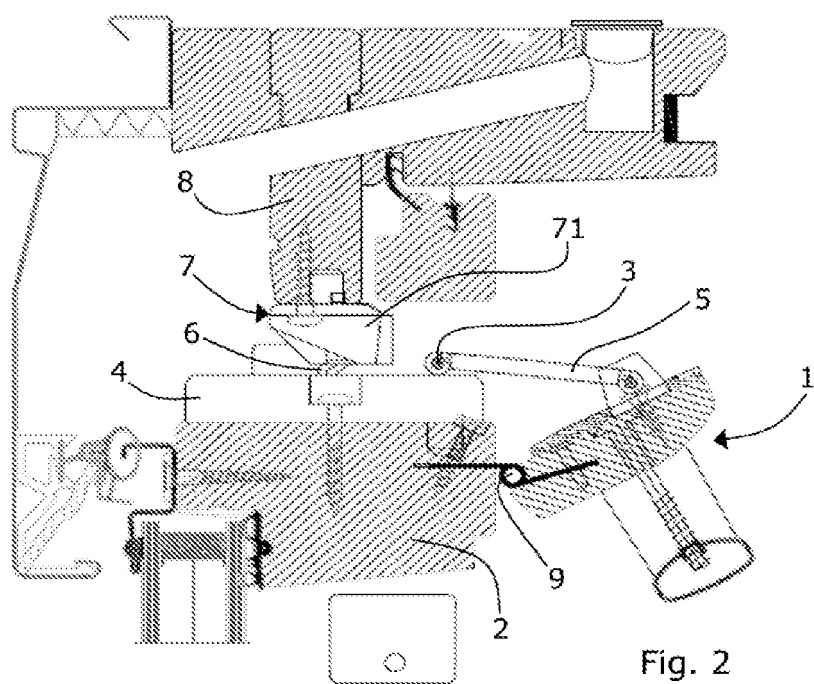
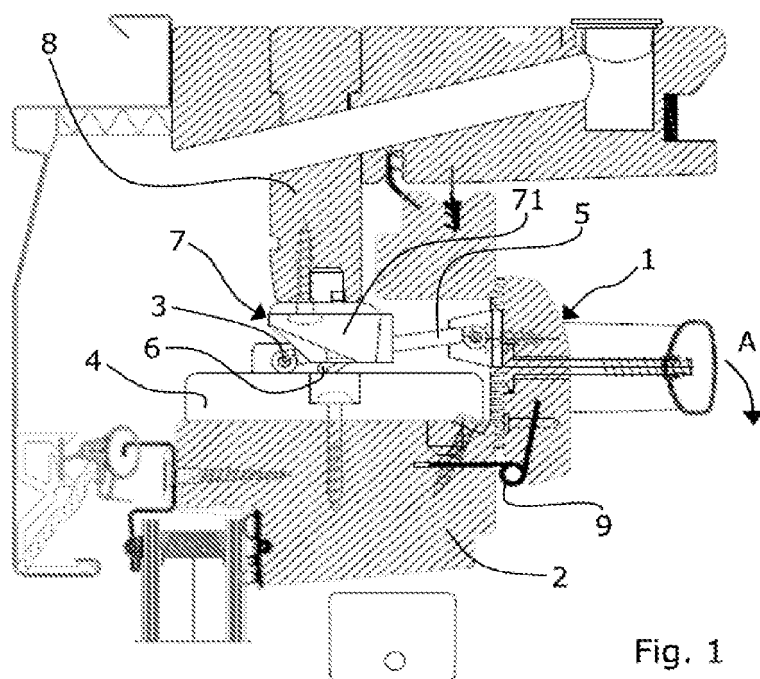
6. A locking assembly according to any of claims 1-5, **characterized in that** at least one hinge part is made from a combination of two types of material, preferably from two kinds of plastic having different resistance to wear, such as poly-oxy-methylene (POM) and poly-propylene (PP) softened with a ethylene-propylene-diene-monomer (EPDM). 35

7. A ventilating window having a sash arranged to be openable with respect to a main frame by pivotal movement about a pivot axis parallel to a pair of opposed sash members and comprising a locking assembly according to any of the preceding claims. 40

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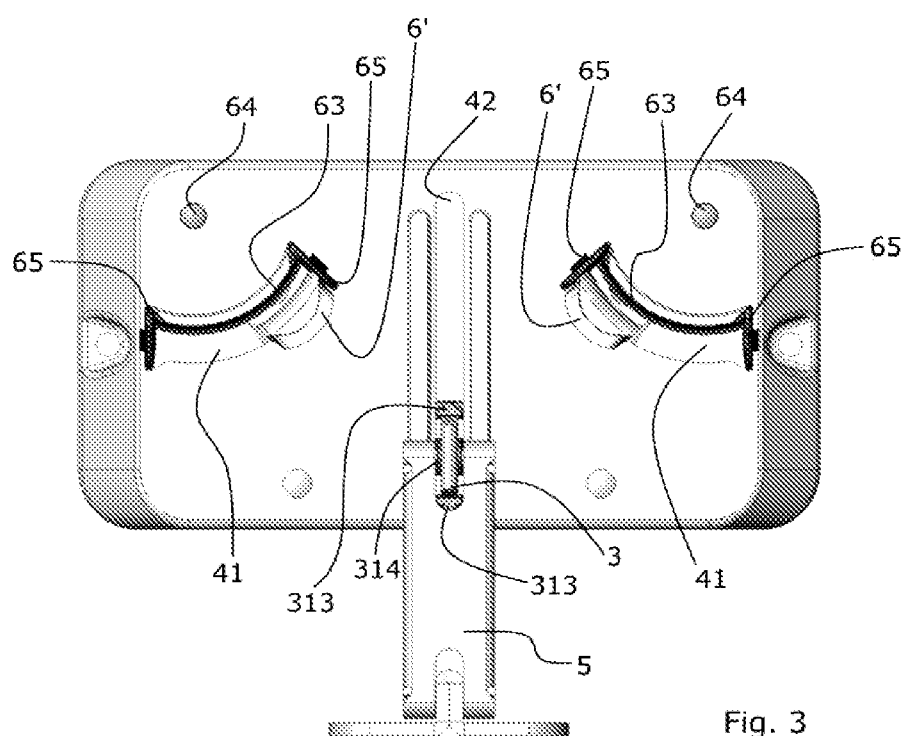


Fig. 3

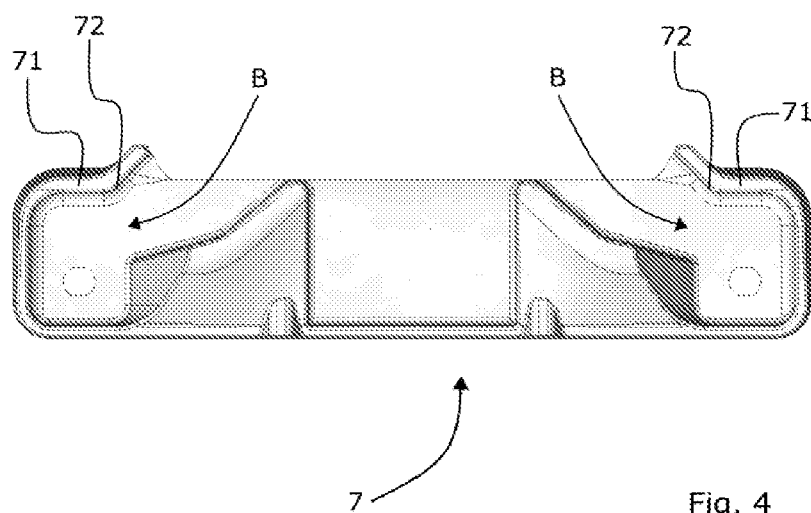


Fig. 4

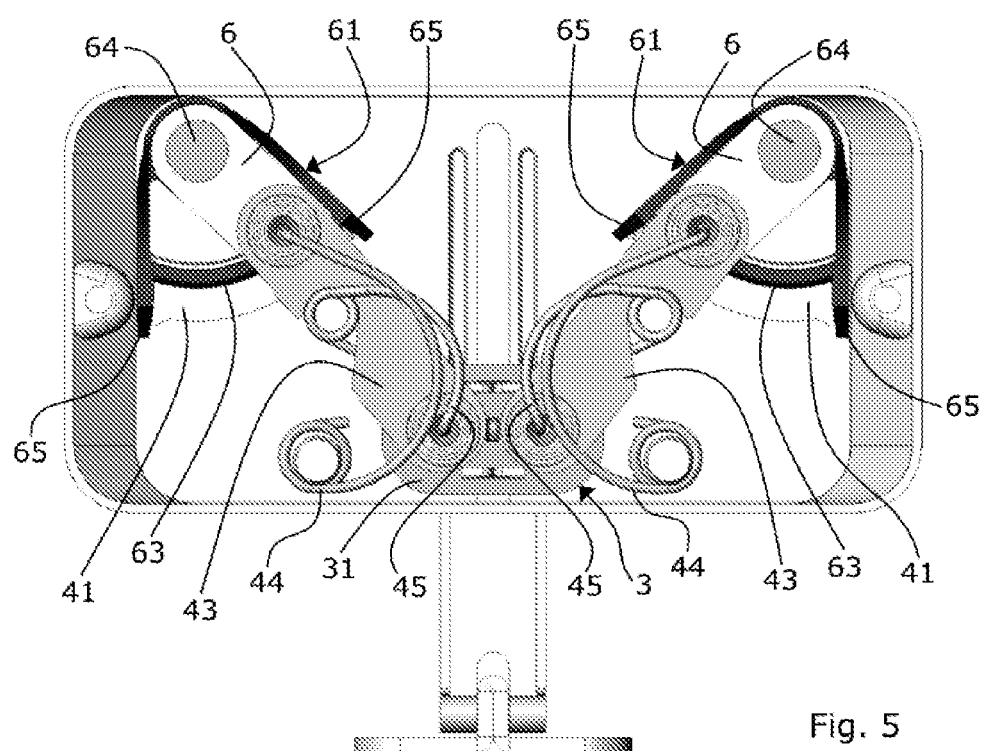


Fig. 5

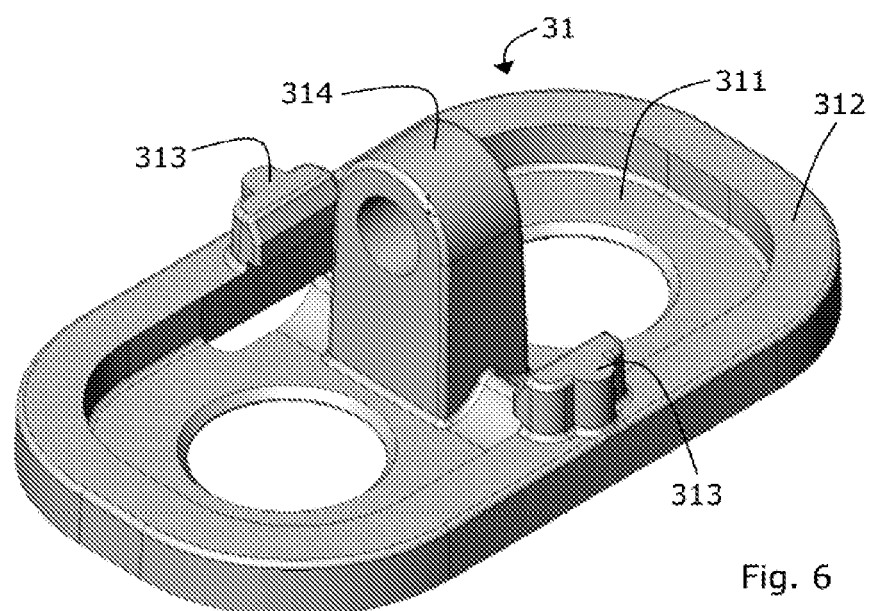
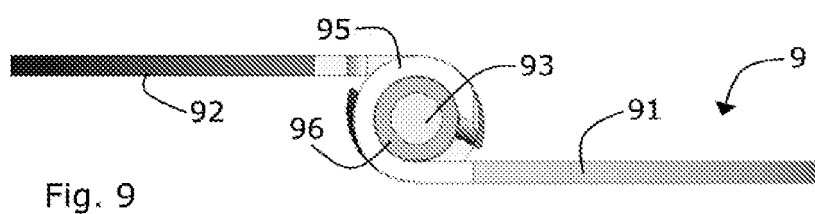
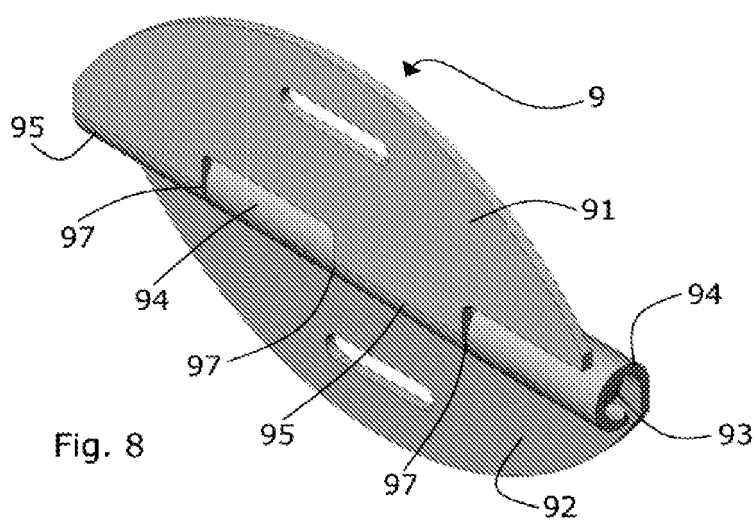
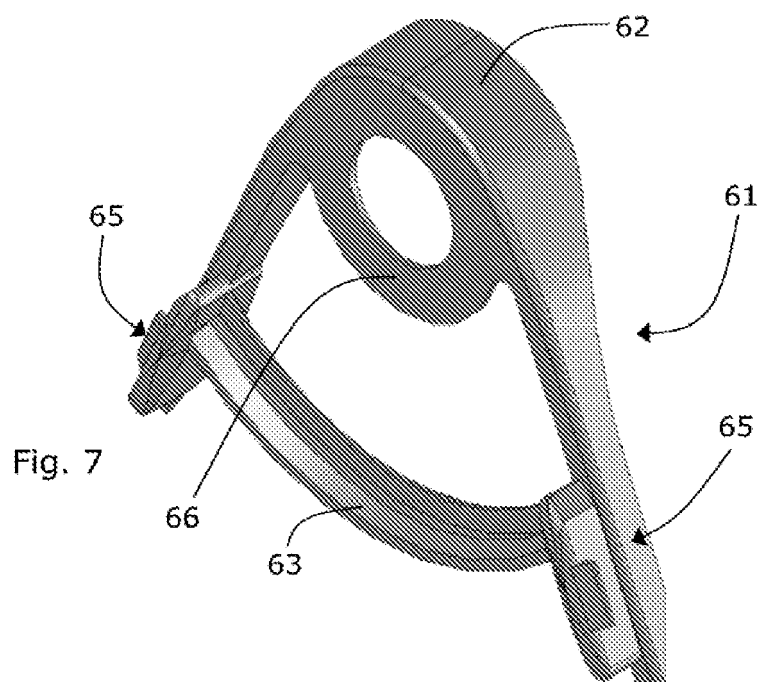


Fig. 6





EUROPEAN SEARCH REPORT

Application Number
EP 09 16 0609

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