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(54) **ROOF WINDOW WITH IMPROVED HANDLE**

(57) In a roof window, the sash (2) is opened and closed relative to the frame (1) by means of operating means including a handle (5) rotatably connected to a sash bottom member (24) and comprising a shaft (55) with a predefined length (L_s) and a cross-sectional dimension (H_s) lodged in an aperture (245) in the sash bottom member (24). Turning the handle (5) by its grip

(51), a pawl (56) interacts with a striking plate (8) connected to the frame bottom member (14). The handle (5) is provided with a shock absorbing bushing (9) having a predefined length (L), at least one outer cross-sectional dimension (D) and an opening (92) with at least one cross-sectional dimension (H), and extending about the shaft (55).

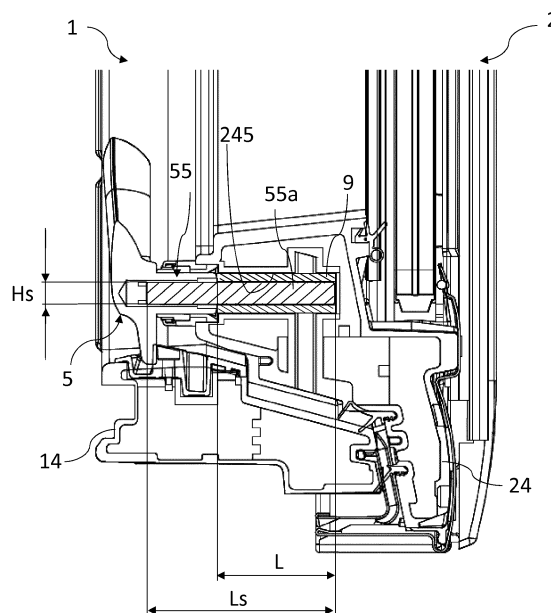


Fig. 5

Description

Technical Field

[0001] The present invention relates to a roof window comprising a frame having a plurality of frame members including a top member, two side members and a bottom member, a sash having a plurality of sash members a top member, two side members and a bottom member, and operating means including a handle, said handle being rotatably connected to a sash member and comprising a shaft with a predefined length and at least one cross-sectional dimension lodged in an aperture in the sash member, a grip and a pawl to interact with a striking plate connected to the frame member.

Background Art

[0002] Roof windows come in a number of varieties and models. Typically, the windows are generally equipped with operating means as well as ventilation means. Some roof windows are provided with a ventilation flap rotatably connected to the sash, which at the same time fulfils the role of operating means to release and activate a lock cooperating with the frame.

[0003] The solution with a pivotally connected ventilation flap has proven to function particularly well as described in for instance Applicant's European patent No. EP 2 751 355 B1.

[0004] However, in some roof windows, it is desirable to provide the roof window with a ventilation device of simpler kind, and to separate the operation of the opening of the window from the ventilation device. While this provides for a number of advantages including a less complex design and manufacture, the sash member in which the handle shaft is lodged is more exposed to external loads, not only during normal operation involving handling of the handle, but also in case of excess load and sudden impacts for instance from people inadvertently stepping on the sash during installation or maintenance, snow or wind load, or attempts at breaking and entering. In turn, this may lead to damaging of the components of in particular the sash.

[0005] Attempts at alleviating the adverse effects on operating devices are addressed in for instance KR 20090070449 A. However, there is still room for improvement.

Summary of Invention

[0006] It is therefore the object of the invention to provide a roof window, in which the potential risks of damage are mitigated in a simple manner.

[0007] This is achieved with a roof window of the kind mentioned in the introduction, which is further characterised in that the handle is connected to the sash bottom member and is provided with a shock-absorbing bushing having a predefined length, at least one outer cross-sectional dimension and an opening with at least one cross-sectional dimension, and extending about the shaft.

tional dimension and an opening with at least one cross-sectional dimension, and extending about the shaft.

[0008] In this way, a suitable compromise has been found in that the handle is located where it is easily accessible and the increased simplicity aimed at is achieved, while at the same time, a mechanically reliable and cost-effective solution has been found in the shock-absorbing bushing which acts as an additional security element and absorbs load from any impact affecting the roof window which could otherwise potentially damage in particular the interior of the sash bottom member.

[0009] In a presently preferred embodiment, the predefined length of the bushing is chosen such that the bushing extends about a major part of the length of the shaft, preferably at least over 60% of the length of the shaft. In this way, satisfactory shock-absorption has been found while at the same time the design, texture and functioning of other components of the handle are not impaired. In a development of this preferred embodiment, a free portion of the shaft is lodged within the sash bottom member and the bushing extends about the shaft over substantially the entire free portion of the length of the shaft.

[0010] In another embodiment, the at least one cross-sectional dimension of the opening in the bushing substantially corresponds to the respective at least one cross-sectional dimension of the shaft such that an interference fit is provided between the bushing and the shaft. This is in particular advantageous during mounting since the bushing will be at least temporarily prevented from falling of the shaft and may thus be assembled as a sub-unit. In use, the interference fit provides for reliable positioning of the bushing within the handle. In one development of this embodiment, the shaft has a substantially square cross-sectional configuration and the at least one cross-sectional dimension is the side of the square, preferably the shaft has chamfered edges. In another development the opening in the bushing has a substantially square configuration and the at least one cross-sectional dimension is the side of the square, preferably the opening has rounded edges.

[0011] In a further embodiment, the bushing has a substantially cylindrical cross-sectional configuration and the at least one outer cross-sectional dimension is the diameter of the bushing. While in principle, the bushing could have any suitable configuration, a cylindrical shape is easy to manufacture and fit. In one development of this embodiment, the aperture in the sash bottom member has a substantially cylindrical shape and an inner diameter substantially corresponding to the diameter of the bushing. In another development, the ratio between the diameter and the square side of the bushing lies in the range 0.2 and 0.65, preferably in the range 0.4 to 0.6, more preferably in the range 0.55 to 0.59. In another development, the diameter lies in the range 10 to 20 mm and the square side in the range 5 to 10 mm. In general, the dimensions chosen will be dependent on the choice of material, but these ranges have proven to function well.

[0012] The material of the bushing is any suitable material fulfilling the desired requirements to shock-absorption and also other material properties such as elasticity, hardness, strength, durability etc., but it is preferred that the bushing is made from a plastic material, such as a thermoplastic elastomer (TPE).

[0013] The inventive handle is particularly advantageous in case the sash bottom member is provided as a moulded component comprising a shell of a plastic material, such as polyurethane (PU), enclosing a set of core members, and the core member in which the shaft of the handle is lodged is made from a relatively stronger material than the other core members of said set.

[0014] In an alternative embodiment, the striking plate (8) in the frame bottom member (14) comprises a lock recess (81) and a vent recess (82), and is made from a plastic material reinforced by glass fibres.

[0015] Other presently preferred embodiments and further advantages will be apparent from the subsequent detailed description and drawings.

Brief Description of Drawings

[0016] In the following description embodiments of the invention will be described with reference to the schematic drawings, in which

Fig. 1 is a perspective view of an embodiment of a roof window, seen from the interior side and in a closed position;

Fig. 2 is a partial perspective view, on a larger scale, of the top part of the sash of the roof window in an embodiment of the invention;

Fig. 3 is a partial perspective view, on a larger scale, of the bottom part of the roof window in an embodiment of the invention;

Fig. 4 is an exploded partial perspective view of the details shown in Fig. 3;

Fig. 5 is a sectional view of the bottom parts of the embodiment of the roof window shown in Figs 3 and 4;

Fig. 6 is a partial perspective view corresponding to Fig. 3, on a larger scale;

Fig. 7 is an end view, on a larger scale, of the bushing in an embodiment of the roof window according to the invention; and

Fig. 8 is a perspective view, on a larger scale, of the striking plate in the embodiment of the roof window shown in Fig. 6.

Description of Embodiments

[0017] Referring initially to Fig. 1, the general configuration of a roof window is shown.

[0018] The roof window here comprises a primary frame in the form of a stationary frame 1 configured for installation in an inclined roof surface, here by means of mounting brackets 3 provided at the corners, but other

installation principles may be applied as well. The frame 1 comprises a plurality of frame members, here including a frame top member 11, two frame side members 12 and 13, and a frame bottom member 14.

[0019] At least one secondary frame is connected to the stationary frame 1, in the embodiment shown a sash 2 carrying a pane 4. The sash 2 is pivotally connected to the stationary frame 2 in order to be able to rotate the sash 2 to an open position. To that end, the sash 2 is provided hinge fitting part (not shown), cooperating with a counterpart hinge fitting part (not shown) provided on the frame 1. The sash 2 comprises, corresponding to the frame 1, a sash top member 21, two sash side members 22 and 23, and a sash bottom member 24. In principle, the hinge axis could be located arbitrarily in the roof window, but is here substantially centre-hinged. The roof window could be top-hinged as well, meaning that the hinge axis is located near the frame top member 11 and the sash top member 21.

[0020] From the shown closed position, the user operates the operating device of the window, here in the form of a handle 5 at the bottom member 24 of the sash 2, interacting with a striking plate 8 fastened to the bottom member 14 of the frame 1.

[0021] Finally, the roof window is provided with a ventilation device 6 accommodated in a top sash unit 7, acting to allow passage of air also in the closed position of the window. Further details of the ventilation device 6 and the top sash unit 7 are the subject of Applicant's co-pending patent application having the same filing date as the present application, and the contents thereof are incorporated herein by reference.

[0022] In the following, embodiments of the roof window will be described with particular focus on the handle 5.

[0023] As mentioned, the operating means for opening and closing the sash 2 relative to the frame 1 include the handle 5 which is rotatably connected to the sash bottom member 24. The handle 5 comprises a shaft 55 with a predefined length L_s and at least one cross-sectional dimension H_s . The shaft 55 could in principle have a number of cross-sectional configurations including for instance triangular or hexagonal, but in the embodiment shown, the shaft 55 has a substantially square cross-sectional configuration and the at least one cross-sectional dimension H_s is the side of the square. As indicated and shown most clearly in Fig. 4, the shaft 55 is here provided with chamfered edges.

[0024] The shaft 55 is lodged in an aperture 245 in the sash bottom member 24, and has a grip 51 for a user to grasp and a peg or pawl 56 to interact with a striking plate 8 connected to the frame bottom member 14. Other components of the handle 5 include crank portion 52, console 53 and washer 54. To fasten the handle 5 to the sash bottom member 24, apertures 246 are provided for receiving fastening means such as screws which in the mounted condition are located within a removable part (not shown in detail) of the console 53.

[0025] During manufacture of the roof window, a shock-absorbing bushing 9 is positioned on the shaft 55 to extend about the shaft 55 such that the bushing 9 envelops the shaft 55, at least partially, and the handle 5 with bushing 9 is connected to the sash bottom member 24. For reasons of readability of the drawing, the bushing 9 is here shown as two halves. While the bushing could in principle be formed as a two-component element, it will be a single element in most applications.

[0026] The bushing 9 has a predefined length L, at least one outer cross-sectional dimension D and an opening 92 with at least one cross-sectional dimension H. Referring to Fig. 7, the opening 92 in the bushing 9 has a substantially square configuration in the embodiment shown, and the at least one cross-sectional dimension H is the side of the square. At the corners of the square-shaped opening 92, rounded edges are provided. The bushing 9 here has a substantially cylindrical cross-sectional configuration and the at least one outer cross-sectional dimension is the diameter D of the bushing 9.

[0027] It is preferable that the predefined length L of the bushing 9 is chosen such that the bushing 9 extends about a major part of the length Ls of the shaft 55, preferably at least over 60% of the length Ls of the shaft 55.

[0028] In the embodiment shown, a free portion 55a of the shaft 55 is lodged within the sash bottom member 24, substantially in its entirety, and here the bushing 9 extends about the shaft 55 over substantially the entire free portion 55a of the length Ls of the shaft 55. In turn, this means that the shaft 5 is covered throughout its length located within the sash bottom member 24.

[0029] To hold the bushing 9 on the shaft 55 of the handle, it is preferred that the cross-sectional dimension H of the opening 92 in the bushing 9 substantially corresponds to the cross-sectional dimension Hs of the shaft 55 such that an interference fit is provided between the bushing 9 and the shaft 55.

[0030] Correspondingly, the aperture 245 in the sash bottom member 24 has a substantially cylindrical shape and an inner diameter substantially corresponding to the diameter D of the bushing 9.

[0031] The wall thickness of the bushing 9 should be chosen such that satisfactory shock-absorbing properties are achieved, while at the same time a sufficient wearability is obtained. Measured as the ratio between the diameter D and the square side H of the bushing 9 of the embodiment shown, it is preferred that the ratio lies in the range 0.2 and 0.65, preferably in the range 0.4 to 0.6, more preferably in the range 0.55 to 0.59. Suitable dimensions of bushing 9 are chosen in accordance with the physical requirements and material, but in typical examples the diameter D lies in the range 10 to 20 mm and the square side H in the range 5 to 10 mm. Here, H is about 8.3 mm and D is about 14.2 mm, hence the ratio is about 0.58.

[0032] The length L of the bushing 9 is chosen in dependence of the components of the sash, but typically lies in the range 30 to 60 mm, preferably in the range 40

to 50 mm. Here, L is about 44 mm.

[0033] In principle, the bushing 9 may be made from any suitable material meeting the demands to shock-absorbing properties and resistance to wear, but is advantageously made from a plastic material, such as a thermoplastic elastomer TPE. This material may easily and cost-effectively be provided as a moulded component for instance by extrusion or injection moulding.

[0034] The configuration of the frame 1 and the sash 2 may in principle be compact wooden structures; however, in the embodiment shown at least the sash bottom member 24 is provided as a moulded component comprising a shell 240 of a plastic material, such as polyurethane PU, enclosing a set of core members 241, 242, 243, and wherein the core member in which the shaft 55 of the handle 5 is lodged, here denoted first core member 241, is made from a relatively stronger material than the other core members of the set, here second and third core members 242, 243. Also visible in Fig. 6 is recess 249 which is present for manufacturing purposes, and the configuration of the frame bottom member 14 as comprising shell 140 and first and second core members 141, 142.

[0035] Finally, the striking plate 8 in the frame bottom member 14 comprises a lock recess 81, corresponding to closed position of the sash 2 relative to the frame 1, and a vent recess 82 allowing a slight opened position. The striking plate 8 is made from a plastic material reinforced by glass fibres. Furthermore, an aperture 83 for fastening means such as a screw is shown.

[0036] The invention is not limited to the embodiments shown and described in the above, but various modifications and combinations may be carried out.

35 List of reference numerals

[0037]

- | | |
|-----|---------------------|
| 1 | stationary frame |
| 11 | frame top member |
| 12 | frame side member |
| 13 | frame side member |
| 14 | frame bottom member |
| 2 | sash |
| 21 | sash top member |
| 22 | sash side member |
| 23 | sash side member |
| 24 | sash bottom member |
| 3 | mounting bracket |
| 4 | pane |
| 5 | handle |
| 51 | grip |
| 52 | crank portion |
| 53 | console |
| 54 | washer |
| 55 | shaft |
| 55a | free end of shaft |
| 56 | pawl |

6 ventilation device
 7 top sash unit
 8 striking plate
 81 lock recess
 82 vent recess
 83 aperture for fastening means
 9 bushing
 91 wall
 92 hole

parts of frame bottom member 14

140 shell
 141 first core member
 142 second core member

parts of sash bottom member 24

240 shell
 241 first core member
 242 second core member
 243 third core member
 245 shaft and bushing aperture
 246 apertures for fastening means
 249 recess

H square side of hole 92 in bushing 9
 D diameter of bushing 9
 L length of bushing 9
 Ls length of shaft 55
 Hs square side of shaft 55

Claims

1. A roof window comprising
 a frame (1) having a plurality of frame members including a top member, two side members and a bottom member (11, 12, 13, 14),
 a sash (2) having a plurality of sash members a top member, two side members and a bottom member (21, 22, 23, 24), and
 operating means including a handle (5), said handle (5) being rotatably connected to a sash member (24) and comprising a shaft (55) with a predefined length (Ls) and at least one cross-sectional dimension (Hs) lodged in an aperture (245) in the sash member (24), a grip (51) and a pawl (56) to interact with a striking plate (8) connected to the frame member (14),
characterised in that
 the handle (5) is connected to the sash bottom member (24) and is provided with a shock-absorbing

bushing (9) having a predefined length (L), at least one outer cross-sectional dimension (D) and an opening (92) with at least one cross-sectional dimension (H), and extending about the shaft (55).

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 2. A roof window according to claim 1, wherein the predefined length (L) of the bushing (9) is chosen such that the bushing (9) extends about a major part of the length (Ls) of the shaft (55), preferably at least over 60% of the length (Ls) of the shaft (55).
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3. A roof window according to claim 2, wherein a free portion (55a) of the shaft (55) is lodged within the sash bottom member (24) and the bushing (9) extends about the shaft (55) over substantially the entire free portion (55a) of the length (Ls) of the shaft (55).
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4. A roof window according to any one of the preceding claims, wherein the at least one cross-sectional dimension (H) of the opening (92) in the bushing (9) substantially corresponds to the respective at least one cross-sectional dimension (Hs) of the shaft (55) such that an interference fit is provided between the bushing (9) and the shaft (55).
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5. A roof window according to claim 4, wherein the shaft (55) has a substantially square cross-sectional configuration and the at least one cross-sectional dimension (Hs) is the side of the square, preferably the shaft (55) has chamfered edges.
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6. A roof window according to claim 5, wherein the opening (92) in the bushing (9) has a substantially square configuration and the at least one cross-sectional dimension (H) is the side of the square, preferably the opening (92) has rounded edges.
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7. A roof window according to any one of the preceding claims, wherein the bushing (9) has a substantially cylindrical cross-sectional configuration and the at least one outer cross-sectional dimension is the diameter (D) of the bushing (9).
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8. A roof window according to claim 7, wherein the aperture (245) in the sash bottom member (24) has a substantially cylindrical shape and an inner diameter substantially corresponding to the diameter (D) of the bushing (9).
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9. A roof window according to any one of claims 7 and 8, wherein the ratio between the diameter (D) and the square side (H) of the bushing (9) lies in the range 0.2 and 0.65, preferably in the range 0.4 to 0.6, more preferably in the range 0.55 to 0.59.
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10. A roof window according to claim 9, wherein the diameter (D) lies in the range 10 to 20 mm and the

square side (H) in the range 5 to 10 mm.

11. A roof window according to any one of the preceding claims, wherein the length (L) of the bushing (9) lies in the range 30 to 60 mm, preferably in the range 40 to 50 mm. 5
12. A roof window according to any one of the preceding claims, wherein the bushing (9) is made from a plastic material, such as a thermoplastic elastomer (TPE). 10
13. A roof window according to any one of the preceding claims, wherein the sash bottom member (24) is provided as a moulded component comprising a shell (240) of a plastic material, such as polyurethane (PU), enclosing a set of core members (241, 242, 243), and wherein the core member (241) in which the shaft (55) of the handle (5) is lodged is made from a relatively stronger material than the other core members (242, 243) of said set. 15
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14. A roof window according to any one of the preceding claims, wherein the striking plate (8) in the frame bottom member (14) comprises a lock recess (81) and a vent recess (82), and is made from a plastic material reinforced by glass fibres. 25

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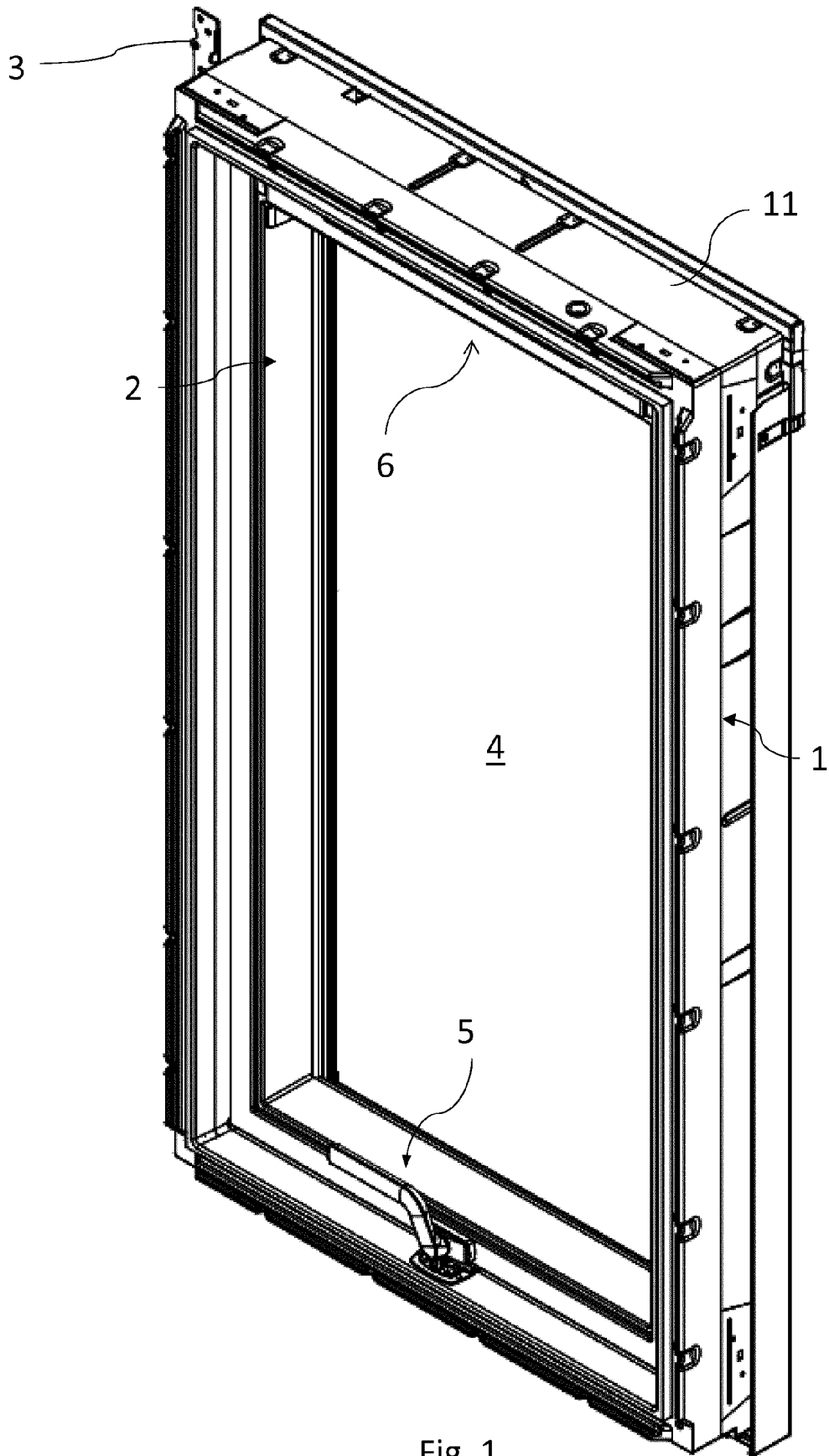


Fig. 1

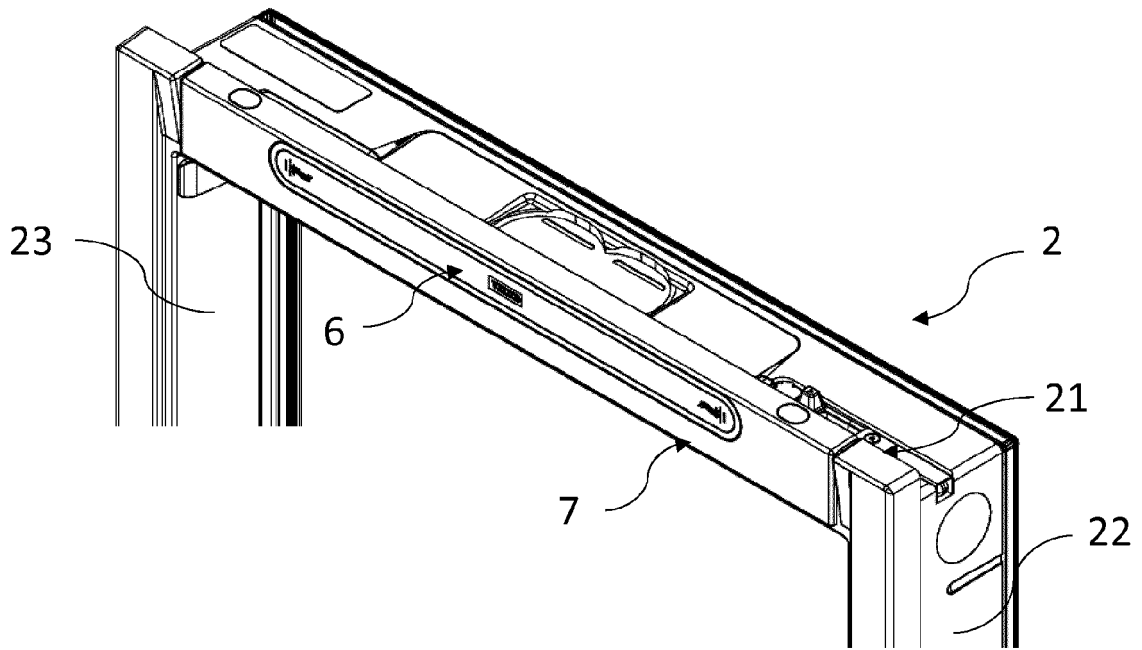


Fig. 2

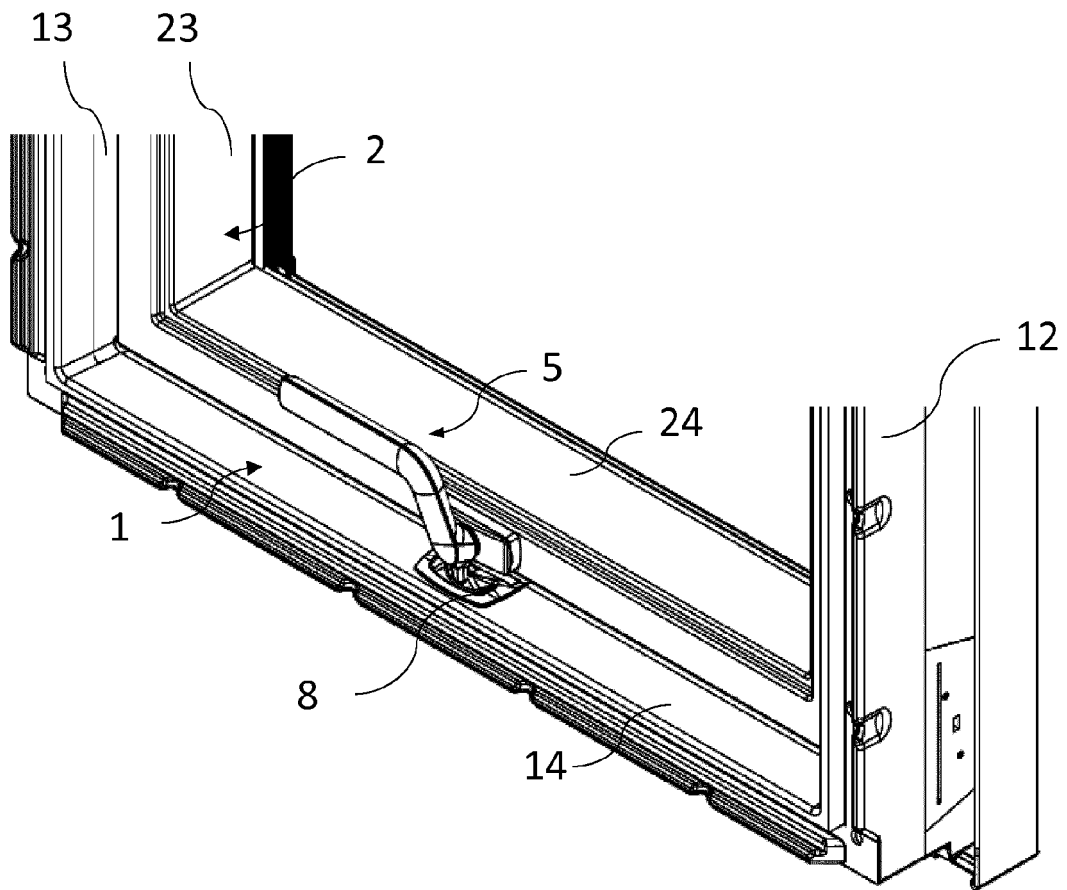


Fig. 3

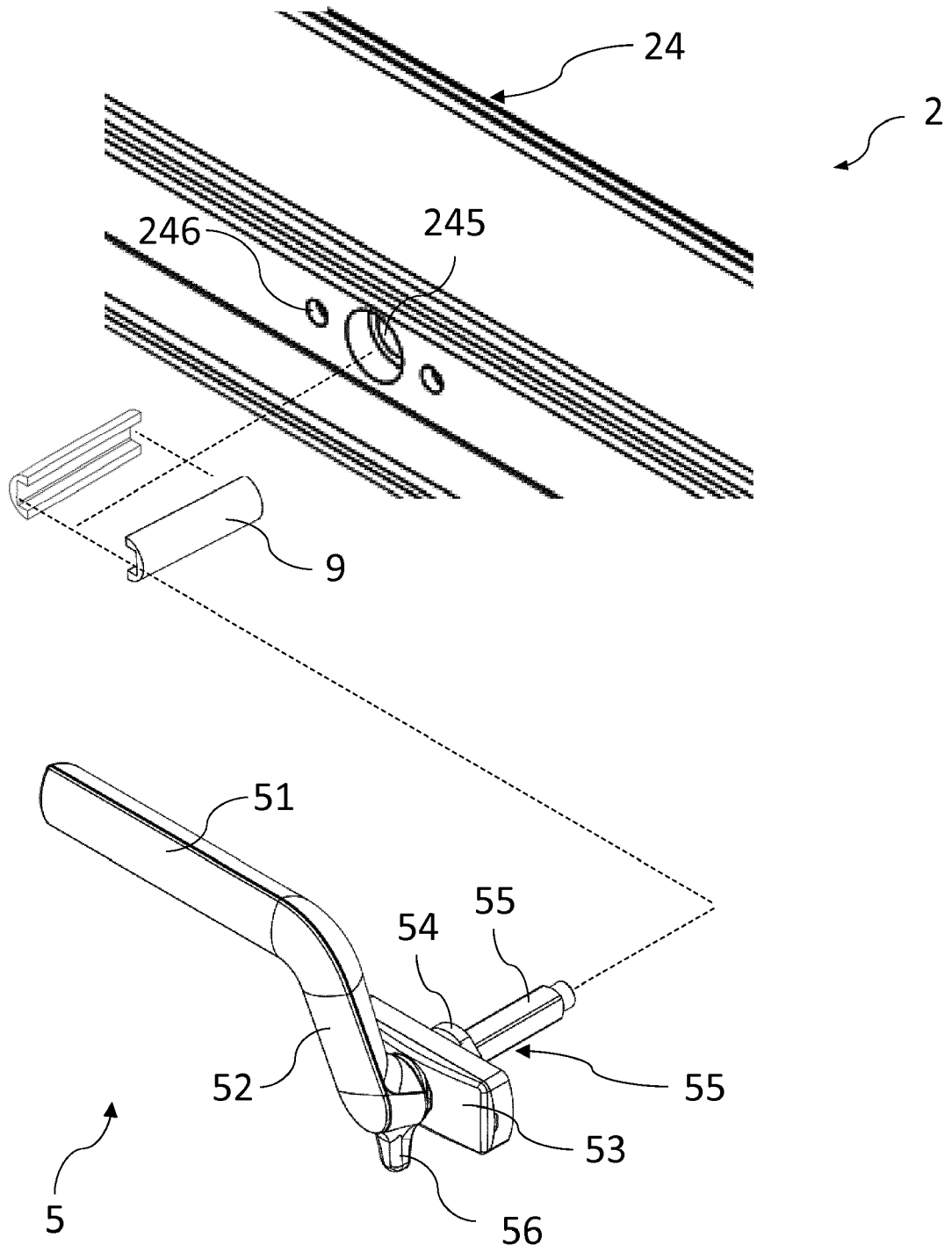


Fig. 4

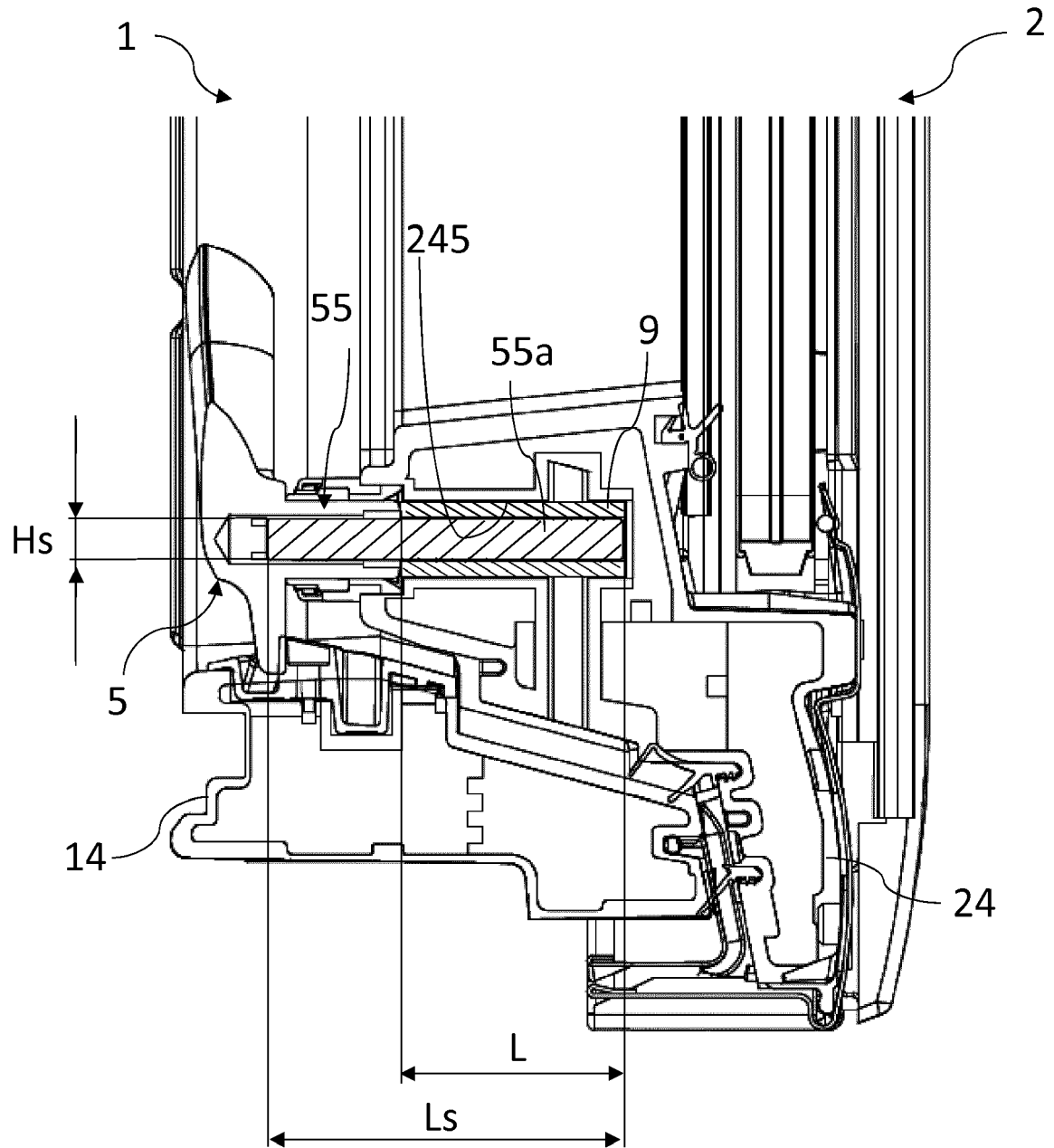


Fig. 5

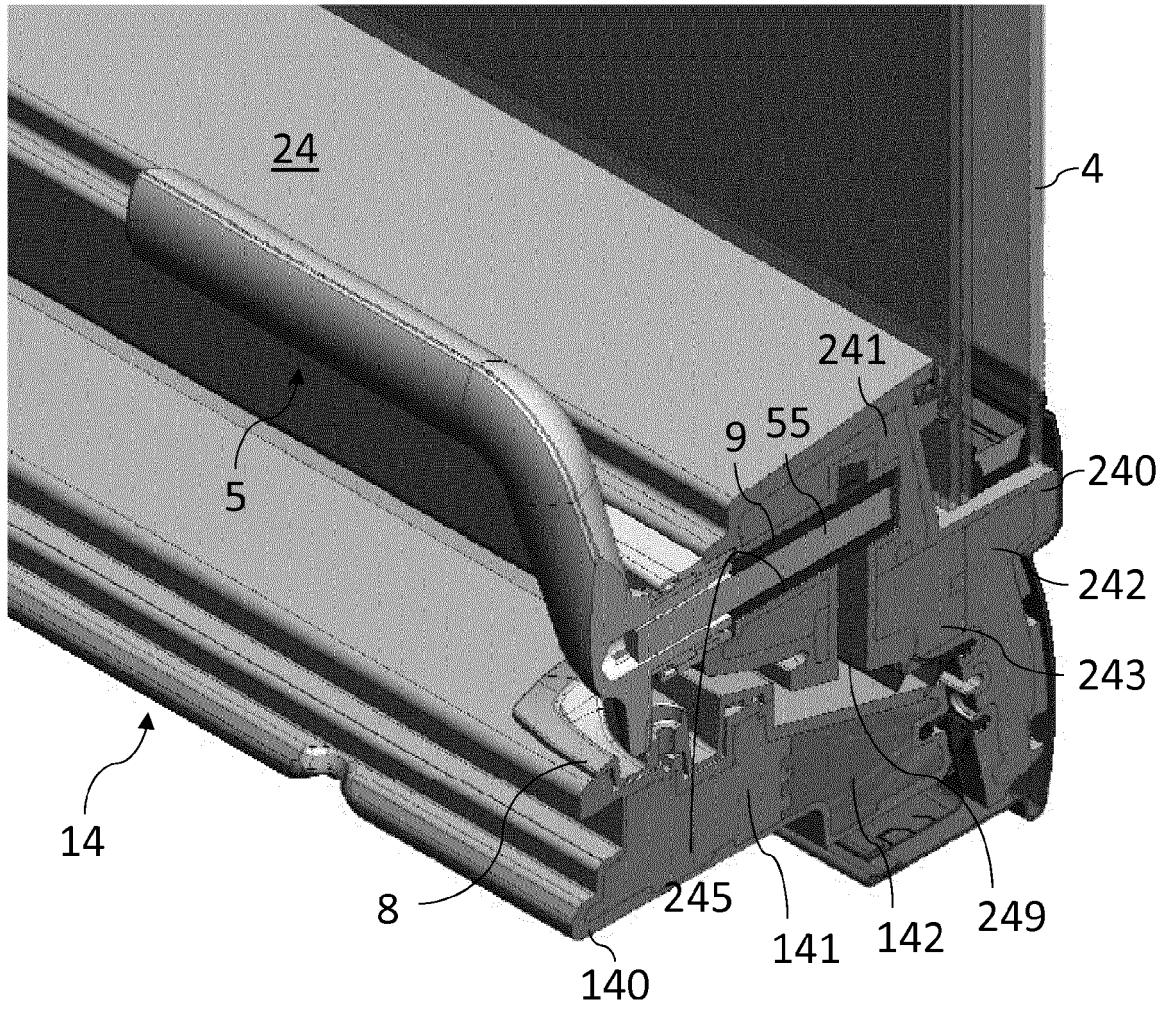


Fig. 6

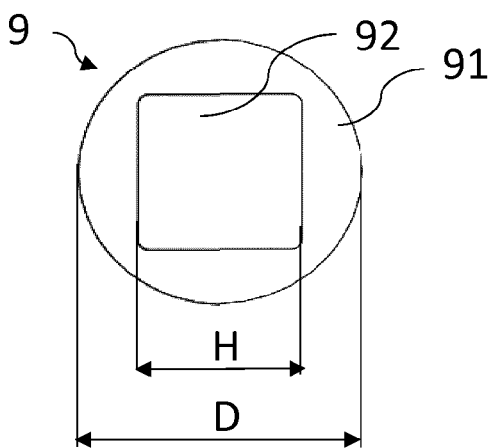


Fig. 7

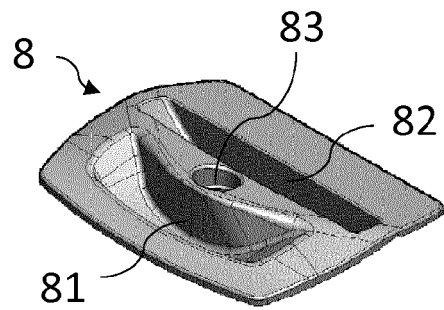


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 19 17 8222

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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A	US 2008/307836 A1 (KIM ET AL) 18 December 2008 (2008-12-18) * paragraph [0041] * -----	1	
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			E05B E04D E05C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 October 2019	Examiner Van Beurden, Jason
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ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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07-10-2019

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