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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).

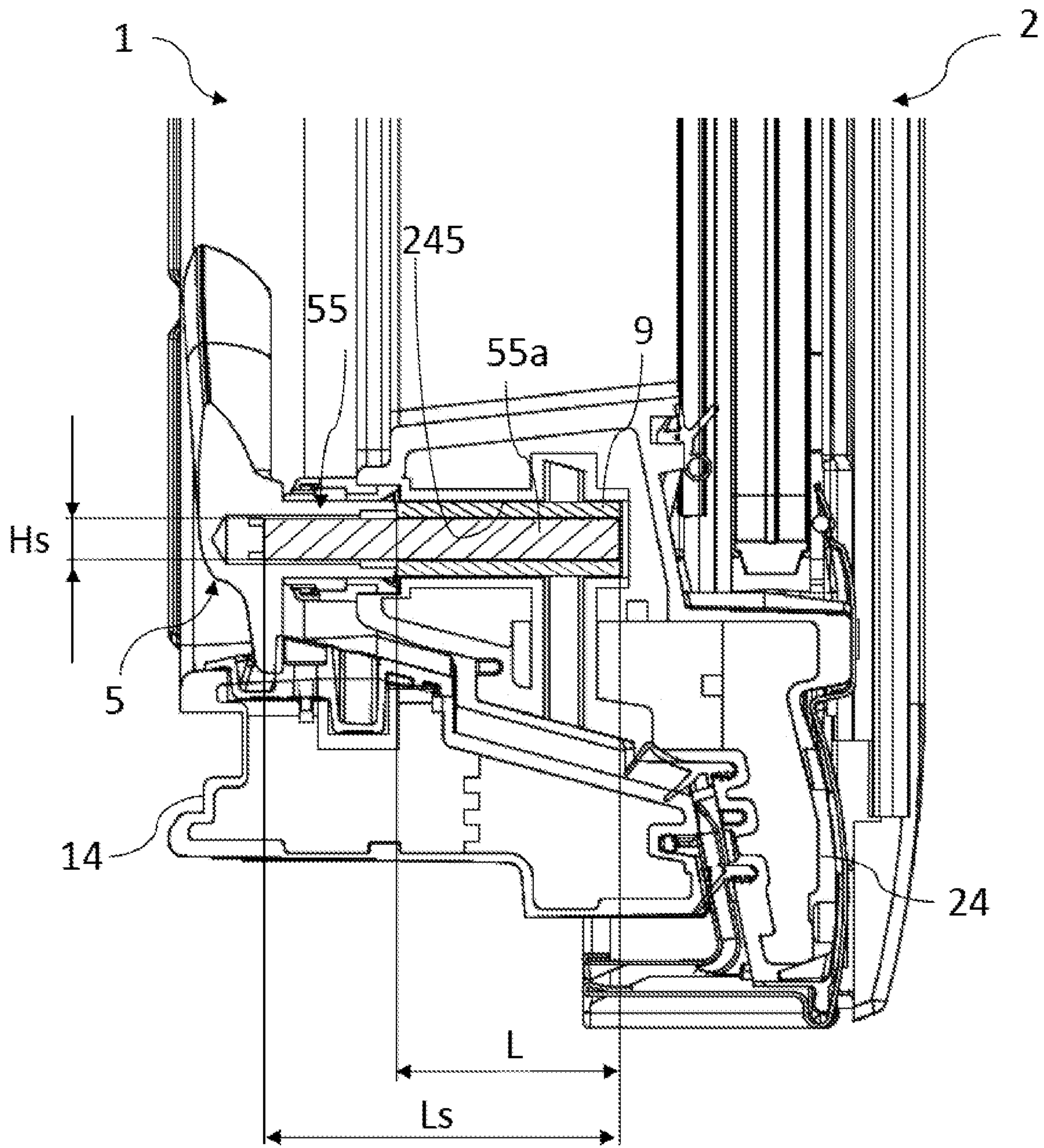


Fig. 5

Title of Invention

Roof window with improved handle.

Technical Field

5 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
10 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

15 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.

20 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.

 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
25 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
30 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.

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

5 Summary of Invention

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.

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
10 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.

In this way, a suitable compromise has been found in that the handle
15 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
20 the sash bottom member.

Presently preferred embodiments and further advantages will be apparent from the subsequent detailed description and drawings.

Brief Description of Drawings

25 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
30 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;

5 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

10 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

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

15 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
20 and 13, and a frame bottom member 14.

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
25 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
30 as well, meaning that the hinge axis is located near the frame top member 11 and the sash top member 21.

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.

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.

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

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 15 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 20 most clearly in Fig. 4, the shaft 55 is here provided with chamfered edges.

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 25 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.

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 30 9 envelops the shaft 55, at least partially, and the handle 5 with bushing 9 is connected to the sash bottom member 24.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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

List of reference numerals

- 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

Krav

1. Tagvindue omfattende
en karm (1) med flere karmelementer, der indbefatter et topelement,
to sideelementer og et bundelement (11, 12, 13, 14),
5 en ramme (2), som har flere rammeelementer, et topelement, to
sideelementer og et bundelement (21, 22, 23, 24), og
betjeningsmiddel indbefattende et håndtag (5), hvor håndtaget (5) er
drejeligt forbundet til et rammelement (24) og omfatter en aksel (55) med en
foruddefineret længde (L_s) og mindst én tværsnitsdimension (H_s) anbragt i et
10 hul (245) i rammeelementet (24), et greb (51) og en pal (56) til at samvirke med
et slutblik (8), der er forbundet med karmelementet (14),
k e n d e t e g n e t ved, at
håndtaget (5) er forbundet til rammebundelementet (24) og er
tilvejebragt med en stødabsorberende bøsning (9) med en foruddefineret
15 længde (L), mindst én ydre tværsnitsdimension (D) og en åbning (92) med
mindst én tværsnitsdimension (H) og udstrækker sig omkring akslen (55).
2. Tagvindue ifølge krav 1, hvor den foruddefinerede længde (L) af
bøsningen (9) er valgt således, at bøsningen (9) udstrækker sig omkring en
større del af længden (L_s) af akslen (55), fortrinsvis mindst over 60% af
20 længden (L_s) af akslen (55).
3. Tagvindue ifølge krav 2, hvor en fri del (55a) af akslen (55) er
anbragt inden i rammebundelementet (24), og hvor bøsningen (9) udstrækker
sig omkring akslen (55) over i det væsentlige hele den frie del (55a) af længden
(L_s) af akslen (55).
- 25 4. Tagvindue ifølge et hvilket som helst af de foregående krav, hvor
den mindst ene tværsnitsdimension (H) af åbningen (92) i bøsningen (9) i det
væsentlige svarer til den respektive mindst ene tværsnitsdimension (H_s) af
akslen (55), således at der er tilvejebragt en interferenspasning mellem
bøsningen (9) og akslen (55).
- 30 5. Tagvindue ifølge krav 4, hvor akslen (55) har en i det væsentlige
kvadratisk tværsnitskonfiguration og den mindst ene tværsnitsdimension (H_s)
er siden af kvadratet, fortrinsvis har skaftet (55) afrundede kanter.

6. Tagvindue ifølge krav 5, hvor åbningen (92) i bøsningen (9) har en i det væsentlige kvadratisk konfiguration, og den mindst ene tværsnitsdimension (H) er siden af kvadratet, fortrinsvis har åbningen (92) afrundede kanter.

5 7. Tagvindue ifølge et hvilket som helst af de foregående krav, hvor bøsningen (9) har en i det væsentlige cylindrisk tværsnitskonfiguration og den mindst ene ydre tværsnitsdimension er diameteren (D) af bøsningen (9).

8. Tagvindue ifølge krav 7, kendetegnet ved, at åbningen (245) i rammebundelementet (24) har en i det væsentlige cylindrisk form og en indre
10 diameter, som i det væsentlige svarer til bøsningens (9) diameter (D).

9. Tagvindue ifølge et hvilket som helst af kravene 7 og 8, hvor forholdet mellem diameteren (D) og den kvadratiske side (H) af bøsningen (9) ligger i intervallet 0,2 og 0,65, fortrinsvis i intervallet 0,4 til 0,6, mere foretrukket i intervallet 0,55 til 0,59.

15 10. Tagvindue ifølge krav 9, hvor diameteren (D) ligger i intervallet 10 til 20 mm og den kvadratiske side (H) i intervallet 5 til 10 mm.

11. Tagvindue ifølge et hvilket som helst af de foregående krav, hvor længden (L) af bøsningen (9) ligger i intervallet 30 til 60 mm, fortrinsvis i intervallet 40 til 50 mm.

20 12. Tagvindue ifølge et hvilket som helst af de foregående krav, hvor bøsningen (9) er fremstillet af et plastmateriale, såsom en termoplastisk elastomer (TPE).

13. Tagvindue ifølge et hvilket som helst af de foregående krav, hvor karmbundelementet (24) er tilvejebragt som en støbt komponent omfattende
25 en skal (240) af et plastmateriale, såsom polyuretan (PU), der omslutter et sæt af kerneelementer (241, 242, 243), og hvor kerneelementet (241), i hvilket skaftet (55) på håndtaget (5) er anbragt, er fremstillet af et relativt stærkere materiale end de andre kerneelementer (242, 243) af nævnte sæt.

14. Tagvindue ifølge et hvilket som helst af de foregående krav, hvor
30 slåpladen (8) i karmbundelementet (14) omfatter en låseudsparing (81) og en udluftningsudsparing (82) og er fremstillet af et plastmateriale forstærket med glasfibre.

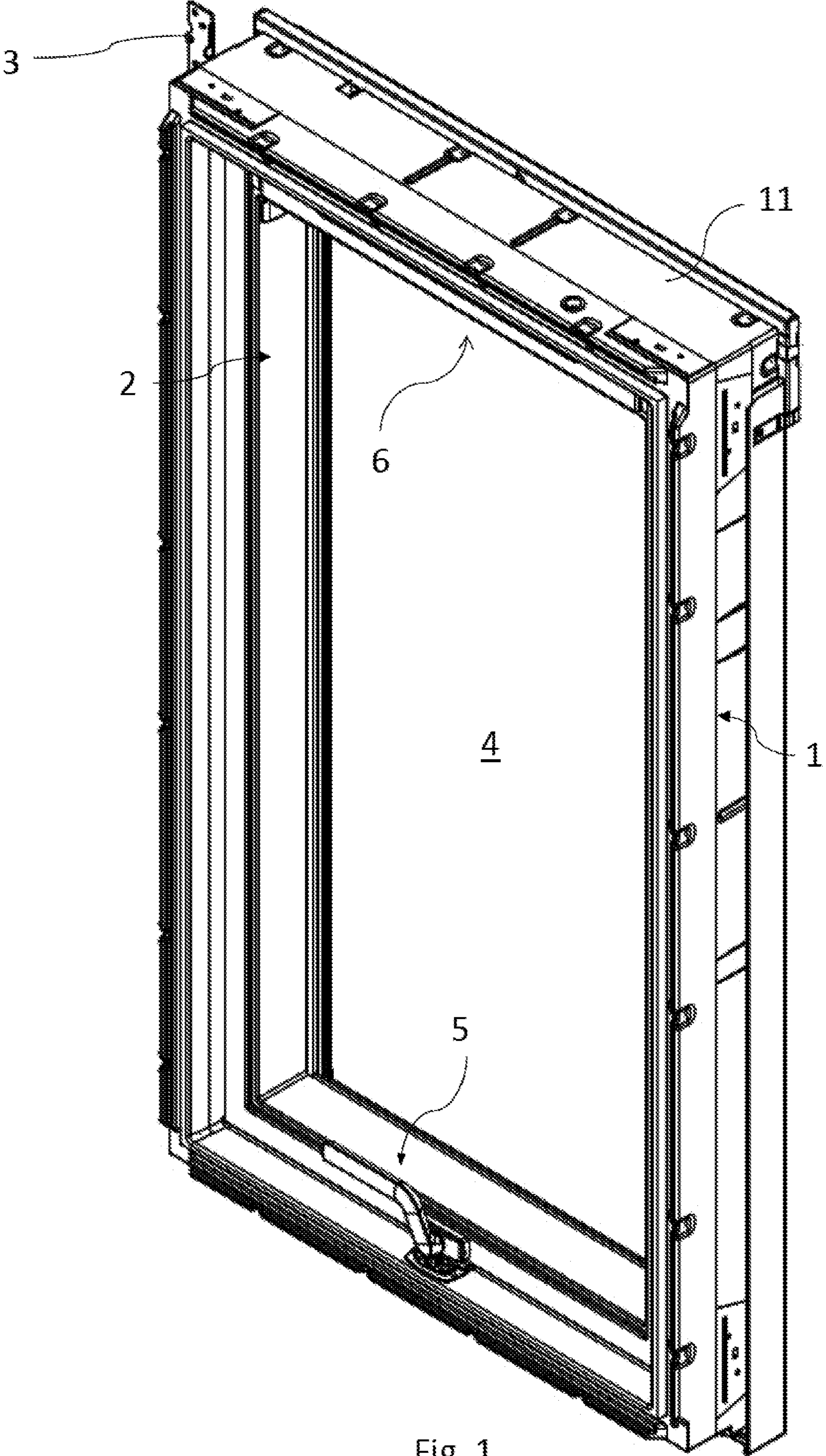


Fig. 1

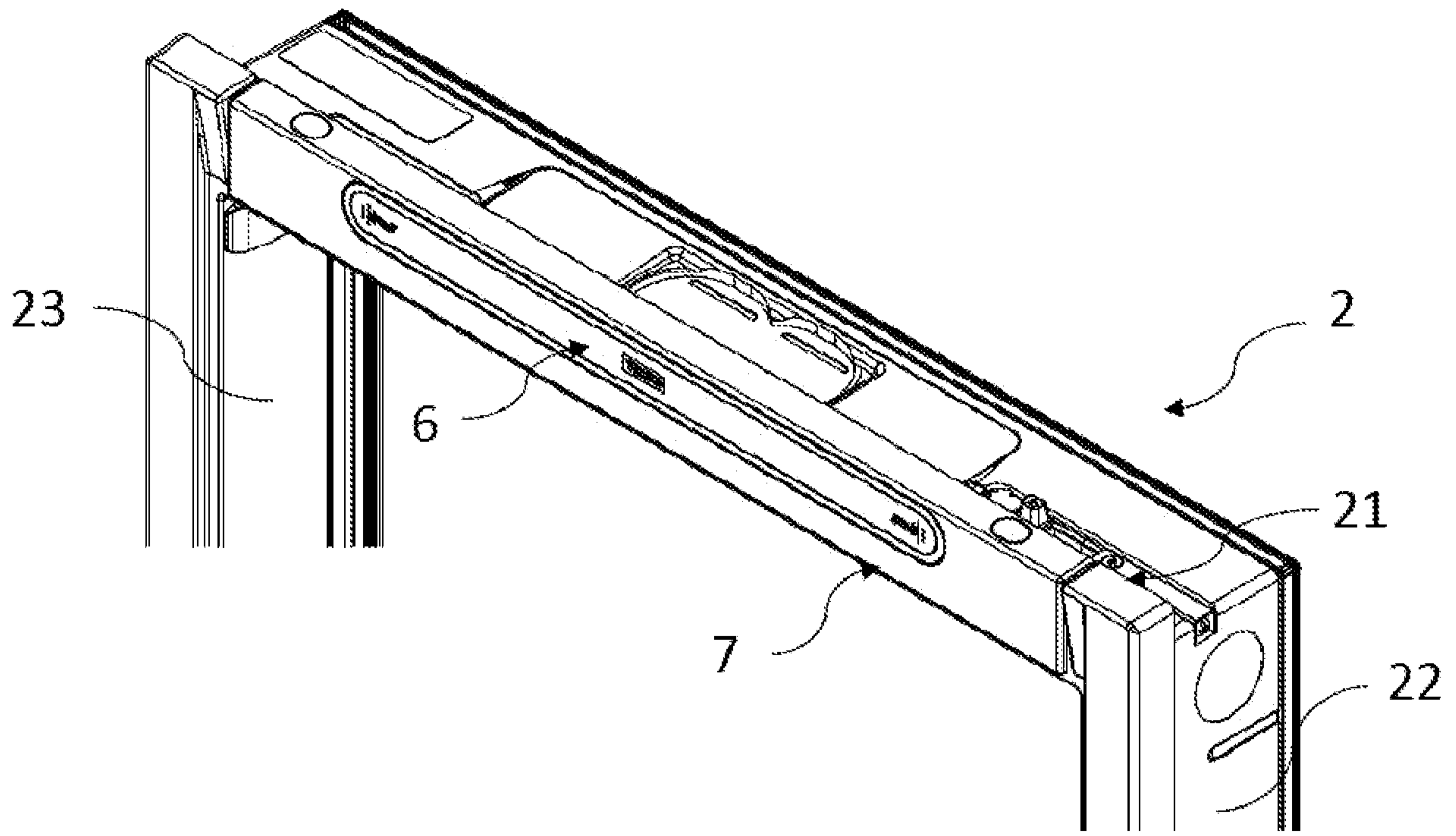


Fig. 2

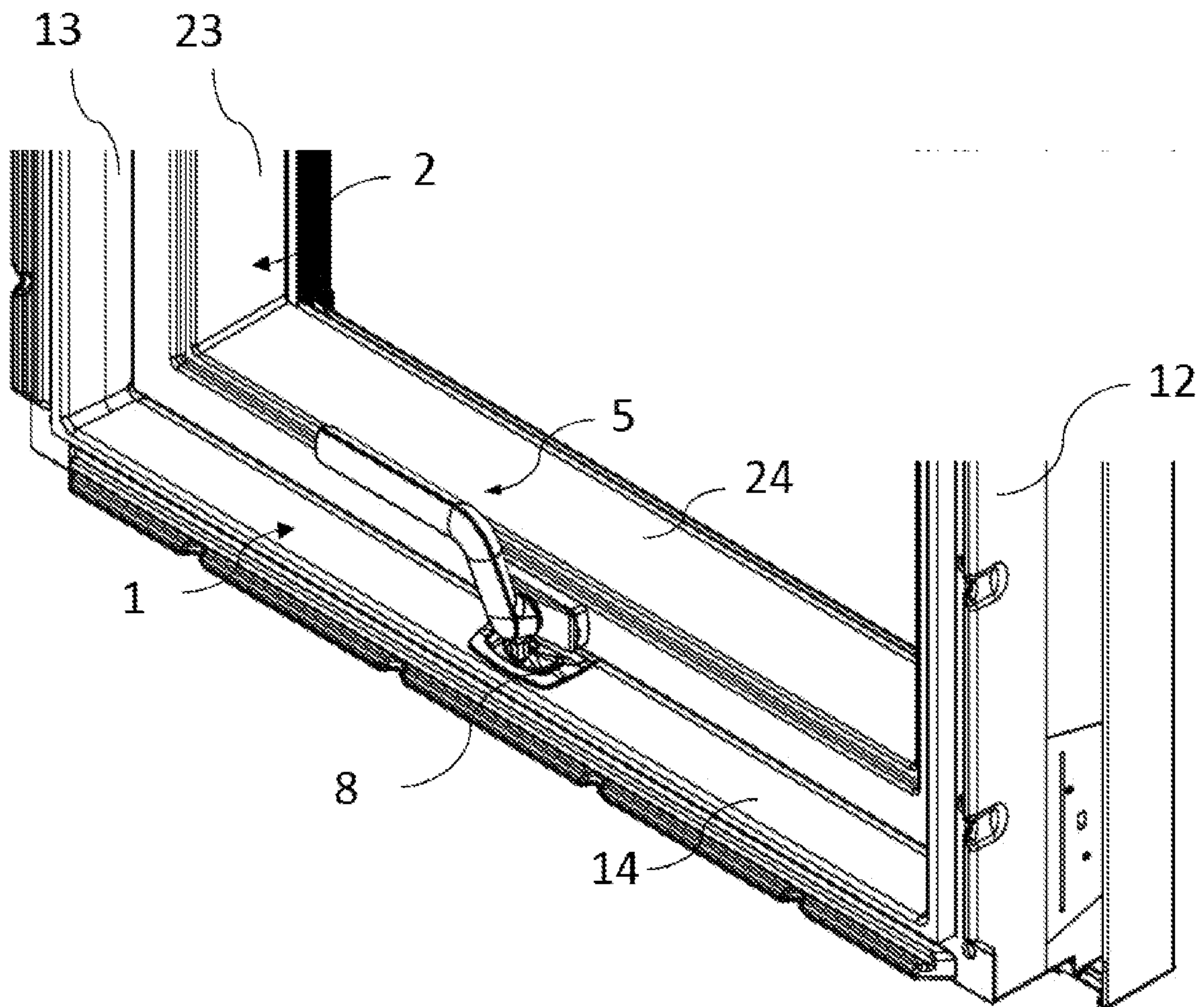


Fig. 3

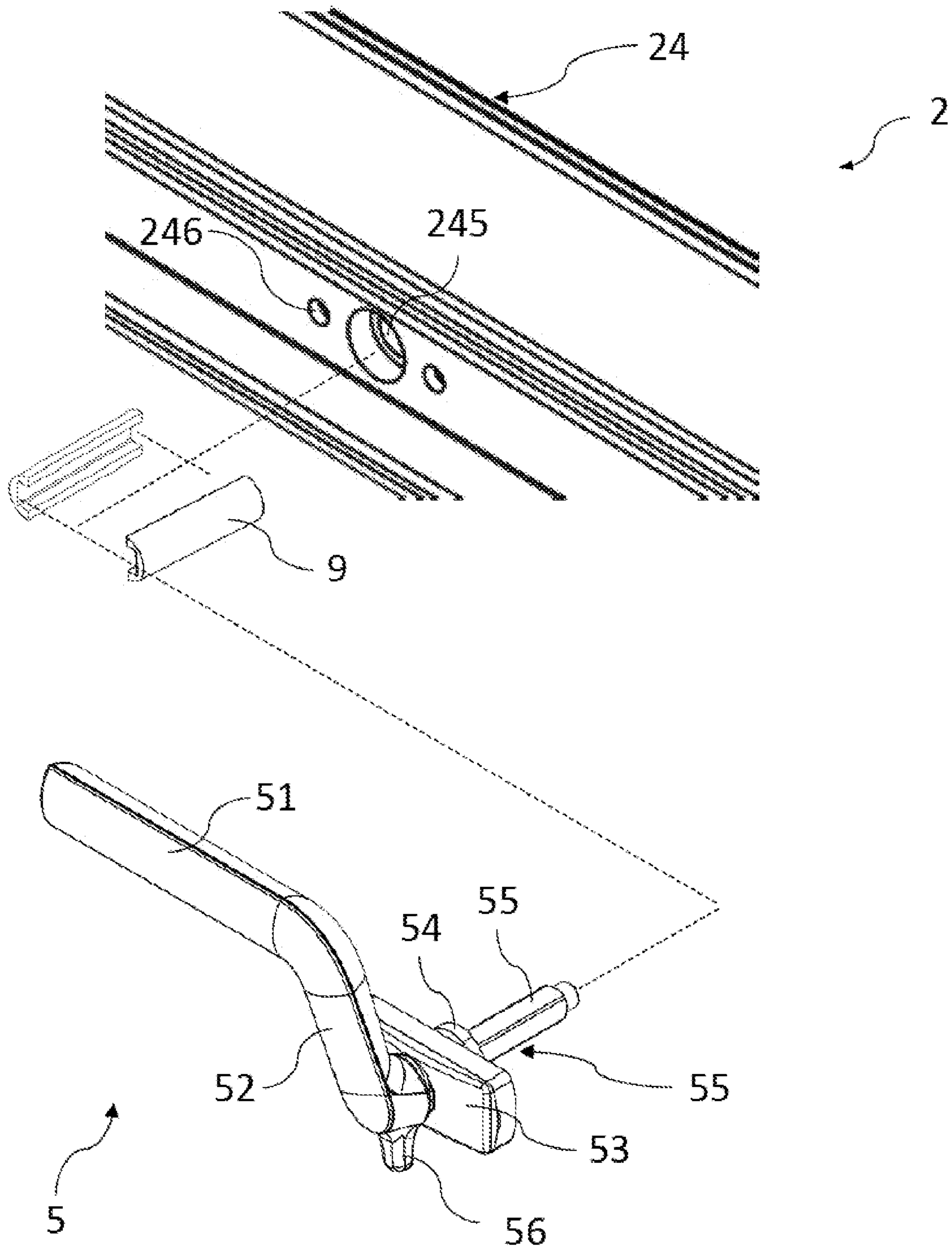


Fig. 4

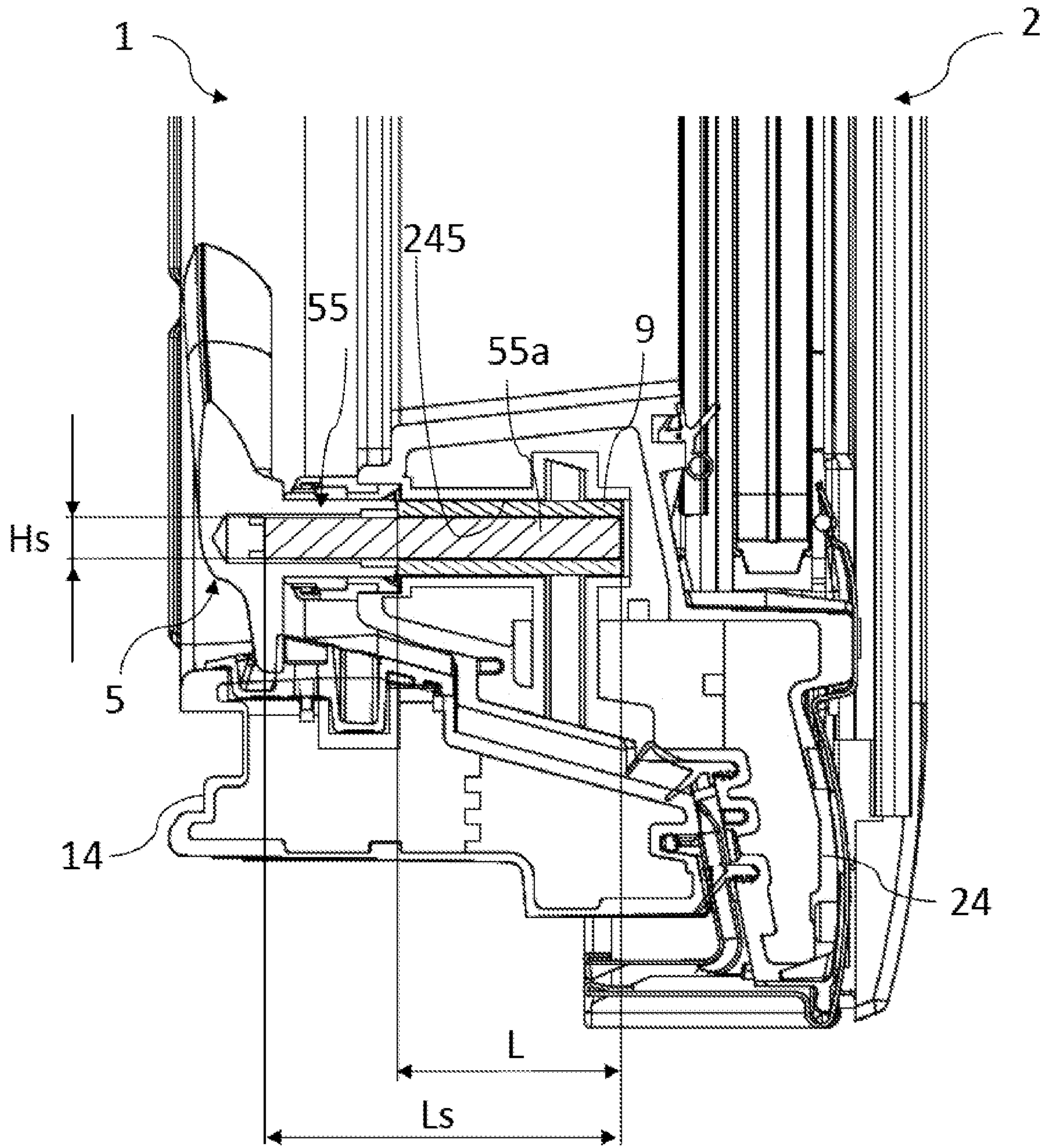


Fig. 5

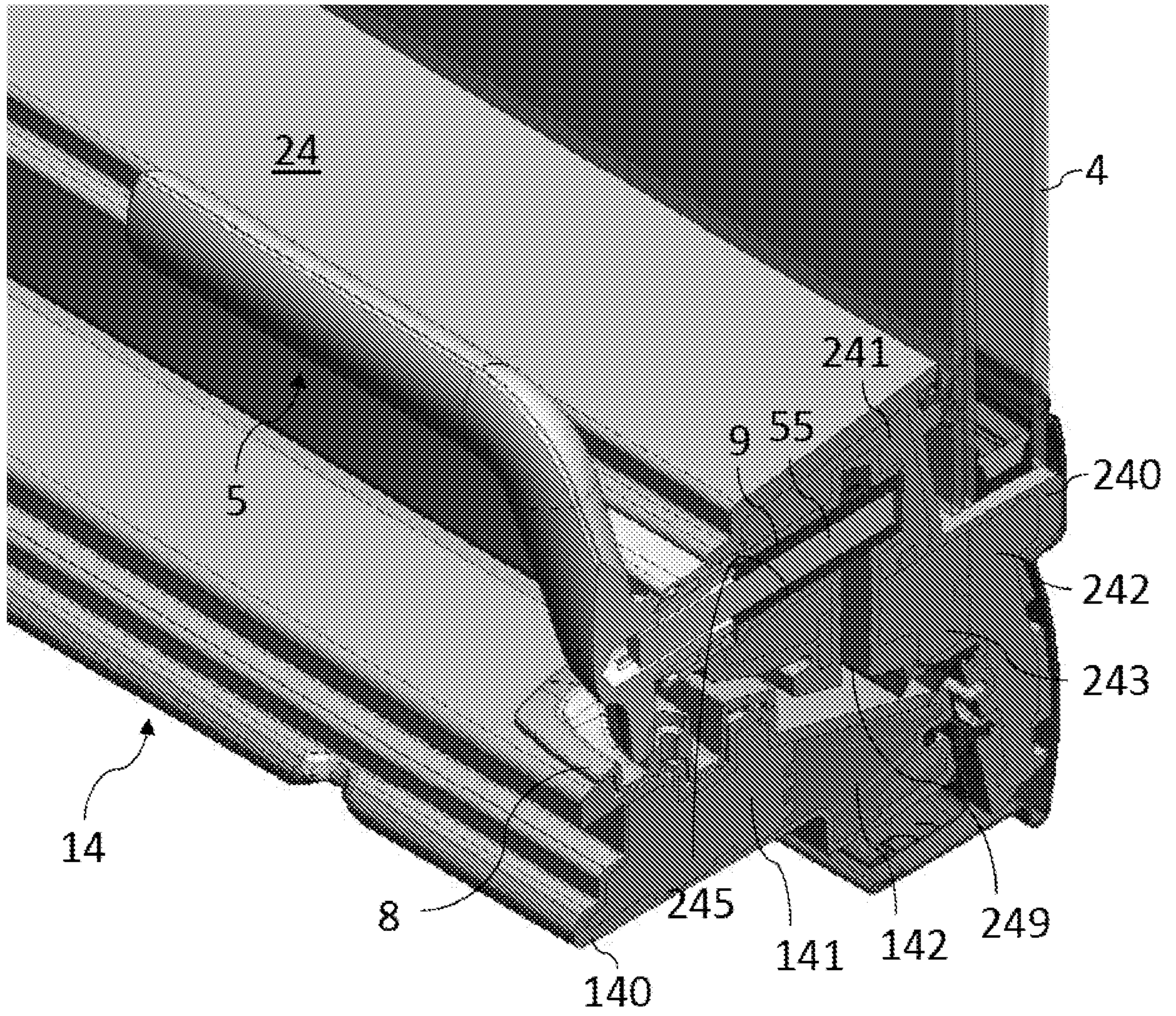


Fig. 6

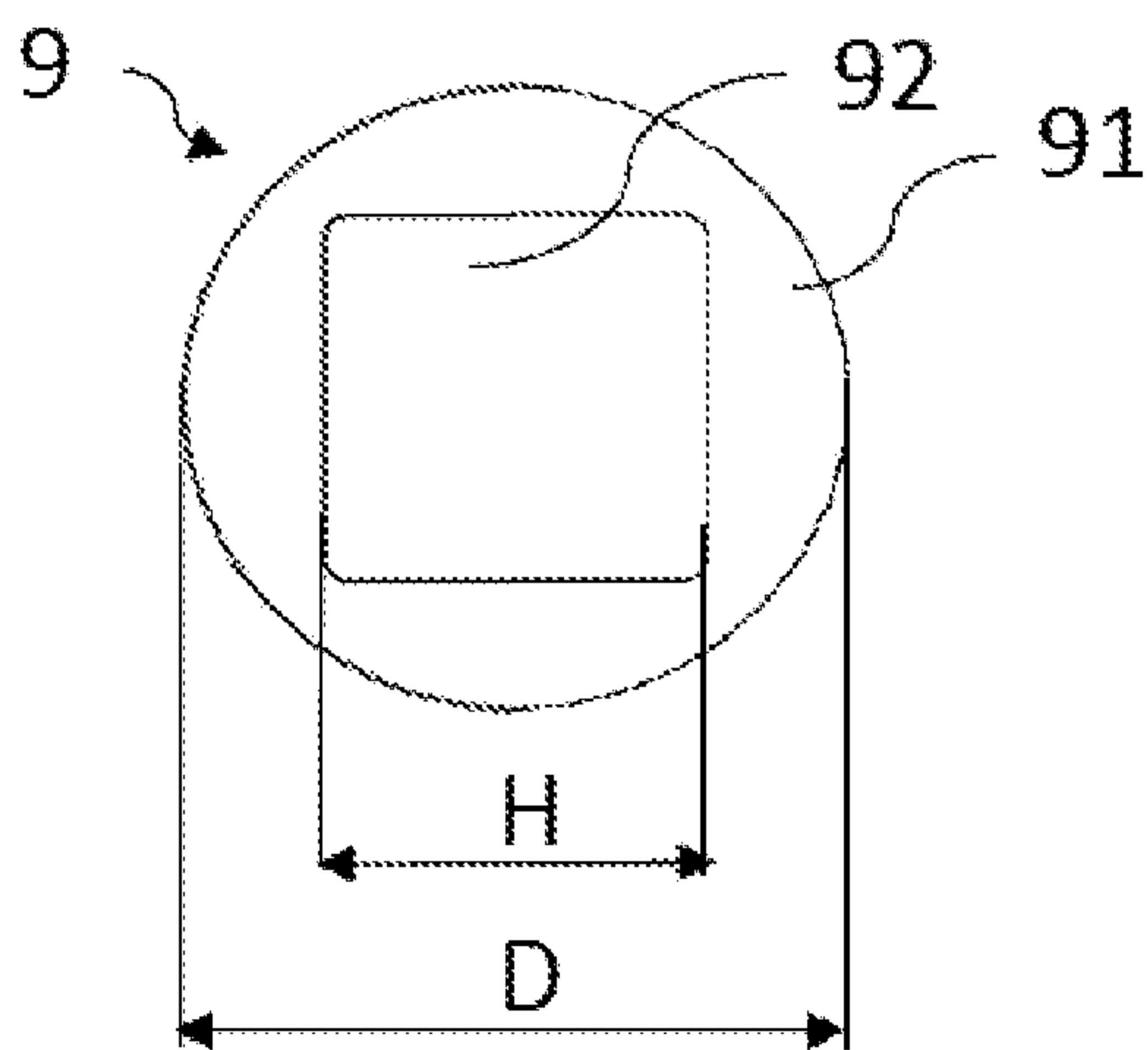


Fig. 7

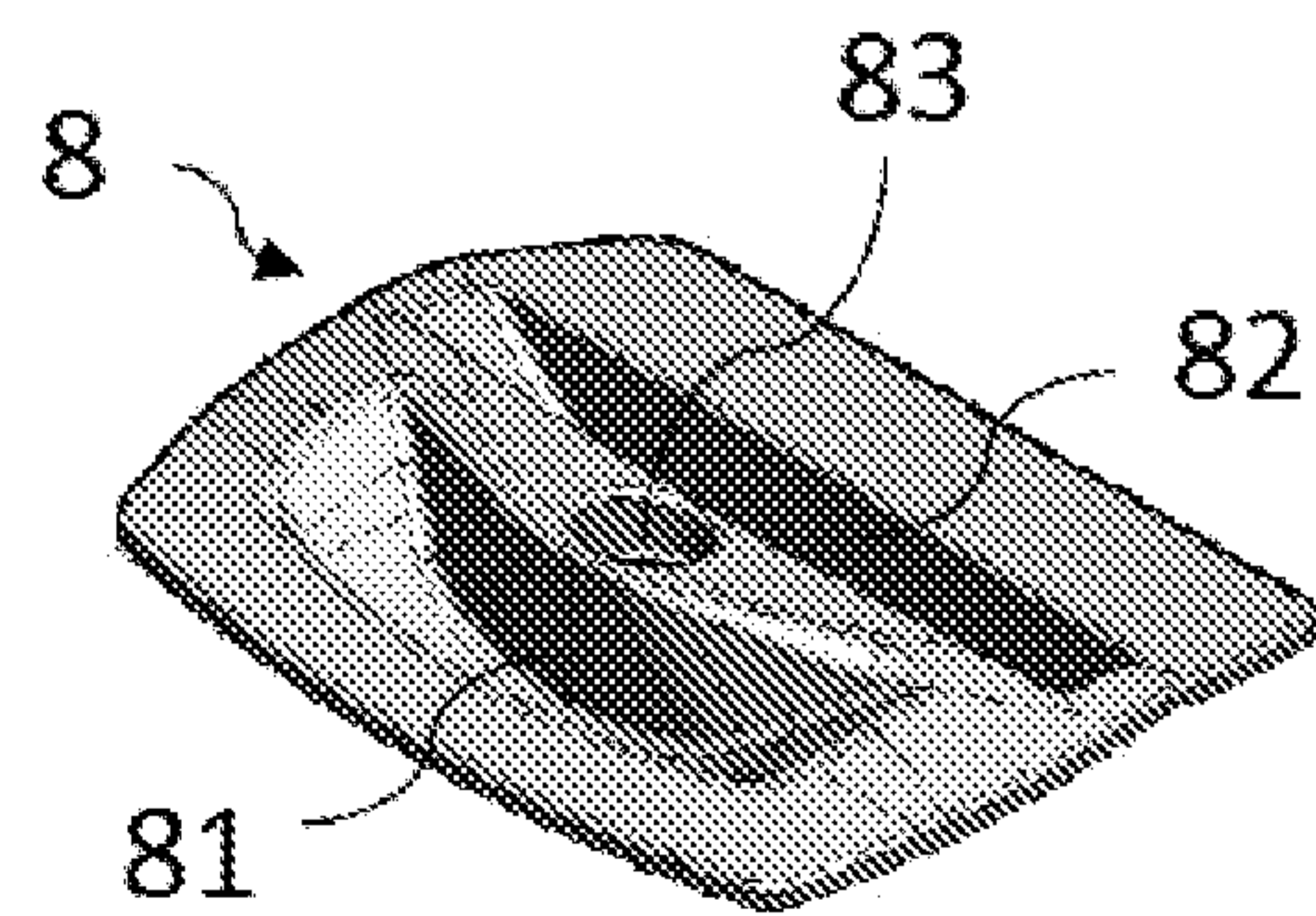


Fig. 8

SUPPLEMENTAL SEARCH REPORT - PATENT		Application No. PA 2018 70327
A. CLASSIFICATION OF SUBJECT MATTER E05B1/00 (2006.01), E04D13/03 (2006.01) According to International Patent Classification (IPC)		
B. FIELDS SEARCHED		
PCT-minimum documentation searched (classification system followed by classification symbols) IPC & CPC: E05B, E06B, E05C, E04D, E05F		
Documentation searched other than PCT-minimum documentation DK, NO, SE, FI: IPC-classes as above		
Electronic database consulted during the search (name of database and, where practicable, search terms used) EPODOC, WPI, English Full-Text		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant for claim No.
	No further documents found	
<input type="checkbox"/> Further documents are listed in the continuation of Box C.		
* Special categories of cited documents: "A" Document defining the general state of the art which is not considered to be of particular relevance. "D" Document cited in the application. "E" Earlier application or patent but published on or after the filing date. "L" Document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified). "O" Document referring to an oral disclosure, use, exhibition or other means.		"P" Document published prior to the filing date but later than the priority date claimed. "T" Document not in conflict with the application but cited to understand the principle or theory underlying the invention. "X" Document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone. "Y" Document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" Document member of the same patent family.
Danish Patent and Trademark Office Helgeshøj Allé 81 2630 Taastrup Denmark Tel.: +45 4350 8000 Fax: +45 4350 8001		Date of completion of the search report 09 June 2020
		Authorized officer Peter Simonsen Telefon nr. +45 43 50 83 25

SUPPLEMENTAL SEARCH REPORT - PATENT		Application No. PA 2018 70327
C (Continued). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant for claim No.