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(54) **Vehicle window lifter**

(57) A window lifter (1) comprises at least one guide (2, 3) suitable to be fastened to an inner panel (4) of a door (D) of a motor vehicle, wherein said at least one guide (2, 3) is suitable to slidably support a slider (5, 6) so configured to receive and support a window pane (7). The window lifter further comprises a flexible member (15) associated with the at least one guide (2, 3) at one end thereof, said flexible member (15) being a fastening member of the guide (2, 3) to the inner panel (4) of the door (D). The presence of the flexible member (15) allows to simplify assembly operations of the guide (2, 3), as well as to reduce its manufacturing costs and assembly time.

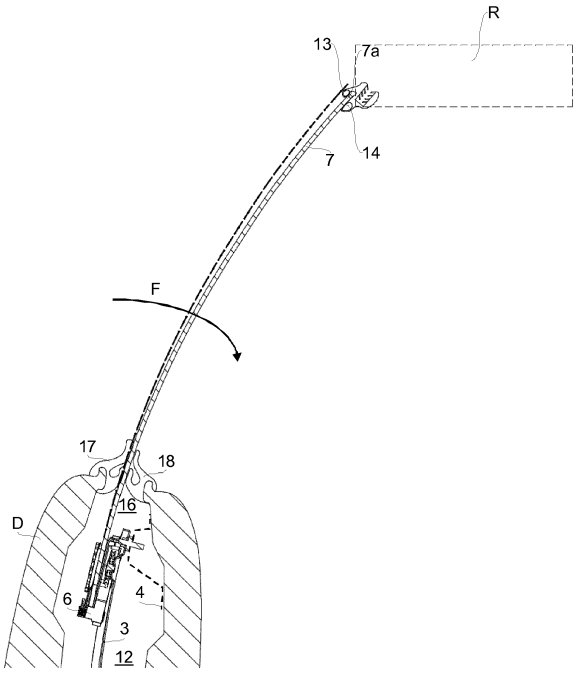

Fig.2

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Description

[0001] The present invention relates to a window lifter that may be mounted inside motor vehicles doors, and in particular to a window lifter for frameless windows.

[0002] The doors of a motor vehicle are generally provided with an inner panel, i.e. a supporting structure, on which various components such as, for example, the locks, hinges, handles and window lifters are mounted.

[0003] A window lifter generally comprises at least one guide adapted to slidably support a slider intended to receive and move a window pane of the door window.

[0004] The slider is generally driven by a kinematic chain that typically comprises one or more moving cables connected to the slider and forming a closed loop path around the guide. The moving cables are supported by pulleys or sliding blocks restrained to the guide and are wound around a drum arranged proximate to the guide. The drum is connected to a driving device which can be a manual drive, for example a crank, or an automatic drive, such as an electric gear motor.

[0005] For the maneuvering of window panes of a large size there are generally used window lifters comprising a pair of guides fastened to the door inner panel of the motor vehicle and arranged spaced apart and parallel to one another, wherein each guide is provided with a slider.

[0006] The window pane supported by the one or more sliders and by the respective guides enters and exits from a seat formed in the vehicle door; externally to the seat the window pane is generally guided by a frame restrained to the door inner panel. The frame is provided with a series of gaskets suitable to prevent ingress of air, dust, and water inside the passenger compartment of the vehicle. When the door window is fully closed, the frame completely surrounds the window pane along its periphery.

[0007] There are also motor vehicles, such as those of convertible type, wherein the doors are devoid of the frame surrounding the window panes externally to their seat and the window panes are entirely free along their periphery, with the exception of their lower portion that moves in and out of the door. The overall aesthetic effect provided by these door windows, generally known as "frameless windows", is a greater continuity and uniformity of the surface formed by the window panes, which allows a great freedom in the design of a motor vehicle.

[0008] Due to the absence of a frame, air, dust and water are prevented from entering the passenger compartment of the vehicle by the gaskets that border it, i.e. those arranged along the profiles of the vehicle frame and roof, or of its convertible top, which are completely in contact with the periphery of the window pane when the latter is in the outermost position relative to its seat in the door. In order to ensure adequate tightness conditions against the ingress of air, dust and water, the window panes of frameless windows are mounted so as to create a certain level of compression against the gaskets. This also allows frameless windows to withstand pressure differences between the inside and the outside of the passenger compartment generated by the air flows when the vehicle is travelling, without vibrating and/or shifting from their nominal position.

[0009] This type of mounting of frameless windows necessarily requires an adjustment phase, which is carried out once the window lifter has been assembled on the inner panel of the door. To this aim, the door guides are pivotally connected to the door inner panel about a substantially horizontal axis at one end thereof, i.e. about an axis parallel to the floor of the vehicle, and at the opposite end they are provided with adjustment means, e.g. screw registers, suitable to allow their assembly at different distances from the door inner panel. By acting on the adjusting means it is therefore possible to vary the inclination of each guide with respect to the door inner panel and thus to change the position of the window pane of the frameless window relative to the gaskets bordering the passenger compartment of the vehicle until the desired level of compression is obtained.

[0010] In the frameless windows known in the art, the guides are pivoted by way of a hinge comprising a metal block and a pin. The pin is restrained at one end of the guide and is inserted into the metal block, which is then fastened to the inner panel of the door, for example by a screw.

[0011] The assembly operations of the guides of known window lifters are considered rather laborious and time consuming by those skilled in the art, in particular because the available space at the fastening points of the guides is very small and because, in order to correctly insert and block the hinge, it is necessary to precisely align the metal block with a fastening hole formed on the door inner panel.

[0012] Furthermore, the components of the hinge must be pre-assembled on the guide, which increases its manufacturing costs.

[0013] The object of the present invention is therefore to provide a window lifter for frameless windows which can overcome these drawbacks. Said object is achieved with a window lifter the main features of which are specified in the first claim, while other features are specified in the remaining claims.

[0014] An idea of solution underlying the present invention is to replace the hinge formed by the pin and the metal block with a flexible member associated with one end of the guide and suitable to allow to fasten the guide to the door inner panel of the motor vehicle. The presence of a flexible member allows to simplify the assembly operations because it does not require a precise alignment between the parts as it happens in the case of a traditional hinge.

[0015] Moreover, the presence of a single component, instead of a pair of components such as the pin and the metal block, facilitates the handling of the guide and its positioning during assembly, in particular when other components are assembled on the door inner panel. The time required to assemble the guides of the window lifter

according to the invention are thus considerably reduced compared to those needed to assemble the guides of the window lifters known in the art.

[0016] The provision of a single component, i.e. the flexible member, in replacement of the components of a traditional hinge also allows to reduce the manufacturing costs of the individual guides of the window lifter.

[0017] The flexible member is advantageously formed integrally with the guide, allowing to further reduce the number of components, the manufacturing costs and the assembly time.

[0018] According to an embodiment of the invention, the flexible member is in the form of a flap obtained by forming a through opening proximate to the fastening point of the end of the guide to the door inner panel. This solution is extremely cost effective, easy to manufacture and advantageous, because it allows to carry out the invention by simply modifying guides already used in the field.

[0019] Depending on design requirements, the flap-shaped flexible member may be reinforced by forming one or more ribs in its bending direction, e.g. by drawing.

[0020] Alternatively, the flexible member may be formed as a separate component with respect to the guides of the window lifter and adapted to be mounted between the end of each guide and the door inner panel. This solution may be advantageous when, due to design needs, it is necessary to use different materials for the manufacturing of the flexible member and/or to use special shapes that cannot by easily obtained by starting from the basic structure of the guide.

[0021] Further advantages and features of the window lifter according to the present invention will become clear to those skilled in the art from the following detailed and non-limiting description of embodiments thereof with reference to the accompanying drawings in which:

- Figure 1 is a front view which schematically shows a window lifter mounted on the inner panel of a door;
- Figure 2 is a sectional view of the window lifter of Figure 1 taken along line II-II;
- Figure 3 is a perspective view schematically showing a guide of the window lifter according to the invention;
- Figures 4 and 5 are a perspective view and a longitudinal sectional view, respectively, showing a fastening mode of the guide of Figure 3 to the inner panel of a door, and
- Figures 6 and 7 are a perspective view and a longitudinal sectional view, respectively, showing an alternative fastening mode of the guide of Figure 3 to the inner panel of a door.

[0022] The window lifter according to the present invention comprises at least one guide adapted to be fastened to the inner panel of a motor vehicle door and provided with a slider configured to receive and support a window pane. The slider is slidably mounted on the guide.

[0023] In the embodiment shown in Figures 1 and 2, the window lifter 1 comprises in particular a pair of guides 2, 3 arranged spaced apart and parallel to one another and adapted to be fastened to the inner panel 4 of a door D of a motor vehicle (not shown). The guides 2, 3 are respectively provided with a slider 5, 6 adapted to receive and move a window pane 7.

[0024] The window lifter 1 also comprises in known manner a drum 8 around which one or more moving cables (not shown) connected to the sliders 5, 6 of each guide 2, 3 are wound. The drum 8 is connected to a manual or automatic driving device 9, for example an electric gear motor.

[0025] The moving cables are supported on each guide 2, 3 by pulleys and/or sliding blocks and pass from one guide to the other through special sheaths 10, 11a, 11b.

[0026] The sliders 5, 6 of Figures 1 and 2 are shown in an higher stop position of the respective guides 2, 3, i.e. in a position in which the window pane 7 is completely extracted from a seat 12 formed within the door D of the motor vehicle.

[0027] As explained above, in the case of motor vehicles provided with frameless windows, the door D of the motor vehicle is completely devoid of a frame adapted to surround the window pane when this is completely extracted from its seat 12, whereby in order to ensure adequate sealing conditions with respect to the ingress of air, dust and water into the passenger compartment it is necessary to create a certain compression level of the window pane 7 against the gaskets bordering the motor vehicle passenger compartment.

[0028] As shown in Figure 2, the upper edge 7a of the window pane 7 rests against the gaskets 13, 14 mounted along an edge of the roof R of the motor vehicle. The dashed line indicates a nominal position of the window pane 7 in which it exerts a minimum pressure against the gaskets 13, 14, which is not suitable to ensure adequate sealing conditions with respect to the ingress of air, dust and water. The solid line instead indicates a position wherein the window pane 7 is rotated as shown by the arrow F towards the passenger compartment of the motor vehicle so as to compress the seals 13, 14 to a greater extent, in particular in order to obtain a compression level suitable to obtain the desired tightness conditions with respect to air, dust and water.

[0029] As known, the rotation of the window pane 7 is obtained during assembly by modifying the inclination of the guides, 2, 3, of the window lifter 1 with respect to the inner panel 4 of the door D of the motor vehicle. This is obtained in particular by pivotally connecting one end of the guides 2, 3 to the inner panel 4 of the door D and by varying the distance between the opposite end of each guide and the inner panel 4 by suitable adjusting means, for example, screw registers.

[0030] According to the present invention, the window lifter 1 comprises a flexible member associated to one end of its at least one guide and configured to allow to fasten it to the inner panel 4 of the door. Thanks to the

use of a flexible member it is possible to obtain a rotation of the window pane 7 without resorting to a traditional hinge as in the case of the window lifters known in the field, but exploiting the deformation of the flexible member in the elastic range. This solution allows to simplify the traditional pivot connection of the guides of a window lifter on the inner panel of the door from a mechanical point of view, as well as to reduce the manufacturing costs of the guides and their assembly times.

[0031] According to a preferred embodiment, the flexible member is integrally formed in at least one guide of the window lifter.

[0032] Referring now to Figure 3, which shows for simplicity only a guide of the window lifter 1, for example the guide 2, the flexible member 15 is in the form of a flap. The flap 15 is integrally formed in the guide 2 at one end thereof by forming a through opening, for example a U-shaped through opening, around a hole 2a, which allows to fasten it to the inner panel 4 of the door D. This solution is particularly advantageous since it allows to carry out the invention e.g. by modifying a standard guide, and in any case without resorting to additional elements or to deep changes to the design of the fastening members of the guide.

[0033] Depending on design requirements, the flexible member 15 may be suitably stiffened by way of one or more ribs oriented along the bending direction.

[0034] Referring again to Figure 2, the flexible member 15 is preferably associated to the upper end of each guide 2, 3, i.e. the end intended to be arranged proximate to a slit 16 allowing the window pane 7 to come out from its seat 12 within the door D. It will be understood that the flexible member 15 may also be associated to the opposite end of each guide 2, 3, also allowing a variation of their inclination and therefore a rotation of the window pane 7 for adjusting the level of compression on the gaskets. However, the positioning of the flexible member at the upper ends of the guides 2, 3 is preferred, because the greater proximity of the rotation axis to the exit slit 16 of the window pane 7 from the seat 12 results in a smaller deformation of the gaskets 17, 18 arranged to close of the slit 16 and therefore allows to maintain an adequate level of tightness with respect to air, dust and water compatibly with the degree of rotation of the window pane 7 during the adjustment phase.

[0035] The assembly of the guides 2, 3 on the inner panel 4 of the door at the end where the flexible member 15 is arranged, is generally carried out by means of a screw or a threaded pin. Considering the small thickness of the guides, it is preferable to use a holding member associated with the flexible member 15 and arranged coaxially to the fastening hole of the guide to the inner panel 4 of the door D. The holding member is provided with a threaded hole adapted to receive and hold the screw or threaded pin.

[0036] In the embodiment shown in Figures 4 and 5, the window lifter 1 comprises a holding member in the form of a nut 19. The guide 2 is fastened in known manner to the inner panel 4 of the door by means of a special threaded pin 20 that has a maneuvering central portion 20a having a cylindrical shape and two threaded posts 20b and 20c the profiles of which have opposite thread directions. The threaded pin 20 is arranged between the guide 2 and the inner panel 4 of the door D, while the nut 19 is welded on the flexible element 15 on the opposite side of the guide 2. A threaded post, for example the post 20b, is inserted into the fastening hole of the guide 2, while the opposite post 20c is inserted into a corresponding hole formed in the inner panel 4 of the door D. Similarly to the threaded post 20b, the threaded post 20c can also be blocked on the inner panel 4 of the door D by a nut.

[0037] In the embodiment shown in Figures 6 and 7, the window lifter 1 comprises a holding member in the form of a metal block 21 provided with a threaded hole 21a adapted to receive and hold the threaded pin 20. The metal block 21 is also provided with a slit 21b formed in the direction of its thickness, e.g. along a median plane thereof, and dimensioned so as to allow its fitting on the flap-shaped flexible member 15. The slit 21b is dimensioned so that, once the metal block is fitted on the flexible element 15, the threaded hole 21a is coaxial with the fastening hole of the guide 2. This solution allows to further facilitate the assembly of the guide 2 on the inner panel 4 of the door D. In fact, once the metal block 21 is fitted on the flexible member 15, its position is blocked and the fastening holes are immediately aligned, whereby in order to assemble the guide 2, it is sufficient to rotate the central portion 20a of the threaded pin 20 without having to manually align the other components.

[0038] It is clear that the embodiment of the invention herein described and illustrated is only an example susceptible of numerous variants. For example, the flexible member 15 might be integrally formed with the guide 2, 3 but protrude from its end outwards, thus moving the fastening point of the guide to the inner panel 4 of the door D away from the guide. This solution may be advantageous in case of interference problems among the mechanical components mounted on the guide, such as the pulleys and/or sliding blocks that guide the moving cables of the slider, and those mounted or to be mounted on the inner panel 4 of the door D proximate to the fastening points of the guides 2, 3 of the window lifter 1.

[0039] Furthermore, the flexible member 15 might be a component completely separate from the guides 2, 3 of the window lifter 1 and adapted to be mounted between the end of each guide 2, 3 and the inner panel 4 of the door D. This solution may be advantageous when, due to design needs, it is necessary to use different materials for the manufacture of the flexible member 15 and/or use particular shapes that are cannot be easily obtained by starting from the basic structure of the guide 2, 3.

Claims

1. A window lifter (1) comprising at least one guide (2,

3) suitable to be fastened to an inner panel (4) of a door (D) of a motor vehicle, wherein said at least one guide (2, 3) is suitable to slidably support a slider (5, 6) so configured to receive and move a window pane (7), said window lifter (1) further comprising a flexible member (15) associated with the at least one guide (2, 3) at one end thereof, said flexible member (15) being a fastening member of the guide (2, 3) to the inner panel (4) of the door (D), **characterized in that** said flexible member (15) is integrally formed in the guide (2, 3).

2. A window lifter (1) according to the claim 1, wherein said flexible member (15) is a flap obtained by forming a through opening in the guide (2, 3) around a hole (2a) allowing to assemble it to the inner panel (4) of the door (D).

3. A window lifter (1) according to claim 1, wherein said flexible member (15) is a flap outwardly protruding from an end of the guide (2, 3).

4. A window lifter (1) according to any one of claims 1 to 3, wherein said flexible member (15) comprises one or a number of ribs oriented in a bending direction thereof.

5. A window lifter (1) according to any one of claims 1 to 4, further comprising adjustment means arranged at the end of the guide (2, 3) opposite to the end at which the flexible member (15) is arranged, said adjustment means being suitable to adjust the distance between the guide (2, 3) and the inner panel (4) of the door (D).

6. A window lifter (1) according to claim 5, wherein said adjustment means comprise a screw register.

7. A window lifter (1) according to any one of previous claims 1 to 6, wherein the flexible member (15) is associated with the end of the guide (2, 3) intended to be arranged proximate to a slit (16) allowing the window pane (7) to come out from a seat (12) formed inside the door (D) of the motor vehicle.

8. A window lifter (1) according to any one of claims 1 to 7, further comprising a holding member (19; 21) so configured to receive a threaded pin (20) suitable to allow to assemble the guide (2, 3) to the inner panel (4) of the door (D), said holding member (19; 21) being suitable to be restrained to the flexible member (15) coaxially to the assembling hole (2a) of the guide (2, 3) and being provided with a threaded hole (19a; 21a) suitable to receive and hold said threaded pin (20).

9. A window lifter (1) according to claim 8, wherein said holding member is a nut (19).

10. A window lifter (1) according to claim 8, wherein said holding member is a metal block (21), said metal block (21) being provided with a slit (21b) formed in the direction of its thickness and sized so as to allow to insert the block (21) into the flexible member (15) and such that, once the block (21) is inserted in the flexible member (15), said threaded hole (21a) is aligned with the assembling hole (2a) of the guide (2).

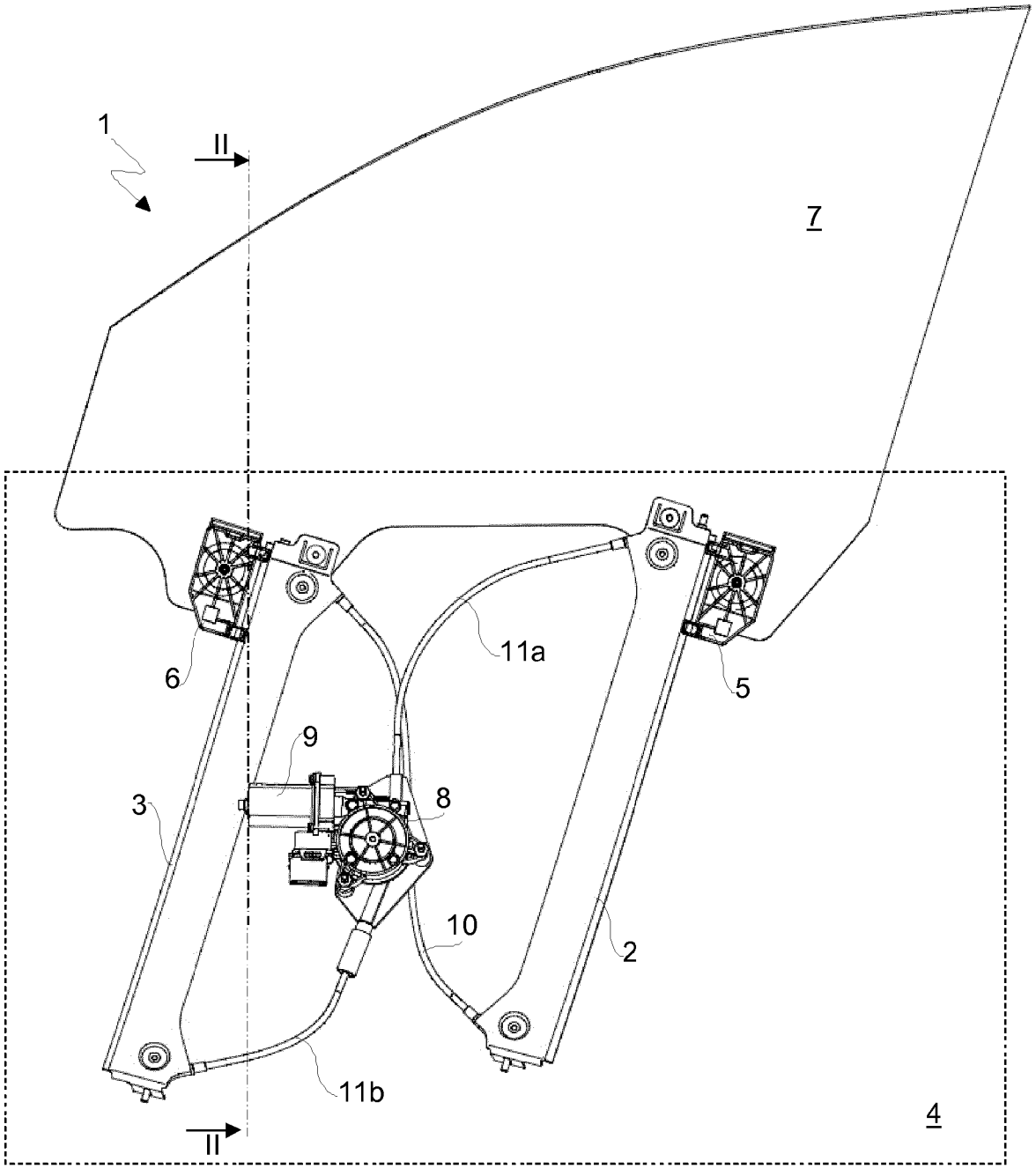

Fig.1

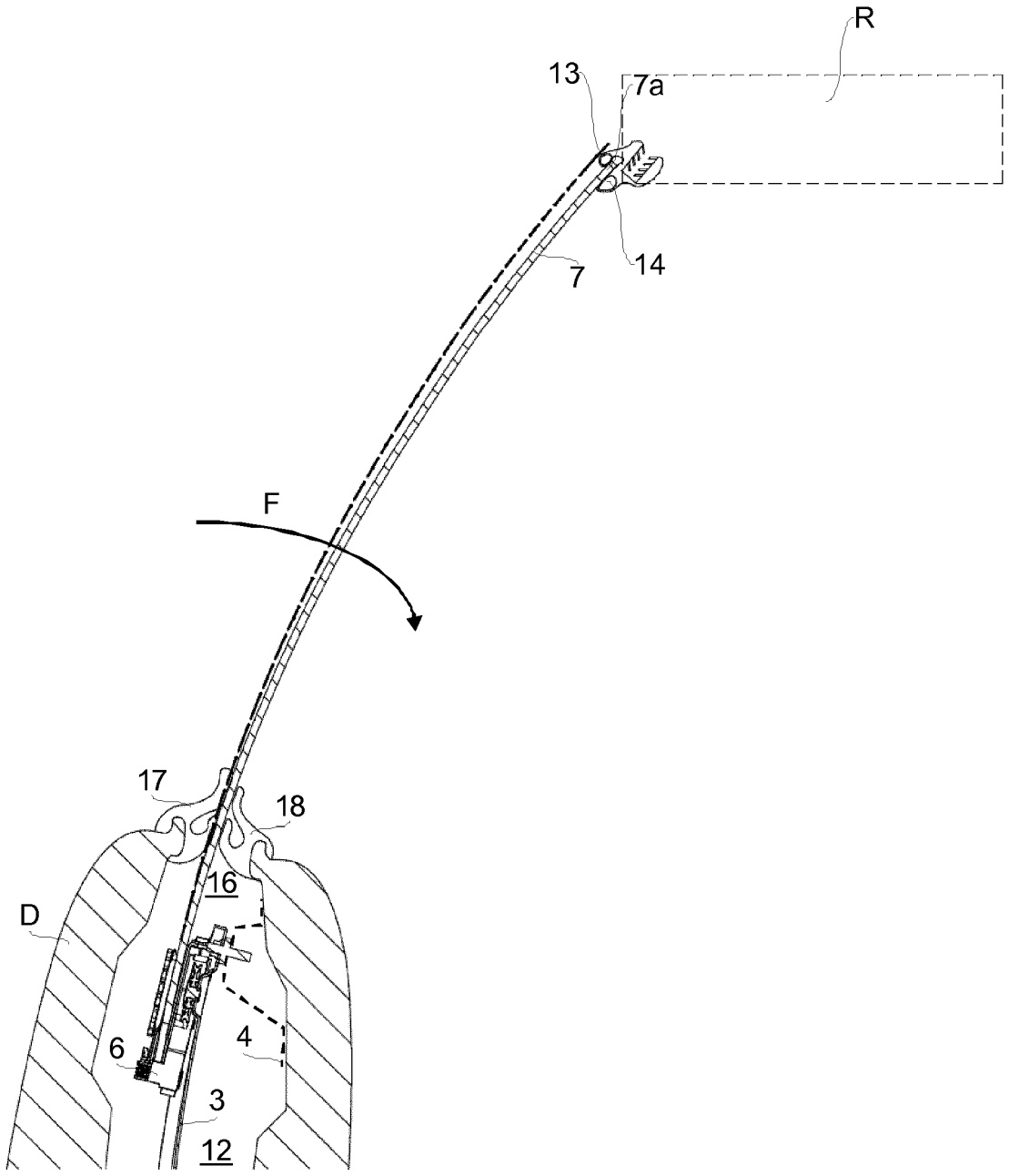

Fig.2

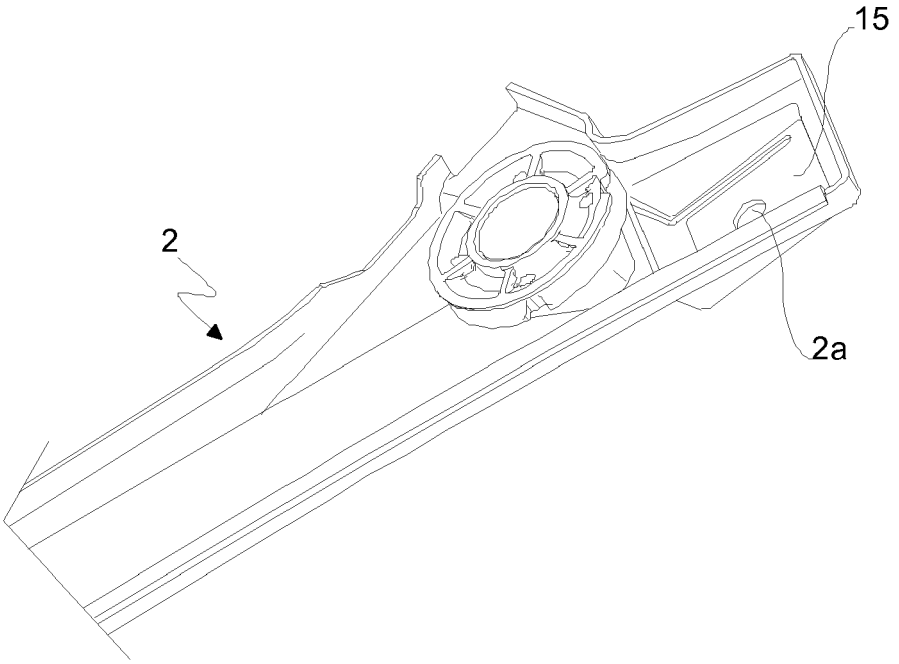

Fig.3

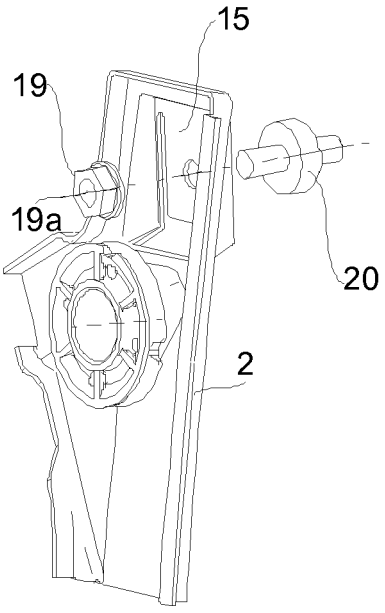

Fig.4

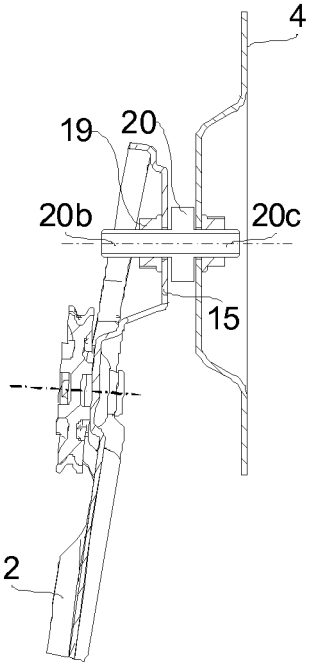

Fig.5

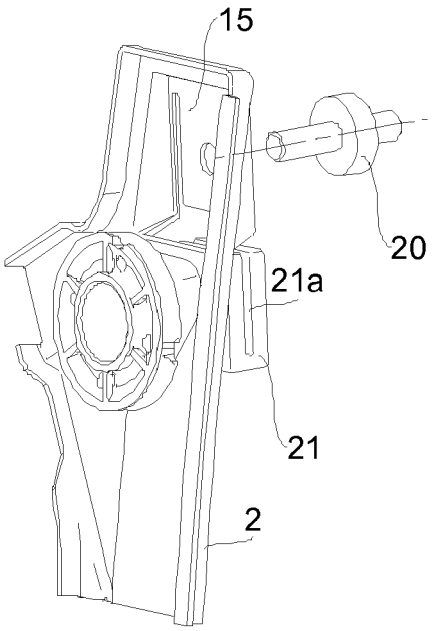

Fig.6

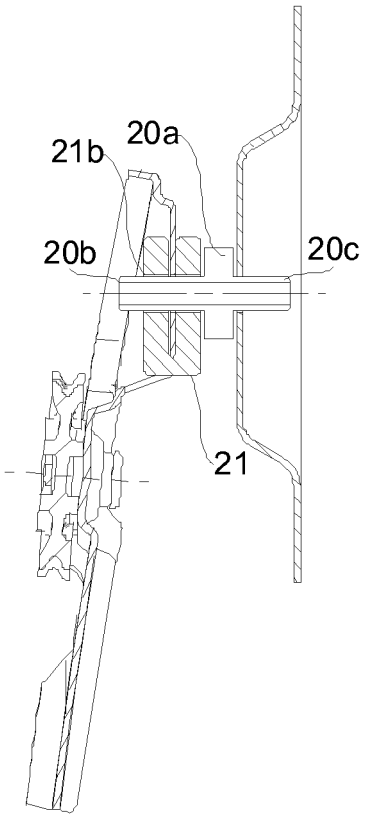

Fig.7

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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 6021

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 203 02 066 U1 (BROSE FAHRZEUGTEILE [DE]) 18 March 2004 (2004-03-18) * page 3 - page 4; figures *	1	INV. B60J1/17
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TECHNICAL FIELDS SEARCHED (IPC)
B60J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 June 2012	Borrás González, E

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