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(54) **ADJUSTING DEVICE FOR ADJUSTING THE POSITION IN HEIGHT OF A WINDOW PANE SUPPORTED BY A MOTOR VEHICLE WINDOW REGULATOR**

(57) A device for adjusting the position of a window pane supported by a window regulator of a motor vehicle, comprises a slider (10) including a base plate (14) that can slide along a guide rail, and a jaw (16) connected to the base plate (14). A receiving space (18) for receiving the window pane (P) is defined between the base plate (14) and the jaw (16). A holding member (32) for holding a pair of cables (26) of the window regulator is associated with the base plate (14), which can be moved with respect to the base body (14) parallel to the guide rail as a result of the rotation of a threaded member (38) caused through a tool operated from the outside the body member. The holding member (32) is slidable with respect to the base plate (14) through corresponding guide formations (46, 48) of the base plate (14) and the holding member (32), and the threaded member (38) engages a nut screw (36) formed in a bracket (34) that extends cantilever from said holding member (32) and is supported by at least one arm (40) projecting from the base plate (14).

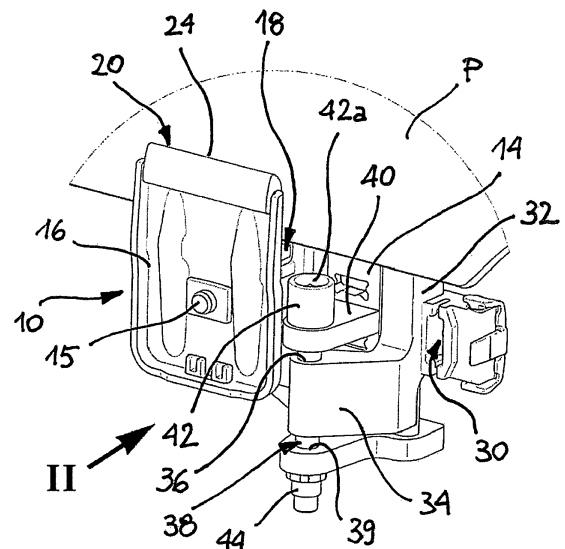


Fig. 1

Description

[0001] The present invention relates in general to a window regulator for motor vehicles and, in particular, it refers to a device for adjusting the position in height of a window pane supported by such a window regulator, typically installed on a component of a motor vehicle body, such as a door or other body member.

[0002] During assembly of glass or crystal window panes of motor vehicles, an adjustment of the position of the window pane is carried out with respect to the door or the body member on which the window regulator is installed, so that the window pane, in its raised configuration, can fit precisely on the seals of the body that surround its upper and side edges.

[0003] In the case of motor vehicle doors lacking a top frame, which are commonly used in cars of more sports type, such as the so-called "roadster" or "cabriolet" cars, the adjustment of the position of such a window pane requires a greater accuracy. In this case, in fact, the edges of the window pane must adhere precisely to the seals fixed to the vehicle body at the free sides of the window pane and, more particularly, rest on such seals with a predetermined preload, in order to ensure, in the closed configuration of the door and with the window pane raised, an optimal tightness against air and water, especially at high speed.

[0004] In the most general case, after the initial provisional adjustment carried out on the window regulator device when the window pane is mounted, the position of each window pane may require a precise adjustment, for example in the Z direction that corresponds to the vertical direction transverse to a longitudinal axis of the motor vehicle, so as to obtain an accurate alignment in height of the window pane, for example with respect to any other adjacent panes of the motor vehicle or to other body members.

[0005] The window pane associated with the window regulator can be supported by a pair of mobile supports or sliders. In this case, the precise adjustment of the position in height of the window pane with respect to each of these two supports also allows the inclination of the window pane to be adjusted on a generally longitudinal plane of the motor vehicle.

[0006] Since it would be extremely laborious, as well as uneconomical, to dismantle again the already assembled door to carry out this precise adjustment by acting from its inner side on the various mechanisms of the window regulator, and in particular on the slider or sliders of the window regulator, such an adjustment is performed by using a tool inserted inside the already assembled door. Preferably, the insertion of this tool inside the door occurs after a window pane scraper or "belt" seal has been removed from the door, and with the window pane completely raised, so that the slider or sliders thereof are in the position closest to the "belt line" of the door, and acting on the outer side of the window pane which often has an inclination or a concavity that might hinder the

introduction of the tool from the inner side.

[0007] To overcome this drawback, various technical solutions have been conceived.

[0008] According to a first known solution, on which the preamble of appended claim 1 is based, a support slider of a window regulator includes a base plate slidably mounted along a guide rail of the window regulator and a jaw movably connected with respect to the base plate, between which a space is defined to receive a lower edge of the window pane. A holding member for holding a pair of driving cables of the window regulator is associated with the base plate, the position of which can be adjusted with respect to the base body by acting on a threaded member substantially parallel to the guide rail, which engages a pair of holes formed in two zones at opposite sides with respect to a recess of the base plate, by means of a maneuvering tool designed to engage a head formation of the threaded member, which head formation is arranged at the lower part of the slider, on the side opposite to the window pane. The part of the shank of the threaded member which extends into the recess of the base plate, engages a nut screw of the holding member which, as a result of the rotation of the threaded member, moves in said recess to adjust the position of the holding member, and therefore of the cables associated therewith, with respect to the base plate of the slider. Since the threaded member is coplanar with the base plate of the slider, the axis of the threaded member is arranged on the inner side of the window pane, and therefore the position of the base plate with respect to the holding member can be adjusted only by a tool inserted inside the assembled door through a hole formed in the bottom of the door frame.

[0009] This solution, however, is not much appreciated since it forces to perform the adjustment of the slider position with respect to the holding member by acting from the bottom of the motor vehicle, in an awkward position for the operator and not very suitable for directly assessing the extent of the adjustment carried out.

[0010] According to another known solution, the threaded member associated with the base body of the slider has a head arranged in the lower part of the slider, the outer surface of which has the shape of a toothed wheel. The teeth of this first toothed wheel engage those of a second toothed wheel which, in turn, meshes with a third toothed wheel, the second and third toothed wheels being supported by a support member that extends cantilever with respect to the base plate of the slider. The third toothed wheel has a shaped axial cavity facing upward, that is on the side of the window pane. By virtue of the presence of this series of toothed wheels, the axis of the third toothed wheel extends outside the window pane close to an outer panel of the door fitted with the window regulator, so that an adjustment tool can be inserted into the door from above until it reaches the shaped cavity of the third toothed wheel, after a "belt seal" of the door has been removed.

[0011] However, even this solution is not very satisfac-

tory owing to the complexity of the mechanism for changing the position of the holding member associated with the slider, the operation of which is delicate and involves relatively high production costs.

[0012] The main object of the present invention is to provide a device for adjusting the position in height of a window pane supported by a window regulator of a motor vehicle, which can be operated by means of a tool inserted into the door from above, which is effective and reliable in operation and involves low production costs.

[0013] This object is achieved by the invention by virtue of an adjustment device the features of which are the subject of the appended claims.

[0014] In particular, by virtue of the fact that the holding member is slidably mounted with respect to the base plate by means of corresponding and reciprocally sliding guide formations formed in the base plate and in the holding member along a direction parallel to said threaded member, and of the fact that the threaded member is rotatably supported by an arm that projects from the base plate, and the threaded stem of which engages a nut screw formed in a bracket that extends cantilever from said holding member, said base plate and said holding member extending beyond the window pane to the outside of said door, or other body member of the motor vehicle, the device of the invention is simple and reliable in operation, and it can be made with low production costs.

[0015] According to a preferred feature of the invention, the threaded member is rotatably supported by a first arm and by a second arm which extend parallel from the base body and which are arranged on opposite sides with respect to said bracket, in which the range of adjustment of the position of the window pane in the Z direction corresponds to the distance between said arms minus the height of said bracket. In this manner, the structure of the base body that supports the threaded member is sturdy and reliable in operation.

[0016] According to another preferred feature of the invention, the guide formations of the base body and of the holding member comprise a rectilinear rib that projects from one side of the base plate, and a groove having a corresponding shape formed into said holding member. In this manner, the guide formations ensure a reliable sliding connection between the base body and the holding member.

[0017] Further characteristics and advantages of the invention will become clearer from the following detailed description of a preferred embodiment and of a modification thereof, given by way of non-limiting example and shown in the appended drawings, in which:

Figure 1 is a schematic perspective view of a first embodiment of a slider of a device for adjusting the position in height of a window pane supported by a window regulator of a motor vehicle,

Figure 2 is a front elevational view of the slider, from the side of arrow II of Figure 1,

Figure 3 is a view of the slider of Figure 2 sectioned along line III-III,

Figure 4 is a view of the slider of figure 2 sectioned along line IV-IV,

Figure 5 is an exploded perspective view of the slider of Figure 1,

Figure 6 is a rear elevational view of the slider of Figure 3,

Figure 7 is an exploded perspective view of a modification of the slider of the device of the invention, Figure 8 is a schematic perspective view of the slider of Figure 7, and

Figure 9 is a view of the slider of Figure 8 sectioned along line IX-IX.

[0018] With initial reference to Figures 1 to 6, a device according to the invention, for adjusting the position in height of a window pane P supported by a window regulator of a motor vehicle, comprises, in a manner known per se, a slider 10.

[0019] The slider 10, in a manner known per se, is intended to be slidably mounted along a guide rail (not shown) that is engaged into a pair of seats 12 (at least one of which can be seen in Figures 5 and 6) formed in a base plate 14 of the slider 10 and provided with respective slides, in order to allow the window pane P to slide as a result of the operation of the window regulator.

[0020] The slider 10 also comprises a jaw 16 opposed to the base plate 14 and movably mounted with respect to the latter, intended to be arranged on the side facing an outer panel of the door or of the body member of the motor vehicle. In a manner known per se, the distance of the jaw 16 with respect to the base plate 14 can be adjusted by means of a screw adjusting element 15 that crosses both the jaw 16 and the base plate 14.

[0021] Between the base plate 14 and the jaw 16, which are preferably made of metallic material, a space 18 for receiving the lower edge of the window pane P is defined, in which a substantially U-shaped insert 20 for resting the window pane P is arranged, which comprises a pair of opposite side portions 22 and 24 that delimit the space 18 from opposite sides. A first side portion of the insert 20, indicated 22, is intended to be arranged adjacent to the base plate 14, while the other side portion, indicated 24, is intended to be arranged adjacent to the movable jaw 16. The insert 20, in particular, is made of a flexible elastomeric material, such as rubber. The bottom of the insert 20 is arranged above the screw element 15, in such a manner that the lower edge of the window pane P does not interfere with this screw element 15.

[0022] The ends of a pair of flexible cables 26 for controlling the movement of the window pane P are associated with the slider 10, each of which comprises a respective terminal block 28. These blocks 28 are inserted on opposite sides in a hollow seat 30 formed in a holding member 32 slidably and adjustably associated with the base plate 14. The cables 26 are connected, in a manner known per se, to a motorized or manually operated trans-

fer unit of the window regulator. In the most common case, the cables 26 are wound on pulleys and on one rotating drum (not shown), the rotation of the latter being controlled through a gearmotor connected to the structure of the door to which the window regulator is associated, which is usually fixed to the aforementioned guide rail or to the door frame.

[0023] The holding member 32 comprises a bracket 34 that extends cantilever to the outside of the door or the body member on which the window regulator is mounted. A through threaded hole 36 is formed in this bracket 34 at its free end opposite to the seat 30 and to the base body 14, which is substantially parallel to the base plate 14 and constitutes a nut screw for a threaded member 38 having a longitudinal axis substantially parallel to the aforesaid guide rail.

[0024] The threaded member 38 is supported in a freely rotatable manner by two parallel arms 40 that project from the base plate 14 to the outside of the door or other body member, and which are arranged according to a fork configuration on opposite sides with respect to the bracket 34, the distance between the arms 40 being greater than the dimension in height of the bracket 34, for the reason which will be explained in greater detail below.

[0025] In particular, the threaded member 38 engages in a freely rotatable manner a pair of coaxial holes 39 formed at the respective free ends of the arms 40. The distance of the nut screw constituted by the hole 36 and of the axis of the holes 39 of the arms 40 with respect to the base plate 14, is such that the axis of the threaded member 38 which engages them extends beyond the space 18 for receiving the window pane P, to the outside of the door or other body member on which the window regulator is mounted. Furthermore, the bottom of the insert 20 is positioned so as to overlook the upper arm 40 of the base plate 14, so that the lower edge of the window pane P that rests on this bottom cannot interfere with the aforesaid upper arm 40.

[0026] The threaded member 38 has a head 42 provided with a shaped cavity 42a intended to be engaged by a tool having a corresponding shape, with the aim of causing the rotation thereof about its own axis in order to perform the adjustment in height of the position of the window pane P. The head 42, in particular, is intended to be arranged upwards with respect to the slider 10 in a condition in which it rests on the upper surface of the upper arm 40, while the lower part of the shank of the member 38 is engaged by a locking element, conveniently consisting of a tightening nut 44 that rests on the lower surface of the lower arm 40, or of another known locking system of the "seger" type. By virtue of the head 42 and the nut 44, which rest on opposite sides of the arms 40, the screw member 38 is locked axially with respect to the arms 40.

[0027] Moreover, the holding member 32 is slidably mounted with respect to the base plate 14 by means of corresponding sliding guide formations. Preferably, a

rectilinear rib 46 parallel to the threaded member 38 extends from one side of the base plate 14, the cross-section of the end profile of such a rib being substantially cylindrical and being connected to the base plate 14 by a longitudinal laminar portion, and the holding member 32 has a groove 48 of a corresponding shape, the substantially C-shaped cross-section of which is adapted to surround a prevalent portion of the profile of the rib 46. The mutual engagement of the rib 46 and of the groove 48 has a minimum axial clearance consistent with the machining tolerances, such as to allow the member 32 to slide along the rib 46, as well as a minimum "rotational" clearance sufficient to allow the member 32 to be assembled on the base plate 14, and to allow the upper arm 40 to be circumvented. Correct sizing of the rib 46 and of the groove 48 ensures the sturdiness of the unit formed by the base plate 14, the holding member 32, the threaded member 38, and the tightening nut 44, which is subject to a "cantilever" stress through the bracket 34.

[0028] According to a modification shown in Figures 7 to 9, in which the same numeral references have been used to indicate parts equal or similar to those of the embodiment previously described, a substantially U-shaped insert 20a made of non-elastomeric plastic material is arranged between the base plate 14 and the movable jaw 16 of the slider 10, in the space 18 for receiving the lower edge of the window pane P. This insert 20a comprises a pair of opposite side portions 22 and 24, which are connected along their lower side by a pair of laminar hinges 23 integral with the side portions 22 and 24. In this case, the thickness of the side portions 22 and 24 is small enough to make the side portions 22 and 24 at least partially flexible. The screw adjusting element 15 of this modification, which is arranged in a spaced position above the bottom of the insert 20a, can be inserted into a hole or a cavity formed in the window pane P close to its lower edge, to center the window pane P with respect to the slider 10.

[0029] In operation of the device of the invention, the window pane P is arranged in the insert 20 of the slider 10 between the side portions 22 and 24. To perform the adjustment of the position in height of the window pane P with respect to the slider, or the sliders, of the window regulator, the belt seal of the door or of the body member adjacent to the window pane P is removed beforehand, so as to clear a space between the window pane P and the outer panel of the door, or of the body member. The maneuvering tool is inserted from above into this space until it engages, with its lower active end, the shaped cavity 42a of the head 42 of the threaded member 38. This is made possible by the fact that, in spite of the curvature of the window pane P, the axis of the threaded member 38 extends completely on the outer side of the window pane P, that is on its side facing the aforementioned outer panel.

[0030] A rotation of the tool in one direction or the other causes the threaded member 38 to rotate correspondingly with respect to the nut screw constituted by the

threaded hole 36 of the bracket 34 of the holding member 32 and, through it, the plate base 14 to undergo a relative displacement in height together with the window pane P, with respect to the hollow seat 30 of the holding member 32 in which the terminal blocks 28 of the flexible cables 26 are inserted, by virtue of the space existing between the arms 40 of the base plate 14 and the bracket 34. In particular, the range of adjustment of the position of the window pane P in the Z direction corresponds to the distance between the two arms 40, minus the height of the bracket 34.

[0031] In this manner, it is possible to adjust the position in height of the base plate 14, and therefore of the window pane P, with respect to the terminal blocks 28 of the flexible cables 26, and therefore with respect to the holding member 32, by acting from the above and from the outside of the window pane P.

Claims

1. Device for adjusting the position of a window pane supported by a window regulator mounted on a door or other body member of a motor vehicle, comprising a slider (10) that includes a base plate (14) intended to be slidably mounted along a guide rail of the window regulator, and a movable jaw (16) connected to the base plate (14), between which a receiving space (18) for receiving a lower edge of said window pane (P) is defined, a holding member (32) for holding a pair of driving cables (26) of the window regulator being associated with the base plate (14), which holding member (32) can be moved with respect to the base plate (14) along a direction generally parallel to said guide rail as a result of the rotation of a threaded member (38) associated with the base plate (14) and with said holding member (32), caused by a tool operated from the outside of said door or other body member of the motor vehicle, in order to adjust the position in height of the base plate (14) with respect to said holding member (32), **characterized in that** said holding member (32) is slidably mounted with respect to the base plate (14) by means of corresponding and mutually slidable guide formations (46, 48) formed in the base plate (14) and in the holding member (32) along a direction parallel to said threaded member (38), said threaded member (38) being rotatably supported by an arm (40) that projects from the base plate (14), and having a threaded stem that engages a nut screw (36) formed in a bracket (34) that extends cantilever from said holding member (32), the base plate (14) and the holding member (32) being arranged on the inside of the door, and said arm (40) and said bracket (34) extending below the window pane (P) to the outside of said door or other body member of the motor vehicle.
2. Device according to claim 1, **characterized in that** said threaded member (38) is rotatably supported by a first arm and by a second arm (40), which extend parallel from the base plate (14) and are arranged on opposite sides with respect to said bracket (34), in which the range of adjustment of the position of the window pane (P) in the Z direction corresponds to the distance between said arms (40) minus the height of said bracket (34).
3. Device according to claim 1 or 2, **characterized in that** said threaded member (38) has a head (42) provided with a control formation (42a) adapted to be engaged by said tool, which faces upwards on the side of the window pane (P) beyond said receiving space (18) for receiving the lower edge of the window pane (P).
4. Device according to claim 3, **characterized in that** the end of said threaded member (38) opposite to said head (42) is engaged by an axial locking member (44).
5. Device according to claim 4, **characterized in that** said axial locking member is a tightening nut (44).
6. Device according to claim 5, **characterized in that** said head (42) rests on a surface of the first arm (40) opposite to said bracket (34), and the tightening nut (44) rests on a surface of the second arm (40) facing the side opposite to said bracket (34) and to the first arm (40).
7. Device according to any one of Claims 1 to 6, **characterized in that** said guide formations comprise a rectilinear rib (46) projecting from one side of the base plate (14), and a groove (48) having a corresponding shape formed in said holding member (32).
8. Device according to any one of Claims 1 to 7, **characterized in that** said rib (46) has a substantially cylindrical cross-section which is connected to the base plate (14) by a longitudinal laminar portion, and **in that** said groove (48) has a substantially C-shaped cross-section adapted to surround a prevalent portion of the rib (46), so as to allow the holding member (32) to be mounted on the base plate (14) with the rib (46) engaged in the groove (48), as well as the sturdiness of the connection between the holding member (32) and the base plate (14) to be assured.
9. Device according to any one of Claims 1 to 8, **characterized in that** the distance of said jaw (16) with respect to said base plate (14) can be adjusted by a screw adjusting element (15) that crosses both the jaw (16) and the base plate (14).
10. Device according to claim 9, **characterized in that**

a U-shaped insert (20, 20a) is interposed between said jaw (16) and said base plate (14), which insert (20, 20a) including a first and a second side portions (22, 24) opposite to each other, made of an at least slightly flexible material, to delimit at opposite sides said receiving space (18) for receiving the lower edge of the window pane (P), said side portions (22, 24) being intended to be arranged adjacent to the base plate (14) and to the movable jaw (16), respectively.

11. Device according to claim 10, **characterized in that** said insert (20) is made of flexible elastomeric material.

12. Device according to claim 10, **characterized in that** the side portions (22, 24) of said insert (20a) are made of plastic sheets connected along their lower sides by at least one laminar hinge (23) integral with said side portions (22, 24).

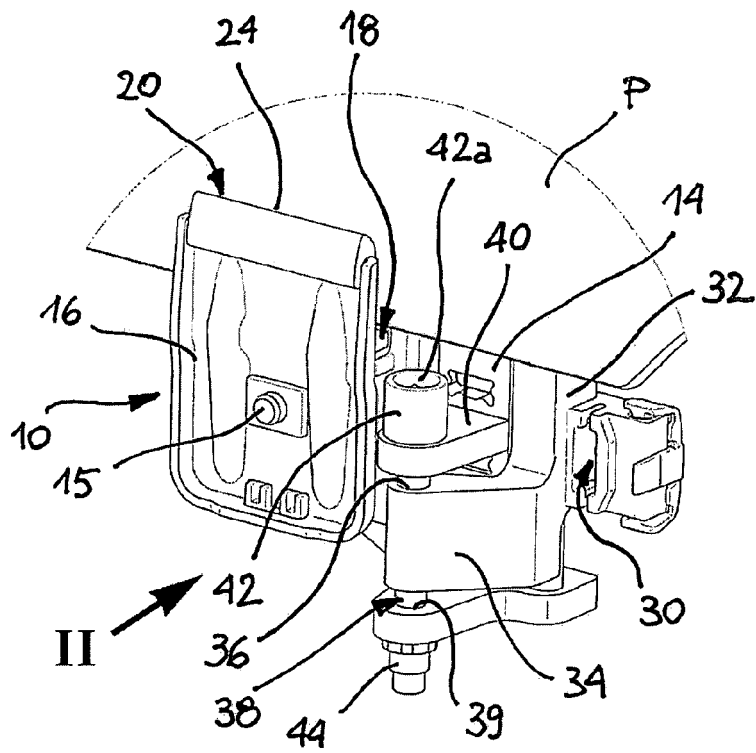


Fig. 1

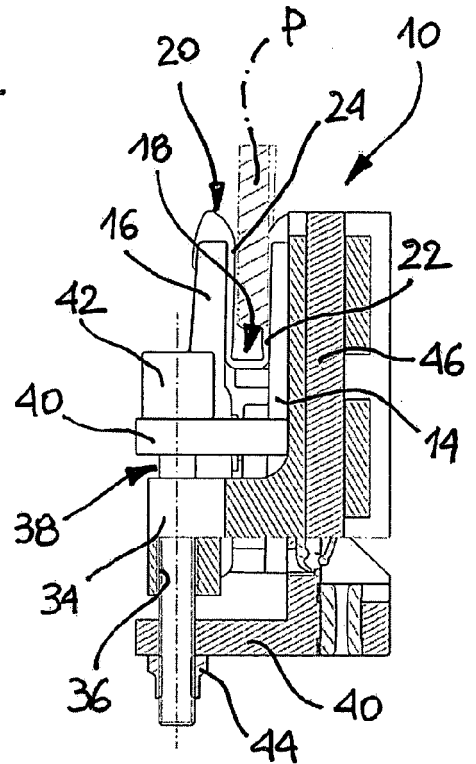


Fig. 3

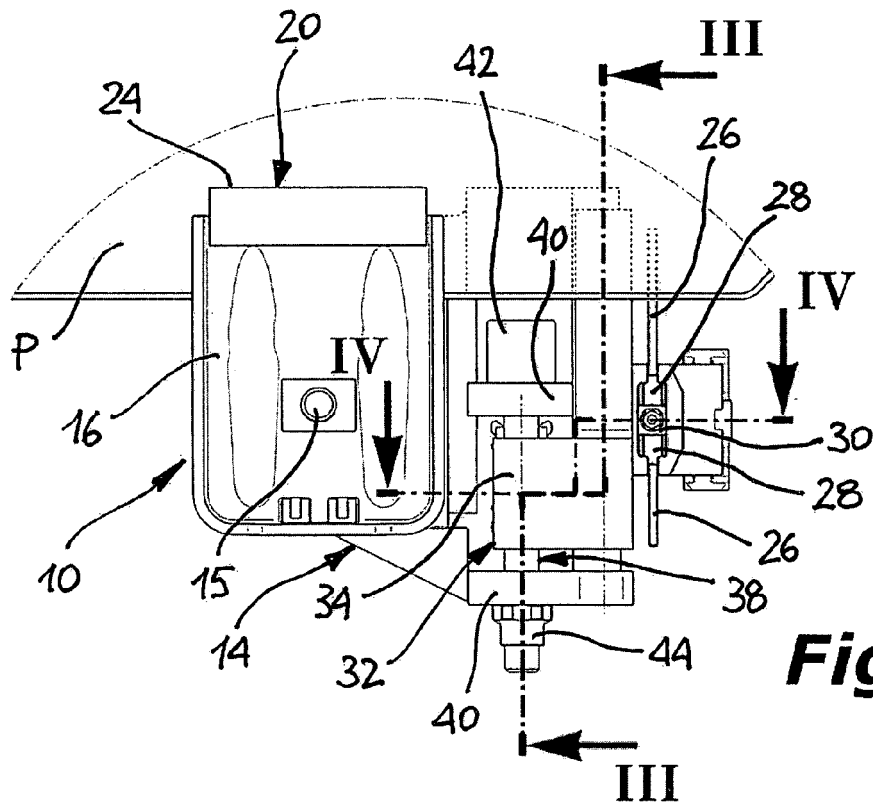
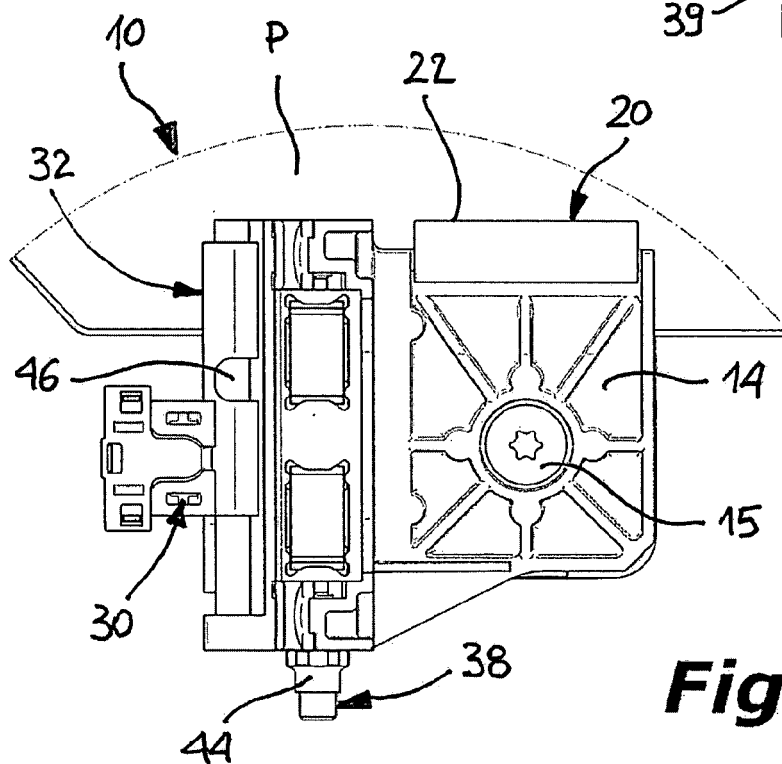
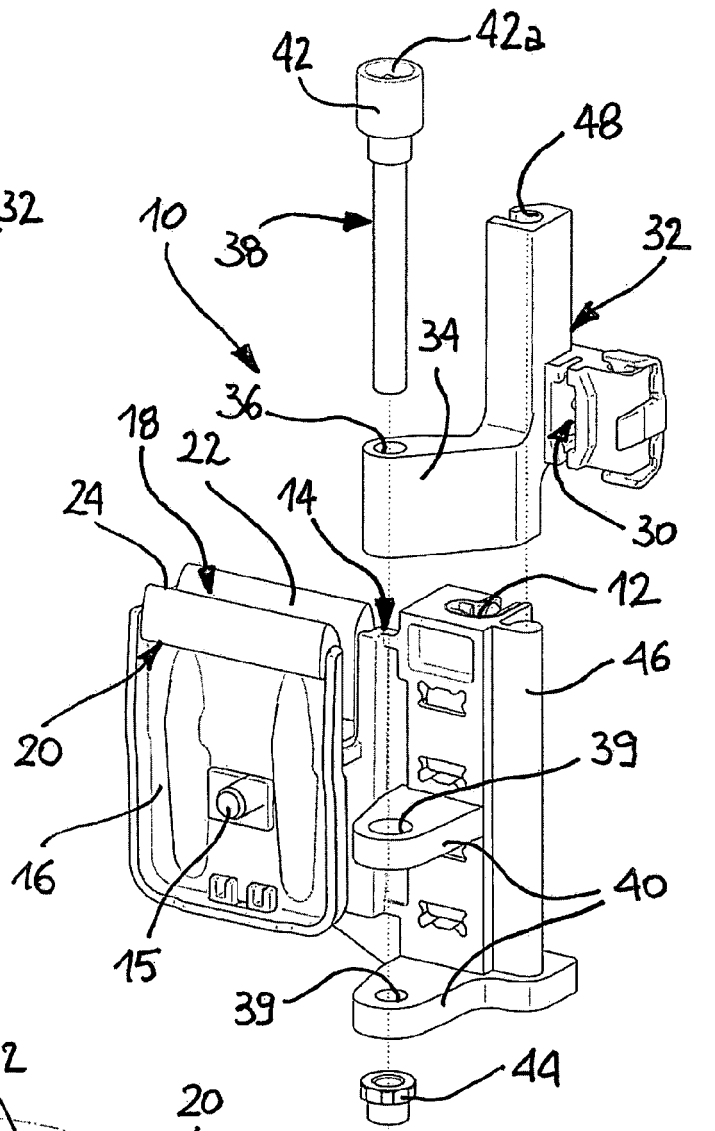
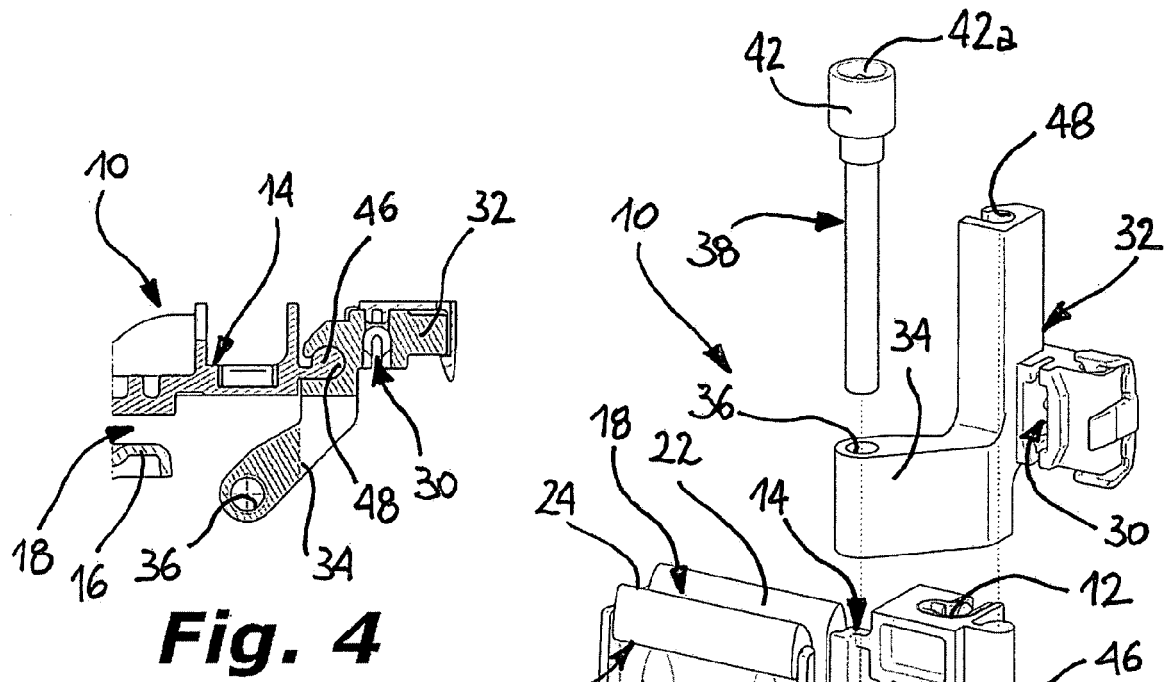
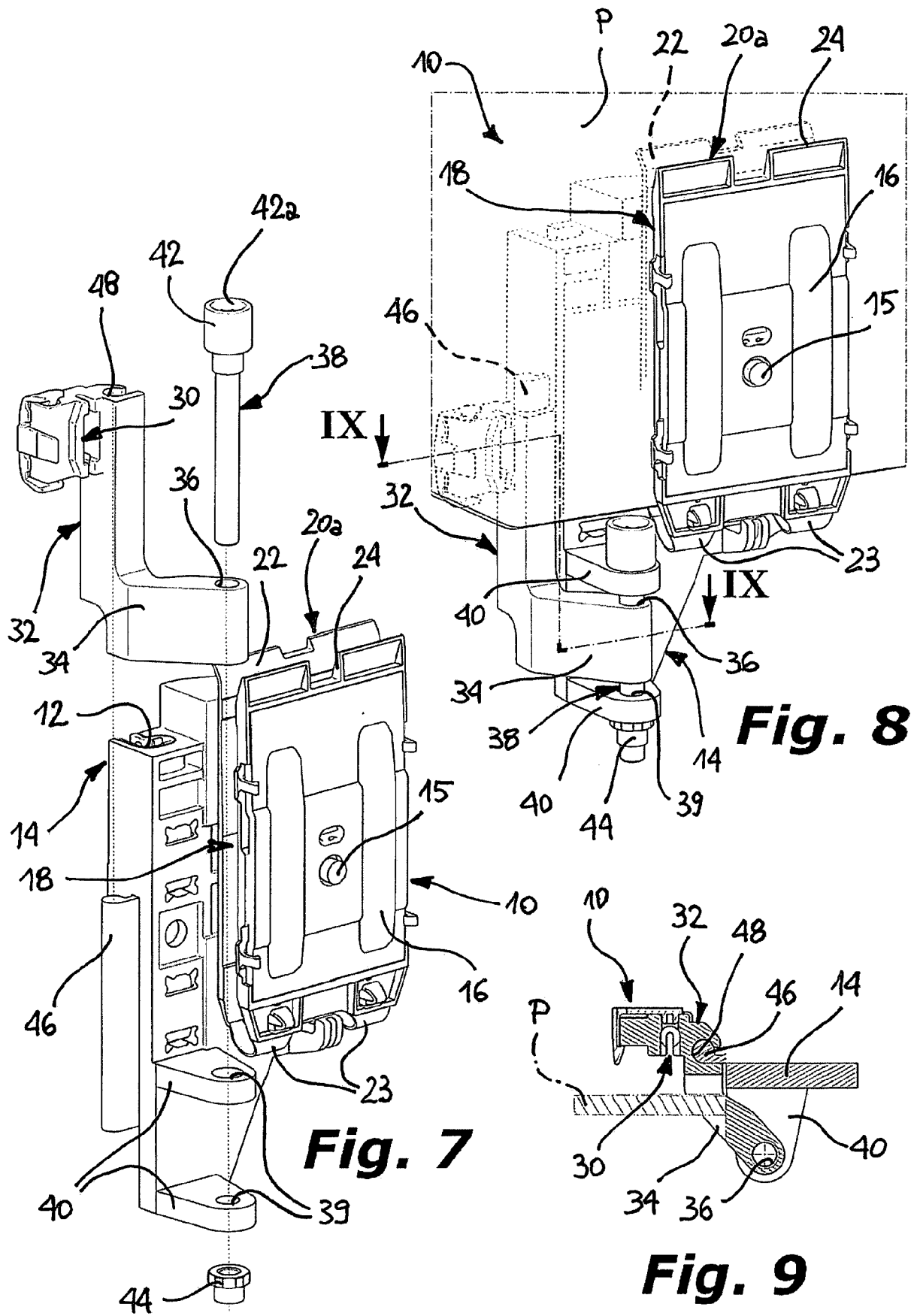


Fig. 2







EUROPEAN SEARCH REPORT

Application Number
EP 18 00 1003

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 May 2019	Examiner Wagner, Andrea
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 18 00 1003

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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