(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 862 998 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.04.2015 Bulletin 2015/17

(51) Int Cl.:
E05F 15/611 *(2015.01)* ***E05D 5/06*** *(2006.01)*

(21) Application number: **13189596.3**

(22) Date of filing: **21.10.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) **Device for pivoting a vehicle door**

(57) The invention relates to a device for pivoting a vehicle door, including:
- a hinge (3) comprising:
• a fixed hinge frame (3a),
• a hinge axis (5) mounted in the fixed hinge frame (3 a), and
• a moving hinge body (3b) mounted so as to pivot around the hinge axis (5) relating to the fixed hinge frame (3a),

- a drive unit (7) for actuating the vehicle door,
- a transmission means (9) connected to the drive unit (7) and to the moving hinge body (3b),
- an adapter (43) mounted on the moving hinge body (3b) linking the transmission means (9) to the moving hinge body (3b), and
- fixation means (51) for fixing the adapter (43) on the moving hinge body (3b).

According to the invention, said fixation means (51) are provided on the moving hinge body (3b) and/or on the adapter (43), so as to allow the moving hinge body (3b) to move relatively to the adapter (43).

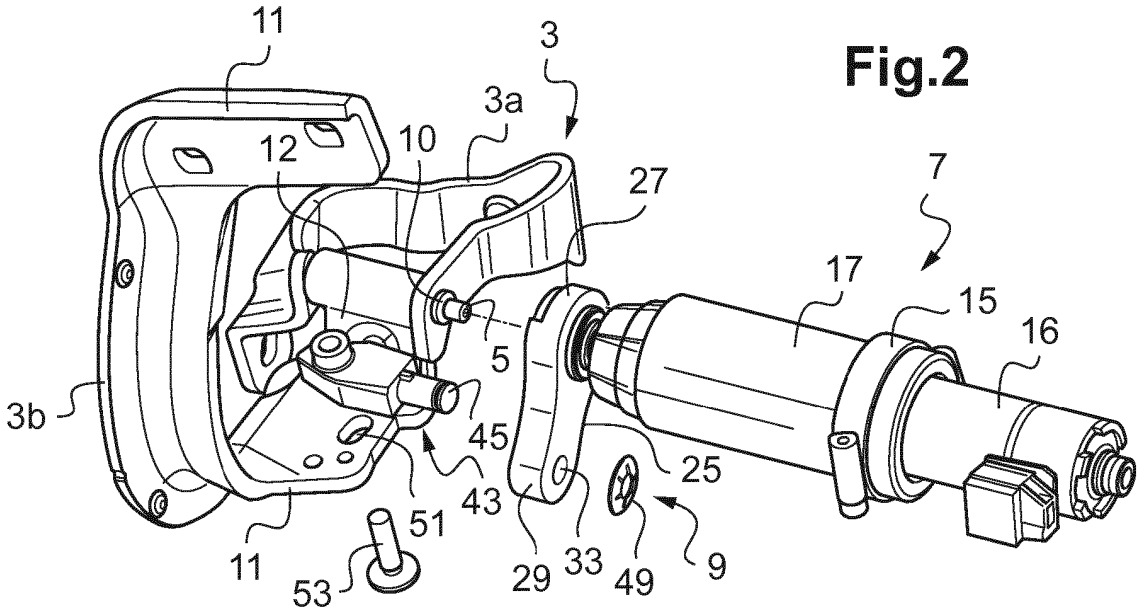

Fig.2

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Description

[0001] The invention relates to a device for pivoting a vehicle door which is connected to a hinge so as to be pivoted around a hinge axis. The hinge is thereafter named door hinge.

[0002] The vehicle door may be either a side door, a tailgate, the lid for closing the engine compartment or the flap for closing a roof opening in a vehicle.

[0003] It is known to actuate the vehicle door using a drive unit, more particularly a modular drive unit, connected to the door hinge.

[0004] As known, the door hinge may comprise a fixed hinge frame intended to be fastened to the armature of the vehicle and retaining the hinge axis, and a moving hinge body to which is connected the vehicle door and which is mounted so as to pivot around the hinge axis of the fixed hinge frame.

[0005] As an example, on vehicles equipped with an automatic tailgate at least one modular drive unit for actuating the tailgate is generally connected to a door hinge.

[0006] A modular drive unit comprises in a known manner a motor and a gear assembly. Transmission means are connected to the associated modular drive unit and to the moving hinge body.

[0007] According to a known solution, the transmission means comprises a lever connected to the moving hinge body. For example, the lever is on the one hand fastened to the modular drive unit and is on the other hand connected to the moving hinge body.

[0008] During manufacturing of the hinge, dimensions of the hinge may vary.

[0009] Generally, an adapter is required between the lever and the moving hinge body which allows to adjust the link between the lever and the moving hinge body, in order to compensate dimensions tolerances of the hinge.

[0010] It is known, for example from DE 10 2006 024 349, that the lever is connected at one end to a drive shaft of the drive unit and has on the opposite end a hole for receiving a sliding block. The device further comprises an adapter for example screwed on the moving hinge body and provided with a pin mounted rotatable in the sliding block.

[0011] The assembly may be relatively difficult because of the many different parts. Those several parts may be expensive parts as they have to be manufactured precisely, and it may be complicate to adapt those parts to the hinge. Further, there is a certain amount of play.

[0012] It is the object of the invention to obtain a device for pivoting a vehicle door with a simplified structure for compensating dimensions tolerances of the hinge to which the drive unit is connected.

[0013] This object is achieved according to the invention by a device for pivoting a vehicle door, comprising:

- a hinge with: a fixed hinge frame, a hinge axis mounted in the fixed hinge frame, and a moving hinge body mounted so as to pivot around the hinge axis relating to the fixed hinge frame,
- a drive unit for actuating the vehicle door,
- a transmission means connected to the drive unit and to the moving hinge body,
- an adapter mounted on the moving hinge body linking the transmission means to the moving hinge body, and
- fixation means for fixing the adapter on the moving hinge body,

characterized in that said fixation means are provided on the moving hinge body and/or on the adapter, so as to allow a movement of the moving hinge body relatively to the adapter. The relative movement between the moving hinge body and the adapter allows to adjust the position of the moving hinge body relatively to the transmission means.

[0014] The invention thus removes the expensive sliding block mechanism that was required in some prior art solutions and the related play in it. On the contrary, dimensions tolerances of the hinge are compensated through the adapter on the moving hinge body.

[0015] According to an aspect of the invention, the moving hinge body comprises at least one flange part for fastening to the vehicle door and supporting the adapter, and wherein said fixation means are provided on the flange part and/or on the adapter.

[0016] According to another aspect of the invention, said fixation means comprise a longitudinal hole provided on the moving hinge body for the passage of fastening means. Fastening means may comprise a screw.

[0017] The longitudinal hole may be an oblong hole.

[0018] The invention thus removes the adjustment through prior art sliding block and uses a longitudinal hole in the moving hinge body interface supporting the adapter to compensate tolerances. As there is no more sliding block, the transmission means, comprising for example a lever, can be designed more compact and there is less chance of stress related failure.

[0019] Also the number of parts and the cost are reduced regarding prior art solutions requiring a sliding block cooperating with the transmission means.

[0020] The longitudinal hole may be provided on the flange part of the moving hinge body supporting the adapter.

[0021] According to one embodiment, the moving hinge body comprises an arm bent relatively to the flange part, and the longitudinal hole extends in the direction of the arm.

[0022] According to another aspect of the invention, said fixation means are provided on the adapter and comprise a cage and a nut mounted movable in the cage, so as to allow a relative movement between the moving hinge body and the adapter, and thus to compensate the hinge dimensions tolerances. The nut is advantageously a self adjusting nut. With this arrangement, the moving hinge body may have a circular hole and there is no need to modify currently used hinge.

[0023] According to a preferred embodiment, the cage comprises a body and a covering defining between them a housing of the nut, and the housing of the nut is a longitudinal housing longer than the nut.

[0024] The invention thus removes the adjustment through a sliding block cooperating with the transmission means of some prior art solutions, and uses a nut mounted movable in a cage on the adapter supported by a hinge interface.

[0025] To manage misalignment of the hole in the moving hinge body for the passage of the screw to the adapter, the nut is kept in a cage with some play so it can move toward the screw. Once the screw for example is tightened to the nut the play is removed.

[0026] The invention also removes the related play in the sliding block mechanism. Further the transmission means comprises a lever, said lever cooperates with the adapter. Said lever can be designed more compact and there is less chance of stress related failure.

[0027] Also the number of parts and the cost are reduced.

[0028] The body and the covering of the adapter defining the housing of the nut are both providing with a longitudinal opening for the passage of fastening means, such as a screw.

[0029] According to the preferred embodiment, the longitudinal housing extends in the direction of the arm of the moving hinge body which is bent relatively to the flange part.

[0030] The body and the covering are attached together through coupling means, such as a rivet or a clipping system.

[0031] According to an embodiment, the body and the covering are both provided with complementary clipping parts for assembling through a clipping system, and wherein the covering is locally deformed around the opening.

[0032] Other features and advantages of the invention will emerge more clearly on reading the following description, which is given as a non-limiting illustrative example, and the attached drawings, among which:

- figure 1 shows a device for pivoting a vehicle door comprising a modular drive unit and a hinge of the vehicle door to be pivoted according to a first embodiment having a fixed hinge frame and a moving hinge body,
- figure 2 is an exploded view of the device of figure 1,
- figure 3 is an exploded view of a lever and an adapter arranged between the modular drive unit and the moving hinge body of the device of figure 1,
- figure 4a is a first simplified schematic side view of the moving hinge body,
- figure 4b is a second simplified schematic side view of the moving hinge body with a variation of dimension regarding figure 4a,
- figure 5 shows a second embodiment of a device for pivoting a vehicle door comprising a modular drive unit and a hinge of the vehicle door to be pivoted having a fixed hinge frame and a moving hinge body,
- figure 6 is an exploded view of a lever and an adapter arranged between the modular drive unit and the moving hinge body of the device of figure 5,
- figure 7 shows the lever and the adapter of figure 5 when assembled together,
- figure 8 is an exploded view of a lever and an adapter arranged between the modular drive unit and a moving hinge body of a device according to a third embodiment, and
- figure 9 shows the lever and the adapter of figure 8 when assembled together.

[0033] In these figures, identical elements carry the same references.

[0034] Reference 1 indicates a device 1 partially illustrated in figure 1, for pivoting a vehicle door (not shown). In this document, the term "vehicle door" is understood quite generally to mean a part that may be pivoted for closing a vehicle opening. The vehicle door may therefore involve either a side door, a tailgate, the lid for closing the engine compartment or the flap for closing a roof opening in a vehicle.

[0035] The device 1 comprises a hinge 3 with a hinge axis 5 and a drive unit, more precisely a modular drive unit 7 for actuating the vehicle door (not illustrated) connected to the hinge 3 through a transmission means 9.

[0036] Hereafter, said hinge 3 is referred to as a door hinge 3.

[0037] The vehicle door is connected to the door hinge 3 so as to pivot around the hinge axis 5.

[0038] For example, in a vehicle equipped with automatic tailgate two modular drive units 7 are connected to the two door hinges 3. Alternatively, one modular drive unit is connected to one door hinge 3.

[0039] More precisely, a door hinge 3 comprises a fixed hinge frame 3a and a moving hinge body 3b.

[0040] The fixed hinge frame 3a is intended to be fastened to a fixed armature of the vehicle (not shown).

[0041] The hinge axis 5 is mounted in the fixed hinge frame 3a. The hinge axis 5 has an end which protrudes from the fixed hinge frame 3a extending towards the modular drive unit 7 referring to figure 2. This protruding end of the hinge axis 5 may comprise a bearing surface 10 for the connection with the modular drive unit 7.

[0042] The moving hinge body 3b is mounted in a pivotable manner around the hinge axis 5. For example, in case of a tailgate, the moving hinge body 3b may be fastened on the roof side region of the tailgate of a motor vehicle.

[0043] The moving hinge body 3b has a substantially bent shape.

[0044] One end of the moving hinge body 3b is connected to the hinge axis 5. For example this end may be provided with a rolled part for receiving the hinge axis 5.

[0045] The moving hinge body 3b may further comprise at least one flange part 11 for fastening to the vehicle

door.

[0046] In the illustrated embodiment in figures 4a and 4b, the moving hinge body 3b further comprises an arm 12 bent relatively to the flange part 11. For example, the arm 12 of the moving hinge body 3b may extend sensibly perpendicularly to the flange part 11.

[0047] The free end of the arm 12 may be provided with the rolled part for receiving the hinge axis 5.

[0048] The arm 12 of the moving hinge body 3b has a height defined between the flange part 11 and the end connected to the hinge axis 5. In the illustrated embodiment in figures 4a and 4b, this height is defined between the flange part 11 and the center of the rolled part for receiving the hinge axis 5.

[0049] During manufacturing, this height may vary between a minimal height *Amin* (figure 4a) and a maximal height *Amax* (figure 4b).

[0050] As already said, the vehicle door (not illustrated) can be actuated by the modular drive unit 7 illustrated in figures 1 and 2. To this end, the transmission means 9 is connected both to the moving hinge body 3b and the modular drive unit 7.

[0051] The modular drive unit 7 is intended to be arranged on and fastened to the armature of the vehicle. For example, in case of a tailgate, the modular drive unit 7 may be arranged on a roof support of the vehicle. A collar 15 may be provided for fastening the modular drive unit 7.

[0052] In a known manner, the modular drive unit 7 comprises an electric motor 16, a gear assembly (not shown) connected to the electric motor 16 and a drive shaft extending in the direction of the hinge axis 5. Thus, the hinge axis 5 has an end which protrudes from the fixed hinge frame 3a extending towards the drive shaft of the modular drive unit 7 referring to figure 2. This protruding end of the hinge axis 5 may comprise a bearing surface 10 for the connection with the drive shaft of the modular drive unit 7.

[0053] The modular drive unit 7 also comprises a substantially tubular housing 17 receiving the drive shaft (not shown) with the gear assembly connected to the electric motor 16.

[0054] The transmission means 9 may be connected on the one hand to the drive shaft and on the other hand to the moving hinge body 3b. The drive shaft (not shown) may be for example a splined shaft. The drive shaft intends to engage the hinge axis 5 to align the drive unit 7 to the hinge 3.

[0055] The transmission means 9 may comprise a lever 25 arranged between the modular drive unit 7 and the moving hinge body 3b.

[0056] The lever 25 best shown in figure 3 is connected to the drive shaft of the modular drive unit 7 and also to the moving hinge body 3b. For that, the lever 25 comprises a first end 27 for connection with the modular drive unit 7 and a second end 29 for connection with the moving hinge body 3b. The second end 29 is here arranged longitudinally opposite to the first end 27.

[0057] The lever 25 is connected at its first end 27 to the drive shaft of the modular drive unit 7 in a rotationally fixed manner and at its second end 29 to the moving hinge body 3b.

[0058] For that purpose, the lever 25 comprises at its first end 27 a housing 30 for receiving the drive shaft of the modular drive unit 7. More precisely, the lever 25 is mounted on the drive shaft of the drive unit 7.

[0059] The lever 25 also comprises at its second end 29 a hole 33 for the connection with the moving hinge body 3b.

[0060] The housing 30 at the first end 27 of the lever 25 is here in the form of a hole. The lever 25 may have a hub 35, a tolerance ring 37, and a retaining ring 39 for example which is arranged in the hole 30.

[0061] Referring to figures 4a and 4b, the lever 25 has a length L defined between the center of the hole 33, and the center of the housing 30.

[0062] The device 1 further comprises an adapter 43, 143, 243 arranged on the hinge 3, more precisely on the moving hinge body 3b, which ensures the link between the lever 25 and the moving hinge body 3b. For that purpose, the device 1 comprises fixation means for fixing the adapter 43, 143, 243 on the moving hinge body 3b.

[0063] The lever 25 length L is defined between the center of the hole 33 for connection with the adapter 43, 143, 243 and the center of the housing 30 for connecting the lever 25 to the drive shaft of the modular drive unit 7.

[0064] The drive unit 7 for instance pre-assembled to the lever 25 and the adapter 43, 143, 243, can be connected to the hinge 3.

[0065] In order to adjust the modular drive unit 7 with the lever 25 to the hinge 3, the fixation means of the adapter 43, 143, 243 on the moving hinge body 3b are configured to allow a relative movement between the moving hinge body 3b and the adapter 43, 143, 243, for compensating dimensions tolerances of the hinge 3. As said before, during manufacturing of the hinge 3, dimensions of the hinge 3, more particularly the height of the moving hinge body 3b may vary between minimal and maximal values *Amin* and *Amax*. It is also possible that during manufacturing the lenght L of the lever 25 may vary.

[0066] According to the invention, the fixation means of the adapter 43, 143, 243 on the moving hinge body 3b are provided on the moving hinge body 3b and/or on the adapter 43, 143, 243 so as to allow the adapter 43, 143, 243 to move relatively to the moving hinge body 3b for compensating the variation of the height of the moving hinge body 3b and adjusting the position of the moving hinge body 3b relatively to the lever 25, which may be pre-assembled to the modular drive unit 7.

[0067] According to a first embodiment illustrated in figures 1 to 3, the fixation means of the adapter 43 on the moving hinge body 3b are provided on the moving hinge body 3b. For example, said fixation means are provided on the flange part 11 of the moving hinge body 3b as explained later.

[0068] According to the first embodiment, the adapter 43 is provided with a pin 45 which protrudes from the plane defined by the flange part 11 of the moving hinge body 3b and extends towards the transmission means 9, here the lever 25, as can be seen in figure 2.

[0069] The pin 45 of the adapter 43 is able to engage the associated hole 33 of the lever 25. The pin 45 of the adapter 43 is able to rotate in the associated hole 33 to compensate angular deviation of the hinge 3 regarding the hinge axis 5.

[0070] In the example shown in figure 3, a wave washer 47 may be arranged between the pin 45 and the associated hole 33.

[0071] Moreover, a retaining means 49, such as a retaining ring 49, may be arranged around the pin 45 engaging the hole 33 of the lever 25, on the side of the lever 25 opposite the side of the lever 25 facing the adapter 43. Such a retaining ring 49 may be a flexible ring.

[0072] Further, the adapter 43 is fastened to the moving hinge body 3b, here to a flange part 11 of the moving hinge body 3b, for example by screwing.

[0073] For that purpose, the fixation means of the adapter 43 on the moving hinge body 3b comprise a hole 51 provided on the moving hinge body 3b (visible in figure 2) for receiving a fastening means 53, such as a screw 53.

[0074] The hole 51 is here provided on the flange part 11 bearing the adapter 43. The screw 53 may be inserted in the hole 51 substantially perpendicularly to the flange part 11.

[0075] Furthermore, the hole 51 is designed so that the position of the screw 53 may be adjusted in the direction of the hole 51. That allows to overcome misalignment of the hole 51 for the passage of the screw in the hinge 3 to the threaded hole in the adapter 43.

[0076] For that, the hole 51 may be a longitudinal hole 51, for example oblong or even a slot.

[0077] In the illustrated example, the longitudinal hole 51 extends in the direction of the arm 12 of the moving hinge body (cf figures 4a and 4b).

[0078] The role of the longitudinal hole 51 is to be a means for compensating the dimensions tolerances of the hinge 3, more precisely of the moving hinge body 3b, being provided directly on the moving hinge body 3b.

[0079] Indeed, as can be seen in figure 4a, if the height of the arm 12 of the moving hinge body 3b is of the minimal value *Amin,* the screw 53 may be in a first position in the hole 51, at a first end of the hole 51.

[0080] On the contrary, referring to figure 4b, if the height of the arm 12 of the moving hinge body 3b is of the maximal value *Amax,* the screw 53 may be in a second position in the hole 51, at a second end of the hole 51 opposed to the first end.

[0081] The screw 53 may slide in the hole 51 depending on the height of the arm 12 of the moving hinge body 3b.

[0082] With the help of the longitudinal hole 51, the dimension tolerances of the hinge 3, more precisely of the moving hinge body 3b, are compensated in order to adjust the position of the lever 25 relatively to the hinge 3.

[0083] The assembly according to this first embodiment allows to remove the sliding block of prior art solutions, that was received in the hole of the lever. On the contrary, the above described first embodiment uses an oblong hole 51, for example on the flange part 11 of the hinge 3, to compensate the hinge tolerances.

[0084] As the slider is removed there is only the rotating pin 45 of the adapter 43 which still requires a certain amount of play. Thus the play which was related to the sliding block in some prior art solutions is eliminated.

[0085] Also the number of parts and the cost is reduced.

[0086] Furthermore, in figure 2 the lever 25 and the adapter 43 are shown separate from each other. However it does not represent the mounting procedure. Indeed, the drive unit 7 is generally delivered to the customer with the adapter 43 mounted to the lever 25 with the retaining ring 49. The modular drive unit 7 is then mounted to the car by aligning the hole 51 of the hinge 3 to the adapter 43 and to align the drive shaft of the modular drive unit 7 to the hinge axis 5. Then the adapter 43 is screwed to the hinge 3.

[0087] According to a second embodiment illustrated in figures 5 to 7, the fixation means of the adapter 143 on the moving hinge body 3b so as to allow a movement of the moving hinge body 3b relatively to the adapter 143, are provided on the adapter 143.The adapter 143 differs from the first embodiment previously described referring to figures 1 to 4b, in that the adapter 143 comprises a nut 155 and a cage 157 for receiving the nut 155. Said fixation means of the adapter 143 on the moving hinge body 3b so as to allow a relative movement between the moving hinge body 3b and the adapter 143 comprise the cage 157 and the nut 155.

[0088] In that case, the hole 51 for receiving the screw 53 may not be longitudinal, such as an oblong hole. Particularly, the moving hinge body 3b may have a circular hole 51. Thus, the hinge 3, more precisely the flange part 11 of the moving hinge body 3b according to this second embodiment has not to be modified from the current state of the art.

[0089] More precisely, the nut 155 is here a self adjusting nut 155.

[0090] The cage 157 is designed so that the nut 155 may slide in the cage 157 to overcome misalignment of the hole for the passage of the screw 53 on the hinge 3, here on the flange part 11 of the moving hinge body 3b, to the adapter 143.

[0091] In this second embodiment, the fixation means for compensating the hinge dimensions tolerances are provided on the adapter 143 which is mounted on the moving hinge body 3b. The cage 157 and the sliding nut 155 serve as means for compensating dimensions tolerances of the hinge 3, more precisely of the height of the arm 12 of the moving hinge body 3b.

[0092] For that purpose, the cage 157 is made by two parts: a body 159 and a covering 161 defining between

them a housing for receiving the nut 155. In the embodiment shown, the housing of the nut 155 is a longitudinal housing longer than the nut 155. The housing is in the illustrated embodiment substantially rectangular. The longitudinal housing of the nut 155 may extend in the direction of the arm 12 of the moving hinge body 3b.

[0093] The body 159 and the covering 161 are both providing with a respective opening 163, 165 allowing the passage of the screw 53. These openings 163, 165 are substantially longitudinal, for example in the form of oblong openings, respectively slots. These longitudinal openings or slots 163 and 165 extend in the example shown in the direction of the arm 12 of the moving hinge body 3b. Moreover, as in the example shown, these openings 163, 165 may be central openings 163, 165.

[0094] The housing defined between the body 159 and the covering 161, and the two openings 163, 165, are designed so that the nut 155 is kept in the cage 157 with some play so that the nut 155 can move toward the screw 53. The nut 155 may slide in the longitudinal direction of the openings 163, 165.

[0095] Finally, the body 159 and the covering 161 are attached together through coupling means 167. For example a rivet 167 may be provided for coupling the body 159 and the covering 161 together. The rivet 167 is able to be inserted into associated fixing holes 169 provided superimposed on the covering 161 and on the body 159. The covering 161 attached to the body 159 thus retains the nut 155 in its housing.

[0096] In this second embodiment, to manage misalignment of the hole for the passage of the screw 53 (figure 5) in the hinge 3 relating to the adapter 143, the nut 155 is movable in its housing defined in the adapter 143.

[0097] The nut 155 may slide in the longitudinal housing defined in the cage 157 depending on the height of the arm 12 of the moving hinge body 3b.

[0098] Once the screw 53 is tightened to the nut 155 the play is removed.

[0099] Similarly to the first embodiment, with the help of the adapter 143 with the cage 157 and the nut 155 mounted movable in the cage 157, the dimension tolerances of the hinge 3, more precisely of the moving hinge body 3b, are compensated in order to adjust the position of the lever 25 relatively to the hinge 3.

[0100] The assembly according to this second embodiment also allows to remove the sliding block of prior art solutions, that was received in the hole of the lever. On the contrary, the second embodiment uses a self adjusting nut 155 to the hinge flange part 11.

[0101] Advantages are similar to those of the first embodiment: there are less parts and the cost is reduced regarding prior art solutions with sliding block, and the play which was related to the sliding block in the prior art design is eliminated.

[0102] A third embodiment is illustrated in figures 8 and 9.

[0103] Similarly to the second embodiment, the adapter 243 comprises a nut 155 and a cage 257 for receiving the nut 155, here a self adjusting nut 155.

[0104] The cage 257 is also designed so that the nut 155 may slide in the cage 257 to overcome misalignment of the hole for the passage of the screw (not shown) in the hinge 3 to the adapter 243.

[0105] As previously, the cage 257 is made by two parts: a body 259 and a covering 261 defining between them a housing for receiving the nut 155. The housing is also in the third embodiment substantially rectangular.

[0106] The body 259 and the covering 261 are both providing with a respective opening 263, 265, for example a central opening, which is substantially longitudinal, such as oblong or oval, and allowing the passage of the screw. Similarly to the second embodiment, the housing defined between the body 259 and the covering 261, and the two openings 263, 265, are designed so that the nut 155 is kept in the cage 257 with some play so that the nut 155 can move toward the screw. The nut 155 may slide in the longitudinal direction of the openings 263, 265. Similarly to the second embodiment, the openings 263 and 265 may extend in the direction of the arm 12 of the moving hinge body 3b (not visible in figures 8 and 9).

[0107] The nut 155 may slide in the cage 257, for example in the direction of the arm 12 of the moving hinge body 3b (not shown in figures 8 and 9). Moreover, the nut 155 may slide in the longitudinal housing defined in the cage 257 depending on the height of the arm 12 of the moving hinge body 3b.

[0108] According to this third embodiment, the covering 261 and the body 259 of the adapter 243 are not coupled together through a rivet as described in the second embodiment, but through a clipping system 271, 273 provided on the body 259 and the covering 261. In this third embodiment the coupling means is thus a clipping system.

[0109] To that aim, the body 259 and the covering 261 respectively bear complementary clipping parts 271, 273. According to the example shown in figures 8 and 9, the body 259 is provided with at least one clipping leg 271 for example on its side able to engage an associated clipping opening 273 provided on the covering 261.

[0110] The covering 261 may be made of spring steel. Moreover, the covering 261 may be locally deformed around the opening 265, as shown by reference 275, in order to keep the nut 155 in position and to avoid that the covering 261 rattles.

[0111] Similarly to the second embodiment, with the help of the adapter 243 with the cage 257 and the nut 155 mounted movable in the cage 257, the dimension tolerances of the hinge 3, more precisely of the moving hinge body 3b, are compensated in order to adjust the position of the lever 25 relatively to the hinge 3.

[0112] Advantages are similar to those of the first and second embodiments: there are less parts and the cost is reduced regarding prior art solutions with sliding block, and the play which was related to the sliding block in the

prior art design is eliminated.

[0113] Furthermore, this third embodiment reduces again the number of parts regarding the second embodiment.

[0114] Such a device for pivoting a vehicle door according to one of the embodiments previously described, allows to remove the play between a sliding block and the lever. On the contrary, in order to compensate tolerances of the hinge dimensions, the fixation means for fixing the adapter 43, 143, 243 on the moving hinge body 3b are used for allowing a relative movement between the moving hinge body 3b and the adapter 43, 143,243.

[0115] Those fixation means may be directly arranged on the hinge 3, more precisely on the moving hinge body 3b, as the longitudinal hole 51 provided on the moving hinge body 3b and able to receive the screw 53, or may be arranged on the adapter 143, 243, for example providing an adapter with a cage 157, 257 and an associated nut 155 which can slide in the cage 157, 257. and which is able to receive the screw 53

Claims

1. Device for pivoting a vehicle door, comprising:

- a hinge (3) with:
  - • a fixed hinge frame (3a),
  - • a hinge axis (5) mounted in the fixed hinge frame (3 a), and
  - • a moving hinge body (3b) mounted so as to pivot around the hinge axis (5) relating to the fixed hinge frame (3a),
- a drive unit (7) for actuating the vehicle door,
- a transmission means (9) connected to the drive unit (7) and to the moving hinge body (3b),
- an adapter (43; 143; 243) mounted on the moving hinge body (3b) linking the transmission means (9) to the moving hinge body (3b), and
- fixation means (51; 155, 157; 257) for fixing the adapter (43; 143; 243) on the moving hinge body (3b),

characterized in that:

- said fixation means (51; 155, 157; 257) are provided on the moving hinge body (3b) and/or on the adapter (43; 143; 243), so as to allow the moving hinge body (3b) to move relatively to the adapter (43; 143; 243).

2. Device according to claim 1, wherein the moving hinge body (3b) comprises at least one flange part (11) for fastening to the vehicle door and supporting the adapter (43; 143; 243), and wherein said fixation means (51; 155, 157; 257) are provided on the flange part (11) and/or on the adapter (43; 143; 243).

3. Device according to claim 1 or 2, wherein said fixation means (51) comprise a longitudinal hole (51) provided on the moving hinge body (3b) for the passage of fastening means (53).

4. Device according to claims 2 and 3, wherein the longitudinal hole (51) is provided on the flange part (11) of the moving hinge body (3b) supporting the adapter (43).

5. Device according to claim 4, wherein the moving hinge body (3b) comprises an arm (12) bent relatively to the flange part (11), and wherein the longitudinal hole (51) extends in the direction of the arm (12).

6. Device according to claim 1 or 2, wherein said fixation means (155, 157; 257) are provided on the adapter (143; 243) and comprise a cage (157; 257) and a nut (155) mounted movable in the cage (157; 257), so as to allow a relative movement between the moving hinge body (3b) and the adapter (143; 243).

7. Device according to claim 6, wherein the cage (157; 257) comprises a body (159; 259) and a covering (161; 261) defining between them a housing of the nut (155), and wherein the housing of the nut (155) is a longitudinal housing longer than the nut (155).

8. Device according to claim 7, wherein the body (159; 259) and the covering (161; 261) are both providing with a longitudinal opening (163, 165; 263, 265) for the passage of fastening means (53).

9. Device according to claim 7 or 8, wherein the moving hinge body (3b) comprises an arm (12) bent relatively to the flange part (11), and wherein the longitudinal housing extends in the direction of the arm (12).

10. Device according to claim 3 or 8, wherein the fastening means (53) comprise a screw (53).

11. Device according to one of claims 7 to 9, wherein the body (159; 259) and the covering (161; 261) are attached together through coupling means (167; 271, 273), such as a rivet (167) or a clipping system (271, 273).

12. Device according to claim 11, wherein the body (259) and the covering (261) are both provided with complementary clipping parts (271, 273) for assembling through a clipping system (271, 273), and wherein the covering (261) is locally deformed around the opening (265).

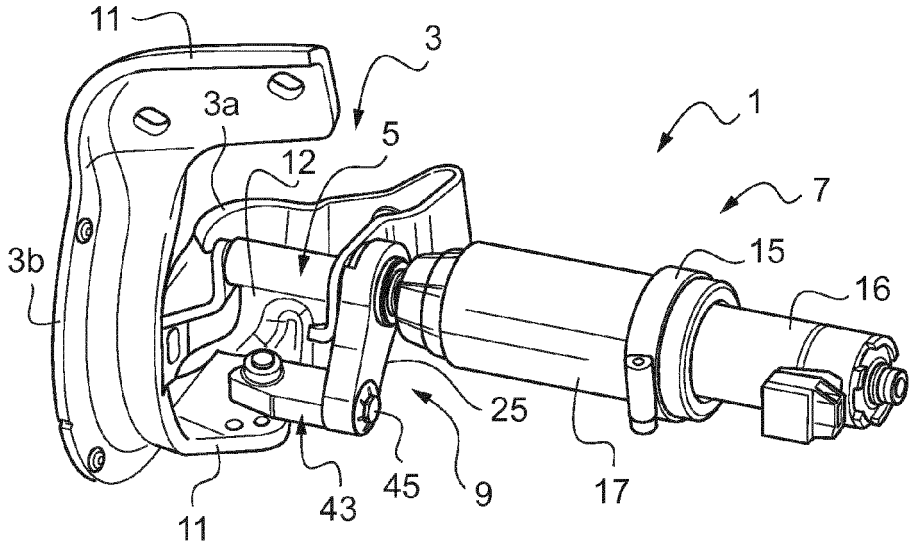


Fig.1

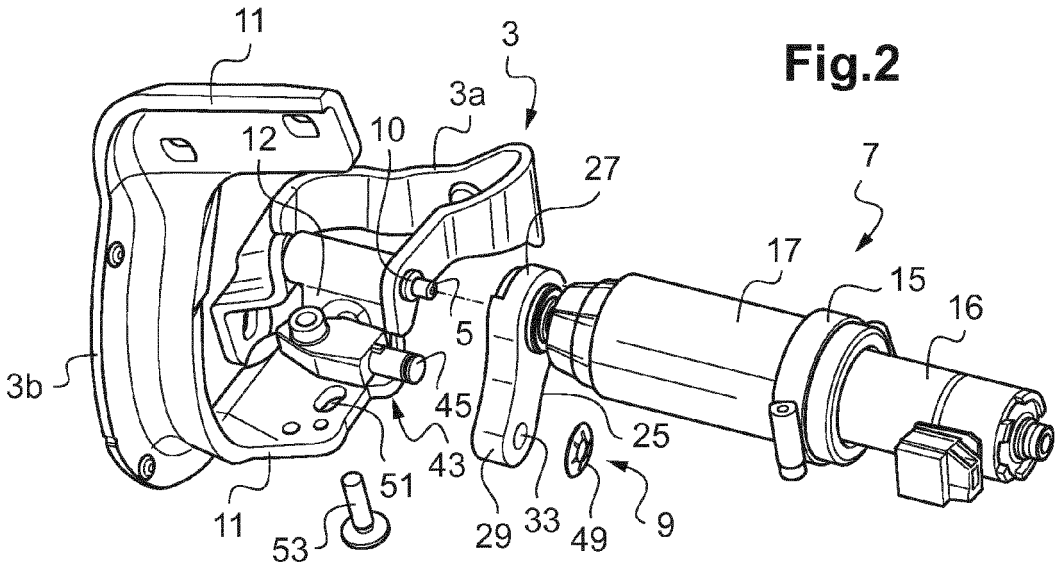


Fig.2

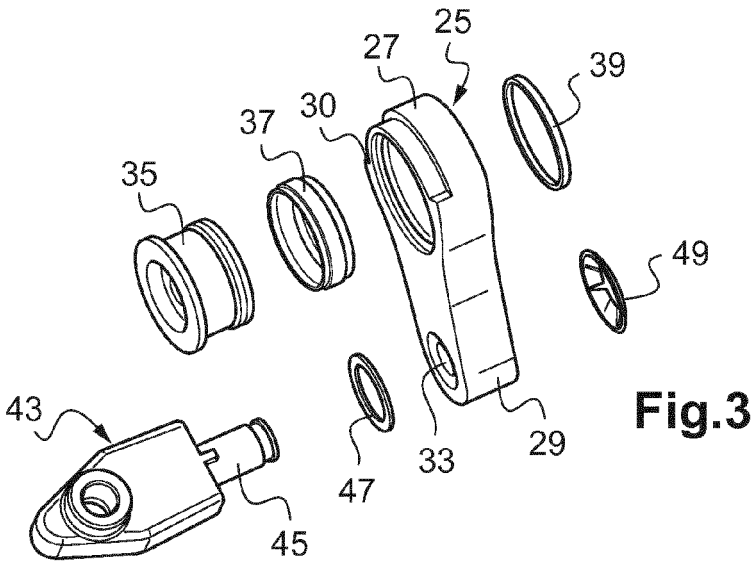


Fig.3

Fig.4a

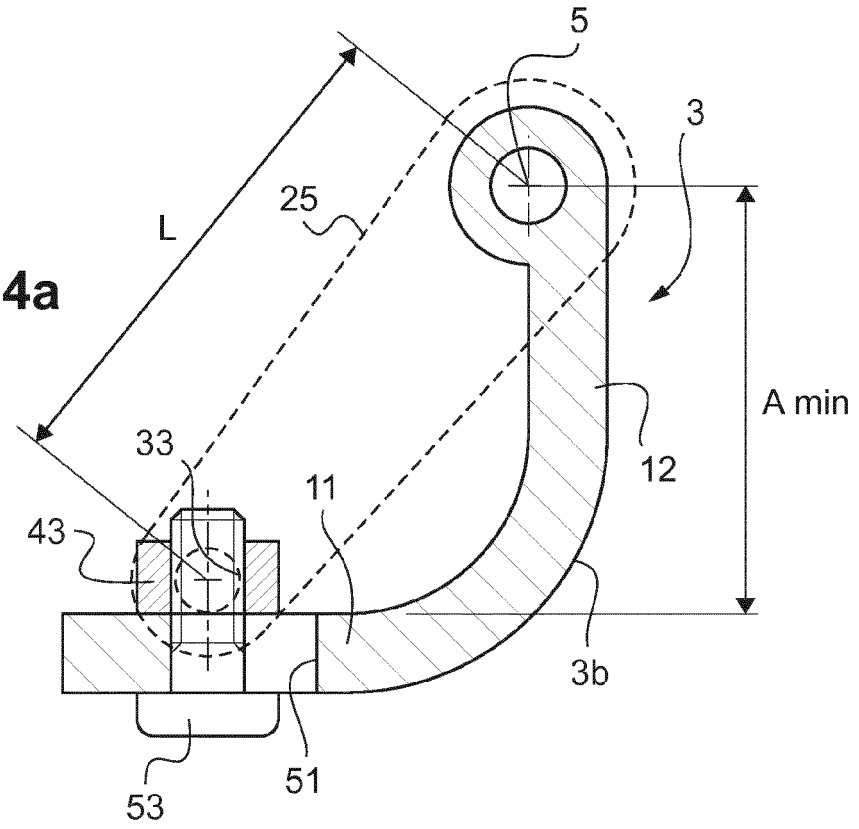
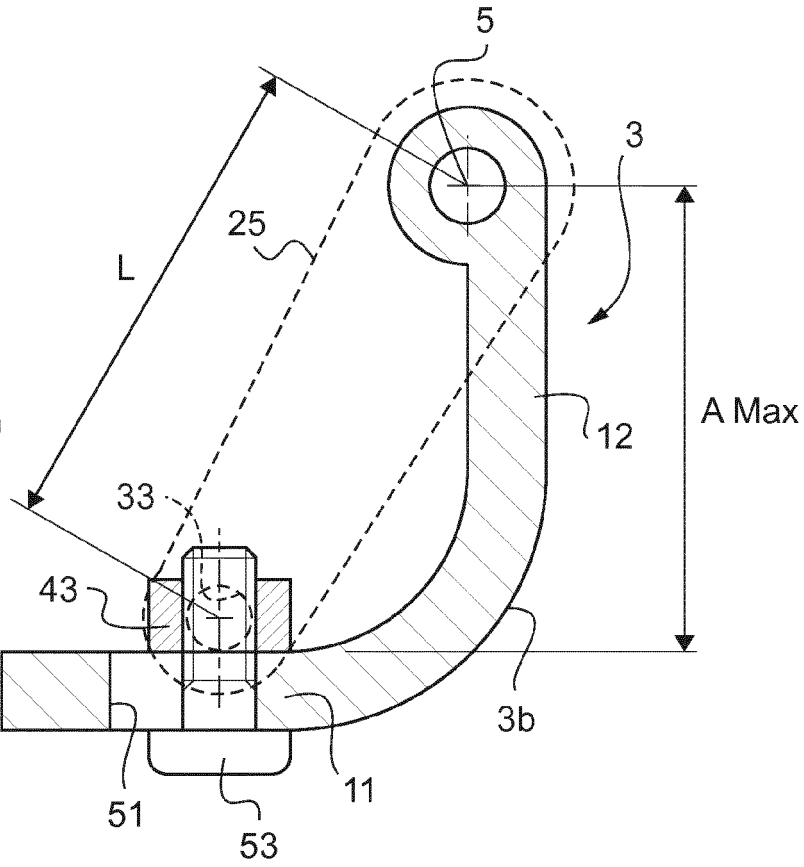


Fig.4b



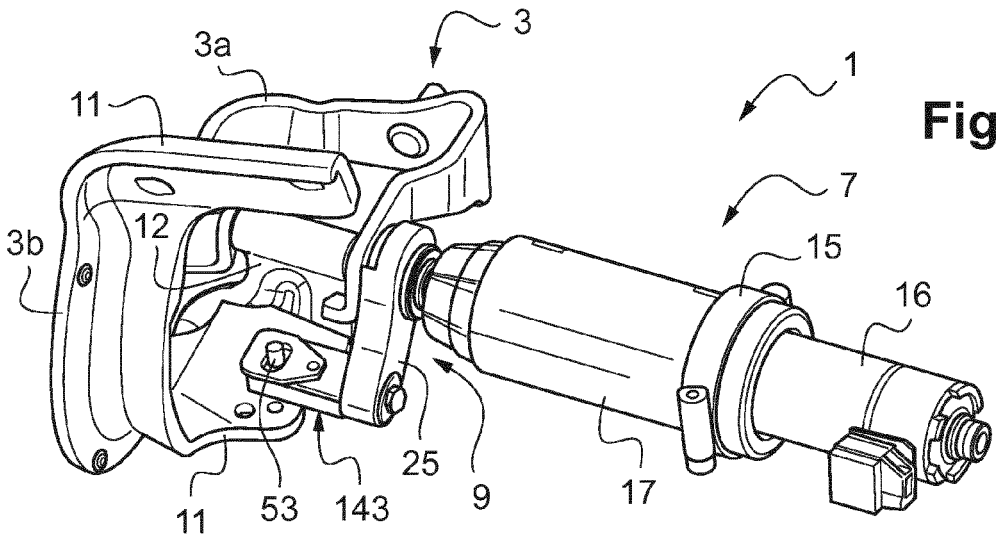


Fig.5

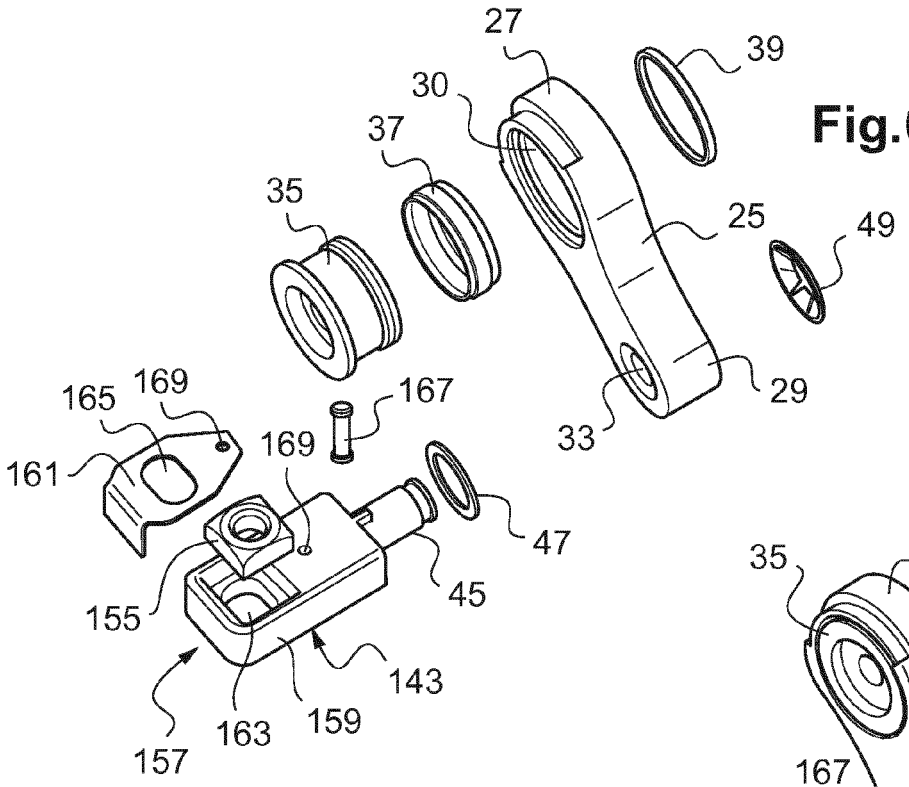


Fig.6

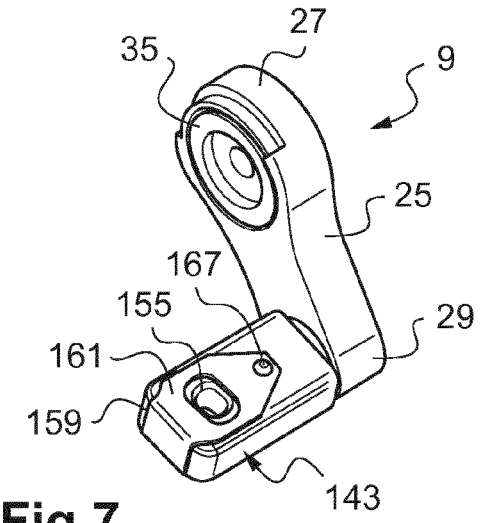


Fig.7

Fig.8

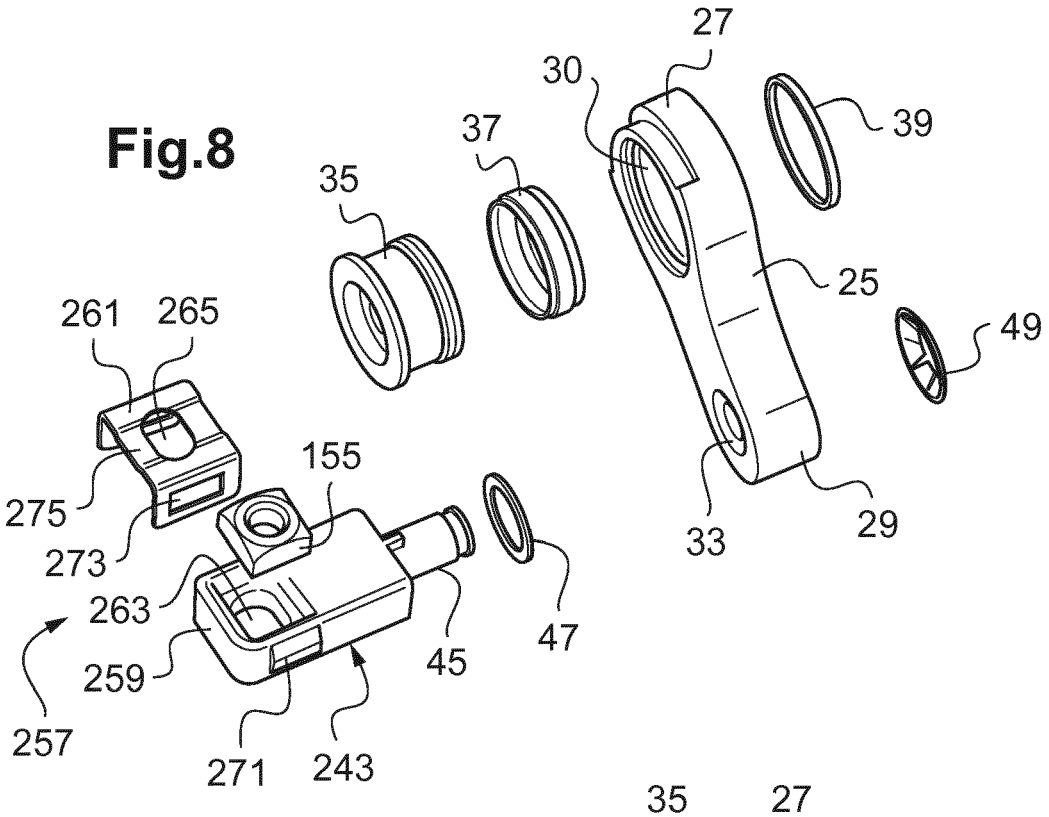

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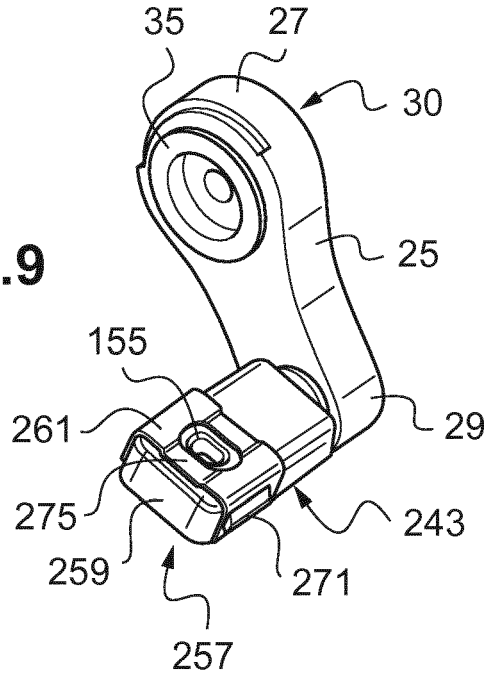
Fig.9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EUROPEAN SEARCH REPORT

Application Number
EP 13 18 9596

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 February 2014	Klemke, Beate

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