

(19)



(11)

EP 3 620 599 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
27.01.2021 Bulletin 2021/04

(51) Int Cl.:
E05B 85/10^(2014.01) E05B 81/90^(2014.01)

(21) Application number: **18192779.9**

(22) Date of filing: **05.09.2018**

(54) **COUPLING DEVICE FOR VEHICLE FLUSH DOOR HANDLE ASSEMBLY**

KUPPLUNGSVORRICHTUNG FÜR FLÄCHENBÜNDIGEN FAHRZEUGTÜRGRIFF

DISPOSITIF DE COUPLAGE POUR POIGNÉE AFFLEURANTE DE PORTE DE VÉHICULE

(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**

(43) Date of publication of application:
11.03.2020 Bulletin 2020/11

(73) Proprietor: **U-Shin Deutschland Zugangssysteme
GmbH
85253 Erdweg (DE)**

(72) Inventors:
• **WINTER, Andreas
85253 Erdweg (DE)**
• **KALIEBE, Lukas
85253 Erdweg (DE)**

- **GRENOUILLAT, Régis
85253 Erdweg (DE)**
- **LINDER, Anton
85253 Erdweg (DE)**
- **PAVLOV, Konstantin
85253 Erdweg (DE)**
- **BOLLINGER, Emmanuel
85253 Erdweg (DE)**

(74) Representative: **Verriest, Philippe et al
Cabinet Germain & Maureau
12, rue Boileau
69006 Lyon (FR)**

(56) References cited:
WO-A1-2015/074020 US-A1- 2016 369 537

EP 3 620 599 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

Technical Field

[0001] The present invention concerns a vehicle door handle assembly, in particular with a flushing door handle lever. Such vehicle door handle assembly comprises a motorized actuator which, when actuated, moves the handle lever between a flush position and a ready position. In the flush position, the handle lever is flush i.e. coplanar with the exterior surface of the door body. In the ready position, the handle lever is protruding from said exterior surface, to be graspable by a user.

[0002] Once the user grasps the handle lever in its ready position, he can pull the lever in a further protruding position and unlatch the door. Indeed, the door handle lever interacts (via a Bowden cable, a rotating pin and/or a gear mechanism) with a latch mechanism to unlatch the door.

[0003] Generally, in door handles, a handle lever spring brings the handle lever back in its ready position when the user releases the handle lever. It is also possible for the motorized actuator to move the handle lever from the ready position back to the flush position after door opening or door closing however, this is however mostly performed by a return spring mechanism. The use of a motorized actuator is nevertheless not compulsory for flush door handles, those can be non-motorized concepts.

Background Art

[0004] The patent application US 2016290018 is known, it deals with a system including a component that can be mounted movably in or on an automobile and an actuating apparatus for the component, the actuating apparatus having a push-push mechanism that interacts with the component. It is possible for the component to be moved out of a closed position by manual exertion of a pressing force counter to the pre-stress of a spring into an unlocked position to unlock the push-push mechanism, out of which unlocked position the component is moved into a partially open position driven by the pre-stress of the spring. Eventually, out of the partially open position the component can be displaced into an open position by manual exertion of a pulling force.

[0005] It is however much more comfortable to have a motorized mechanism that can make the door handle lever available for pulling after any recognition system and/or action of the car owner. Furthermore, the push-push mechanism in this disclosure has to overcome the actuation mechanism with the gearing system integrated leading to stability issues and premature wearing.

[0006] Nowadays, generally speaking, the motorized actuator sets the handle lever in motion via a reduction mechanism, for example a worm drive and gear mechanism, which reduces the rotational speed of the motor actuation while increasing torque value to push the han-

dle lever out into its ready position.

[0007] Such door handle assemblies, i.e. motorized one, also comprise a back-up mechanism, as in document US 2016369537 disclosing a handle including an activation member for activating a latch of a vehicle door to unlatch the door and a grip member that cooperates with the activation member to unlatch the door. The grip member presents a gripping part and is movable between a flushing position in which the gripping part extends flush to an external panel of the door, an active position in which the gripping part projects with respect to the external panel, becoming graspable, and an opening position in which the grip member drives the activation member to unlatch the door. The handle presents a driving mechanism and an actuator lever cooperating with the grip member to drive the latter between the flushing and the active position. When the grip member is pulled in an opening direction, the grip member drives the activation member that unlatches the door.

[0008] To enable the opening of the door in case of, for example, motorized actuator or car battery failure, i.e. when the motorized actuator cannot be actuated, this mechanism comprises a push-push mechanism, in which the user pushes the handle lever inwards from its flushing position until reaching a clicking position in which a preloaded spring is released. Said preloaded spring, when released, pushes the handle lever from the inward clicking position to the outward protruding ready position. Once the user accesses the vehicle in back-up mode, the battery will generally be recharged, and/or the motor failure will be lifted and normal, electric, actuation can be resumed.

[0009] In application US 2016369537, just like in US 2016290018, the flush door handle pops out in a rotational movement which is a common lever extraction for flush door systems. In these prior art mechanisms, the push-push mechanism is integrated inside the actuator mechanism; therefore, the gear mechanism inside the actuator is driven when the back-up manual mode is used. This is detrimental to the door handle stability and means that the actuation mechanism is set in motion even when back-up manual mode is used. This increases the mechanism wearing.

[0010] Eventually, the gearing system of the actuator has to be reversible since the back-up manual mode drives back the completely motorized actuation mechanism. This reversibility means that the gearing system, at the ready position, should be able to return to flush position biased by return springs, henceforth a brake might be needed to guarantee a stable ready position. All these constraints lead to a complex flush door handle.

Summary of invention

[0011] In order to overcome the aforementioned drawbacks, the invention deals with an actuator integrated coupling device comprising a vehicle door handle, the door handle having a handle lever movable between:

- a flush position in which it is flush with an exterior door panel surface,
- a ready position in which it is protruding and graspable by a user,
- and an inward clicking position in which the handle lever is in a retracted position inside the vehicle door, said coupling device comprising:

- a cam rotatable about an axis,
- a motorized actuator for rotating said cam,
- a transmission mechanism comprising a first lever for coupling with the cam to move the handle lever between said flush and ready positions, a push-push unit, coupled to the first lever by a connecting rod so that when the handle lever is pushed to the inward clicking position, the push-push unit pushes back the handle lever in the ready position.

Characterized in that the push-push unit and the motorized actuator are decoupled to allow the push-push unit to move the door handle lever between said flush, ready and retracted positions while the motorized actuator is not subjected to any mechanical strain, the manual push back and manual door handle extraction is performed in a totally decoupled manner with reference to the actuator, the handle lever can go back to flush position electrically by re-setting the push-push unit in its pre-stressed state using motorized actuator.

[0012] In a preferred embodiment, the actuator integrated coupling device according to the invention is characterized in that the motorized actuator comprises an electric motor coupled with a worm drive, said worm driving being coupled with a reduction mechanism to set in rotation the shaft of the cam when the electric motor rotates. This improves the motor efficiency.

[0013] In a preferred embodiment, the actuator integrated coupling device according to the invention is such that the first lever comprises elastic return means, for example a torsion spring or a double torsion spring, to push said first lever back to its flush position once the handle lever has reached ready position.

[0014] In another preferred embodiment, the actuator integrated coupling device according to the invention is characterized in that the transmission mechanism further comprises:

- a first lever axis, the first lever being rotatable about said first lever axis parallel to the cam axis,
- a second lever rotatable about a second lever axis,
- the first and second levers axis being parallel and longitudinally distant from one another,
- at least one linking rod having its ends connected to the first lever and the second lever in articulated connections,
- at least one of said connections comprising a first slotted hole parallel to said linking rod ,
- The first lever, the second lever, the linking rod and

the handle lever forming a kinematics assembly whose deformation is able to displace the handle lever in translation. The translation extraction of the door handle lever is an alternative to a rotation extraction mode.

[0015] Alternatively, the actuator integrated coupling device according to the invention can be such that the first lever is rotatable about a first lever axis parallel to the cam axis, and is directly coupled to the handle lever so that the cam, the first lever and the handle lever form a kinematics assembly whose deformation is able to displace the handle lever in rotation. The rotation extraction of the door handle lever is an alternative to the translation extraction.

[0016] Preferably, the actuator integrated coupling device according to the invention is characterized in that the connecting rod is made of a central rod having, at its two ends, two arms forming each a right angle with the central rod. Such coupling allows better movement transmission between the push-push unit and the first lever.

[0017] In a further preferred embodiment and further improve movement transmission, the actuator integrated coupling device according to the invention is characterized in that the two arms of the connecting rod are parallel.

[0018] In another preferred embodiment, the actuator integrated coupling device according to the invention is characterized in that the first lever comprises at least one arm, said arm having a slotted hole for the coupling with the connecting rod. The slotted hole, gives a degree of freedom needed to pull the handle lever further from the ready position to unlatch it. Without said degree of freedom, the fully extended push-push unit would not allow further pulling for door unlatching.

[0019] Ideally, the actuator integrated coupling device according to the invention is characterized in that the push-push unit is also coupled, at its end opposite to the one coupled to the connecting rod, to a resetting lever system displaceable by the cam so as to push the push-push unit back to its pre-stressed state and pull the first lever, to bring the door handle lever back to its initial flush position. The main advantage here is that on one hand the push-push unit can be activated and/or deactivated both mechanically and electronically via a motorized actuator.

[0020] So as to optimize space distribution of the coupling device and reduce its volume, the resetting lever system preferably comprises:

- a rotatable connecting lever having a central portion and ,at its ends, two radial arms rotatable about the axis of the connecting lever, the first radial arm being coupled to the push-push unit,
- a cam lever with a central portion and two ends, the first end being coupled in a rotatable manner about an axis to the second radial arms of the connecting lever, and the second end extending perpendicularly to the central portion and being displaceable by the

cam, the rotation axis of the connecting lever and the rotation axis of the cam lever being parallel and both perpendicular to the cam rotation axis.

[0021] In a preferred embodiment, the actuator integrated coupling device according to the invention is characterized in that the cam has at least one radial arm for displacing the second end and comprising a chamfer and in that the cam lever second end comprises an oblique surface complementary to the chamfer so that during motorized actuation to reset the push-push unit, the cam is able to rotate, then longitudinally displace the second end before deflecting said second end by following the oblique surface. This allows the motorized cam rotation in a single clockwise direction to reset the push-push unit in its initial pre-stressed state.

[0022] In a further preferred embodiment, the actuator integrated coupling device according to the invention is characterized in that the rotatable coupling about the axis between the cam lever first end and the connecting lever second radial arms comprises a return spring to bias the cam lever second end towards its initial position after deflection.

[0023] Preferably, between the guiding rod radial flange and the connecting lever first radial arm, there is an adjustment screw that allows regulating the push-push system pre-stress manually (cf. fig. 6).

[0024] Generally speaking, the invention is about a coupling device for a flush door handle to be operated in emergency or other cases. The current invention separates the actuator and the push-push system in order to avoid moving the internal parts of the actuator in case of an electrical failure. Furthermore, the system allows the actuator to deactivate the push-push system to retract the door handle.

Brief description of drawings

[0025] Other characteristics and advantages of the invention will appear in the following lines.

[0026] Hereinafter, the figures of the invention are given in an illustrative and not limiting approach, they show:

Figure 1: A flush door handle in a car door.

Figure 2: A perspective view of a coupling device according to the invention.

Figure 3: A perspective view of a cam and a cam lever according to the invention

Figure 4: A front view of a resetting system according to the invention.

Figure 5: An exploded view of a push-push unit and resetting system according to the invention.

Figure 6: A perspective view of a push-push unit according to the invention.

Figure 7: A perspective view of a guiding rod of the push-push unit according to the invention.

Figure 8 A-C: perspective, side and rear view of a flush door handle with the coupling device according

to the invention.

Figure 9: A rear perspective view of a flush door handle with the coupling device according to the invention.

Figure 10: An exploded view of a flush door handle with coupling device according to the invention.

Figure 11: Rear and front view of a door handle according to the invention in flush position.

Figure 12: Rear and front view of a door handle according to the invention in ready position.

Figure 13: rear and top view of a door handle according to the invention in ready position.

Figure 14: rear and top view sequence for a door handle according to the invention in ready position before manual retraction.

Figure 15: rear and top view sequence for a door handle according to the invention before motorized retraction and push-push re-initialization.

[0027] In all figures, the same references apply to the same element.

Description of embodiments

[0028] Though the figures refer to precise embodiments of the invention, other embodiments may be obtained by combining or altering slightly the represented embodiments; said new embodiments are also within the scope of the invention, as defined by the appended claims.

[0029] Figure 1 shows a perspective view of a vehicle Ve, its door panel 100 having a built-in door handle 1. The door panel 100 forms an exterior surface of the vehicle, the door handle 1 is essentially represented by its handle lever 3 (the part meant to be grasped and set in motion by a user).

[0030] The terms like "inwards", "outwards" and equivalents refer to the vehicle interior and exterior. The terms longitudinal, transversal and vertical refer to the directions as drawn in figure 1.

[0031] In figure 1, the handle lever 3 is in a flushing position. In said flushing position, the outer surface of the handle lever 3 is flush with the door panel 100. Said flush position is obtained when the vehicle is rolling or when it is parked. In flush position, the handle lever 3 is less likely, when parked, to interact with by passers, accidentally or not, and air drag is reduced when driving, improving aerodynamics. In the flush position, the handle lever 3 also appears integrated in the door panel 100 in a pleasant and discrete way.

[0032] In the event of a mechanical or electrical failure of the mechanism that drives the lever 3 from the flush position to the ready position, the user can push the lever 3 inwards with respect to the door panel 100, by applying inwards directed pressure Pon the handle lever 3. The handle lever 3 is then in a position herein called clicking position, where a mechanical interaction releases a spring of a push-push unit that drives the lever 3 in ready

position without actuation of a motor.

[0033] A push-push unit per-se is known in the art, for instance, US patent application US 2011/0174102 explains one of them with the principle detailed.

[0034] The figure 2 shows a coupling device according to the invention. The first lever 6 comprises two arms 61 and 62 on both sides of the median plane of said first lever 6, said median plane being perpendicular to the cam 4 rotation axis A6. A double torsion spring lies on the first lever rotation axis A6 to bring the first lever 6 back to flush position from ready position.

[0035] One of the two arms 62 has a slotted hole 62a coupled to the connecting rod 2 (fig. 4 and 5). In figure 2, such connection is made through an arm 21 of the connecting rod 2. The connecting rod 2 has two parallel arms 21 and 23 linked by a central rod 22 perpendicular with both arms 21 and 23.

[0036] The push-push unit 9 depicted in figure 2 is able to displace the arm 23-hence the connecting rod 2- longitudinally along an axis (90). This push-push unit 9 can be pre-stressed by the connecting rod 2 or by a resetting lever system 10.

[0037] The resetting system of figure 2 comprises:

- a rotatable connecting lever 106 (figure 5) having a central portion 106a and, at its ends, two radial arms 106b and 106c rotatable about the axis 110. The first radial arm 106c is coupled to the push-push unit 9;
- and a cam lever 101 (fig. 3-5) with a central portion 101a and two ends 101b and 101c, the first end 101c being coupled in a rotatable manner about an axis 111 (fig. 4) to the second radial arms 106b of the connecting lever 106, and the second end 101b extending perpendicularly to the central portion 101a and being displaceable by a cam 4.

[0038] It is important to note that cam lever 101 has two degrees of freedom, it is able to rotate about axis 111 and to translate longitudinally.

[0039] The rotation axis 110 (fig. 4) of the connecting lever 106 and the rotation axis 111 of the cam lever 101 are parallel and both perpendicular to the cam rotation axis 42.

[0040] The cam 4 (also in fig. 3 and 4) comprises two radial arms 4a and 4b and rotates about the axis 42. The radial arms 4a and 4b extend perpendicularly to the cam rotation axis 42. It should be noted that a cam with a single arm (4a, 4b) is another preferred alternative that would also provide the same effect. The cam 4 can both rotate the first lever 6 and translate the central portion 101a of the cam lever 101.

[0041] The cam 4 also comprises a chamfer 41 (fig.3) and lateral surface 40. The chamfer 41 makes the link between the lateral surface 40 of the cam 4 and the lower surface-parallel to the rotation plane of the cam 4. Said rotation plane being perpendicular to the rotation axis 42 of the cam 4.

[0042] The actuator 8 comprises a motor and gearing

system (both not represented) to drive in rotation the cam 4.

[0043] In figure 3, one can see the cam lever second end 101b ending by an oblique surface 101d complementary to the chamfer 41.

[0044] Referring now to figures 4 to 7 related to the push-push unit 9 and the resetting lever system 10, we describe their components below.

[0045] In figure 4, we can see the guiding rod 94 (see also figure 5) as well as the push-push driver 91 and the carrier 92 of the push-push unit 9.

[0046] The push-push unit 9 comprises a cylinder shaped sleeve 96 inside which a push-push driver 91 is housed in an axially displaceable manner along an axis 90 (fig.2) while being projectable through a sleeve aperture out of the sleeve 96.

[0047] The sleeve 96 cannot rotate since an outer protrusion 96a is housed in a corresponding groove of the push-push unit housing H (fig. 5) to guarantee axial displacement only.

[0048] In addition, as better seen from figure 6, the push-push unit 9 comprises two springs 93a and 93b, co-axial with the sleeve 96 (not represented in figure 6 for clarity), pre-stressing the push-push driver 91 to project from the sleeve 96. More specifically, the small spring 93a biases a rotatable ring 95 towards the push-push driver 91. The main spring 93b biases the push-push driver 91 towards its outer aperture via its radial flange 91b to push the handle lever 3-via first lever 6-from retracted to ready position. Both small and main springs 93a and 93b rest on the radial flange 94c of the guiding rod 94 (fig. 5 and 7).

[0049] The push-push unit 9 further comprises a rotatable ring 95 enclosing the guiding rod 94 and supported in the sleeve 96 in an axially and rotationally displaceable manner. However, said rotatable ring 95 has at least one protrusion towards the inner circumference of said ring 95 being able to engage the guiding rod radial grooves 94a (fig. 5 and 7) so that the ring 95 retains its angular position when the guiding rod 94 is axially displaced.

[0050] In figure 6, between the guiding rod radial flange 94c and the connecting lever first radial arm 106c, there is an adjustment screw that allows regulating the push-push system pre-stress manually.

[0051] The figure 7 shows again the guiding rod 94 of a preferred embodiment of the invention, co-axial with the axis 90 (fig.2), with radial grooves 94a running parallel to the axis 90 and the radial flange 94c able to act as a rest for the spring 93a and 93b. In addition, the guiding rod 94 has locking recesses 94b placed radially between the entries of the grooves 94a.

[0052] These locking recesses can receive at least one protrusion at the inner circumference of the ring 95 once the push-push driver 91 is released by the handle lever 3 after a first inward stroke by a user. Then the springs 93a and 93b push back the rotated ring 95 in the locking recess 94b leading to a locked position. An outer radial protrusion 94d is associated with the guiding rod 94

flange to fit in the corresponding groove of the push-push unit housing H to guarantee axial displacement only. The guiding rod 94 further comprises, radially between the grooves 94a, locking recesses as first deflection faces running obliquely to the sleeve axis 90.

[0053] Equally, the rotatable ring 95 comprises, along its outer circumference, locking recesses as second deflection faces running obliquely to the sleeve axis 90. The first and second deflection faces being circumferentially offset so as to rotate the ring 95 through a predetermined angle when the guiding rod 94 or push-push driver 91 is axially displaced by a pre-determined stroke and said guiding rod 94 and push-push driver 91 come into contact through the offset deflections faces.

[0054] Indeed, when pushing the guiding rod 94 (via a motor driven resetting lever system 10) or the push-push driver 91 (via manually operated connecting rod 2), the inner protrusion 95a at the inner circumference of the ring 95 pops into the locking recess 94b and slides through the first deflection face running obliquely to the sleeve axis. This is the push-push unit locked position.

[0055] To unlock the push-push unit 9 and release the pre-stresses springs 93a and 93b, the handle lever 3 is pushed inwards. Then, the ring 95 rotates and the springs 93a and 93b drive the inner protrusion 95a at the inner circumference of the ring 95 out of the locking recess 94b to the deflection face leading to the grooves 94a for a full excursion to push the door handle lever 3 out.

[0056] We refer now to figure 8 a to c showing the same handle from different angles, respectively perspective, top and rear views. One can see an embodiment with a translation extraction mechanism T where said mechanism of handle movement comprises a second lever 7 connected by two articulated connection 801,802 to linking rods 81,82 and mounted in an articulated manner on parallel rotation axis A6, A7 carried by the handle. This double linking rod system brings stability.

[0057] The two linking rods 81 and 82 are symmetrical with respect to a median plane extending in a longitudinal direction of the handle; said plane is perpendicular to the first and second lever rotation axis A6 and A7. Each of the linking rods 81 and 82 has oblong holes 811 close to the articulated connection 801 and 802 extending parallel to the linking rods.

[0058] These oblong holes allow further pulling from ready position to unlatch the door by pulling on unlatching lever Co (fig. 10). Figure 9 shows a rear view of a door handle according to the invention with a Bowden cable C able to act on said unlatching lever Co. The door handle bracket B is also represented.

[0059] The figure 10 is an exploded view showing more clearly the Bowden cable V, the first and second rotations axis A6 and A7 and their associated first and second levers 6 and 7.

[0060] The figures 11 to 15 will now be used to explain the mechanism of the coupling device according to the invention applied to a translatable extractive door handle.

[0061] The figures 11 and 12 represent the door handle

1 respectively in flush position-that is when the handle lever 3 is co-planar with the door 100- and in ready position when the door handle lever 3 pops out of the door 100 to be grasped by a user willing to unlatch the door and open it. For each figure, on the left is a rear view and on the right, it is the corresponding front view.

[0062] Figures 13 and 14 are respectively rear and front views-from left to right-of a door handle 1 according to the invention in ready position. The figure 13 shows a door handle a ready position after extraction. Figure 14, first figure on the left, is the initial position of the connecting rod 2 (see fig. 8 for larger view). Then in figure 14, second figure on the middle, the handle lever is being pushed as depicted on the picture on the right. In this case, we see a longitudinal displacement towards the right hand side pre-stressing the push-push unit 9 and more precisely, the springs 93a and 93b.

[0063] Looking at fig. 8 a, the sequence is as follows: The user pushes the handle lever 3. Since it is linked to the first lever 6, it creates a rotation about the first axis A6 of the first lever 6. Such rotation displaces the connecting rod 2 since they are linked by the slotted hole 811. The arm 23 transmits to the connecting rod 2 the displacement, thus pushing the push-push unit 9 to pre-stress it as can be seen in the second figure in the middle of fig. 14. This is the sequence for manual push back of the door handle 1 from ready to flush position re-arming the push-push unit 9.

[0064] Once the push-push unit is pre-stressed, if a user pushes it from flush position, the rotatable ring 95 rotates and then slides through the grooves 94a as explained above to push the handle 3 from flush to ready position.

[0065] It is important to note that manual push back and manual door handle extraction as explained in above sequence is performed in a totally decoupled manner with reference to the actuator 8. The first lever 6 does not rotate the cam 4. In case of electric failure, this avoids the manual back-up system to move the actuator 8 gearing mechanism.

[0066] We now refer to figure 15 where the right hand drawing shows a door handle lever 3 in ready position. We want the handle lever 3 to go back to flush position electrically without any direct manual action from the user on the handle lever 3. Such situation occurs naturally when the user locks the car and works away. However it may also occur, for instance, when the battery was empty during car park leaving the handle lever 3 in ready position and then reloads once the problem has been solved and the engine runs because the user is driving the car. For car aerodynamics improvement as well as aesthetic reasons, the handle lever must be flush after a certain car speed.

[0067] Thanks to the invention, such retraction takes place while simultaneously re-setting the push-push unit in its pre-stressed state. To do so, one may look at the arrows of fig. 15 and fig.2. On the left hand side of fig. 15 arrows show the clockwise rotation of the cam 4. The

sequence is as follows when looking at figure 2 and figure 3 (zoomed view of the cam 4 and the cam lever 101): the electric motor inside the actuator 8 rotates and drives in clockwise rotation the cam 4. Such rotation pushes the cam lever 101 that in turn rotates the connecting lever 106 about the axis 104. The clockwise rotation of the second radial arm 106b is transmitted to the first radial arm 106c by the central portion 106a of the connecting lever 106. Since the first radial arm 106c is coupled to the push-push unit 9 via the guiding rod 94, this sequence (fig.6) pre-stresses the springs 93a and 93b, re-arming the push-push unit 9.

[0068] The cam 4 keeps rotating clockwise and its chamfer 41 follows the oblique surface 101d of the cam lever 101. This deflects the cam lever 101 downwards allowing the cam 4 to go back to initial position. After deflection of the cam lever 101, a spring 102 biases back said cam lever 101 to its initial position in the same plane as the rotation plane of the cam 4.

Industrial applicability

[0069] The coupling device according to the invention can be used for flush door handles extracting either rotationally or translationally as explained. The mere fact that the preferred embodiment is a translational flush door handle extraction shall not be considered as a limitation to such preferred embodiment. The coupling device can be adapted to fit any door requiring a flush type handle mechanism.

[0070] A notable advantage of the push-push unit 9 according to the invention is that on one hand it can be activated and deactivated mechanically from one side and on the other hand it can be activated and deactivated electronically-via the motorized actuator 8- from the other side. Therefore, if the push-push unit is activated manually to put the handle lever 3 in ready position, it can afterwards be reinitialized in a motorized way, i.e. set back in flush position electronically.

Claims

1. An actuator integrated coupling device (C) comprising a vehicle door handle (1), the door handle (1) having a handle lever (3) movable between:

- a flush position in which it is flush with an exterior door panel (100) surface,
- a ready position in which it is protruding and graspable by a user,
- and an inward clicking position in which the handle lever (3) is in a retracted position inside the vehicle door (100), said coupling device comprising :

- a cam (4) rotatable about an axis (42),
- a motorized actuator (8) for rotating said

cam (4),

- a transmission mechanism (T) comprising a first lever (6) for coupling with the cam (4) to move the handle lever (3) between said flush and ready positions,

- a push-push unit (9), **characterized in that** the push-push unit (9) is coupled to the first lever (6) by a connecting rod (2) so that when the handle lever (3) is pushed to the inward clicking position, the push-push unit (9) pushes back the handle lever (3) in the ready position, wherein the push-push unit (9) and the motorized actuator (8) are decoupled to allow the push-push unit (9) to move the door handle lever (3) between said flush, ready and retracted positions while the motorized actuator (8) is not subjected to any mechanical strain, the manual push back and manual door handle extraction is performed in a totally decoupled manner with reference to the actuator (8), the handle lever (3) can go back to flush position electrically by re-setting the push-push unit in its pre-stressed state using motorized actuator (8).

2. Actuator integrated coupling device according to claim 1 **characterized in that** the motorized actuator (8) comprises an electric motor coupled with a worm drive, said worm driving being coupled with a reduction mechanism to set in rotation the shaft (42) of the cam (4) when the electric motor rotates.

3. Actuator integrated coupling device according to claim 1 or 2 **characterized in that** the first lever (6) comprises elastic return means (61), such as a torsion spring or a double torsion spring, to push said first lever (6) back to its flush position once the handle lever (3) is in ready position.

4. Actuator integrated coupling device according to anyone of preceding claims **characterized in that** the transmission mechanism (T) further comprises:

- a first lever axis (A6), the first lever (6) being rotatable about said first lever axis (A6) parallel to the cam axis (42),
- a second lever (7) rotatable about a second lever axis (A7),
- the first and second levers axis (A6, A7) being parallel and longitudinally distant from one another,
- at least one linking rod (81, 82) having its ends connected to the first lever (6) and the second lever (7) in articulated connections (801, 802),
- at least one of said connections (801,802) comprising a first slotted hole (811) parallel to said linking rod (81,82),

- The first lever (6), the second lever (7), the linking rod (81, 82) and the handle lever (3) forming a kinematics assembly whose deformation is able to displace said handle lever (3) in translation.
5. Actuator integrated coupling device according to anyone of claims 1 to 3 **characterized in that** the first lever (6) is rotatable about a first lever axis (A6) parallel to the cam axis (42), and is directly coupled to the handle lever (3) so that the cam (4), the first lever (6) and the handle lever (3) form a kinematics assembly whose deformation is able to displace said handle lever (3) in rotation.
 6. Actuator integrated coupling device according to anyone of preceding claims **characterized in that** the connecting rod (2) is made of a central rod (22) having, at its two ends, two arms (21, 23) forming each a right angle with the central rod (22).
 7. Actuator integrated coupling device according to claim 6 **characterized in that** the two arms (21, 23) of the connecting rod (2) are parallel.
 8. Actuator integrated coupling device according to anyone of preceding claims **characterized in that** the first lever (6) comprises at least one arm (62), said arm (62) having a slotted hole (62a) for the coupling with the connecting rod (2).
 9. Actuator integrated coupling device according to anyone of preceding claims **characterized in that** the push-push unit (9) is also coupled, at its end opposite to the one coupled to the connecting rod (2), to a resetting lever system (10) displaceable by the cam (4) so as to push the push-push unit (9) back to its pre-stressed state and pull the first lever (6), to bring the door handle lever (3) back to its initial flush position.
 10. Actuator integrated coupling device according to claim 9 **characterized in that** the resetting lever system (10) comprises:
 - a rotatable connecting lever (106) having a central portion (106a) and, at its ends, two radial arms (106b, 106c) rotatable about the axis (110) of the connecting lever (106), the first radial arm (106c) being coupled to the push-push unit (9),
 - a cam lever (101) with a central portion (101a) and two ends (101b, 101c), the first end (101c) being coupled in a rotatable manner about an axis (111) to the second radial arms (106b) of the connecting lever (106), and the second end (101b) extending perpendicularly to the central portion (101a) and being displaceable by the cam (4), the rotation axis (110) of the connecting

lever (106) and the rotation axis (111) of the cam lever (101) being parallel and both perpendicular to the cam rotation axis (42).

11. Actuator integrated coupling device according to claim 10 **characterized in that** cam 4 has at least one radial arm (4a, 4b) for displacing the second end (101b) comprising a chamfer (41) and **in that** the cam lever second end (101b) comprises an oblique surface (101d) complementary to the chamfer (41) so that during motorized actuation to reset the push-push unit (9), the cam (4) is able to rotate, then longitudinally displace the second end (101b) before deflecting said second end (101b) by following the oblique surface (101d).
12. Actuator integrated coupling device according to claim 11 **characterized in that** the rotatable coupling about the axis (111) between the cam lever first end (101c) and the connecting lever second radial arms (106b) comprises a return spring (102) to bias the cam lever second end (101b) towards its initial position after deflection.

Patentansprüche

1. Kupplungsvorrichtung mit integriertem Aktor (C), einen Fahrzeugtürgriff (1) umfassend, wobei der Türgriff (1) einen Griffhebel (3) aufweist, der beweglich ist zwischen:
 - einer bündigen Position, in der er mit einer Außenfläche eines Türblechs (100) bündig ist,
 - einer Bereit-Position, in der er hervorstehend und von einem Nutzer greifbar ist,
 - und einer nach innen zuschnappenden Position, in der der Griffhebel (3) in einer eingezogenen Position innerhalb der Fahrzeugtür (100) ist, wobei die Kupplungsvorrichtung umfasst:
 - einen Nocken (4), der um eine Achse (42) drehbar ist,
 - einen motorisierten Aktor (8) zum Drehen des Nockens (4),
 - einen Übertragungsmechanismus (T), umfassend einen ersten Hebel (6) zum Kuppeln mit dem Nocken (4) zum Bewegen des Griffhebels (3) zwischen der bündigen und der Bereit-Position,
 - eine Drück-Drück-Einheit (9),

dadurch gekennzeichnet, dass die Drück-Drück-Einheit (9) durch eine Verbindungsstange (2) mit dem ersten Hebel (6) gekoppelt ist, sodass, wenn der Griffhebel (3) in die nach innen zuschnappende Position gedrückt wird, die Drück-Drück-Einheit (9) den Griffhebel (3) in die Bereit-Position zurück-

- drückt, wobei die Drück-Drück-Einheit (9) und der motorisierte Aktor (8) entkuppelt werden, um zu erlauben, dass die Drück-Drück-Einheit (9) den Griffhebel (3) zwischen der bündigen, Bereit- und eingezogenen Position bewegt, während der motorisierte Aktor (8) keiner mechanischen Beanspruchung unterliegt, das manuelle Zurückdrängen und das manuelle Herausziehen des Türgriffs auf eine vollkommen entkuppelte Weise in Bezug auf den Aktor (8) durchgeführt wird, der Griffhebel (3) durch Zurücksetzen der Drück-Drück-Einheit unter Verwendung des motorisierten Aktors (8) elektrisch in ihren vorgespannten Zustand in die bündige Position zurückkehren kann.
2. Kupplungsvorrichtung mit integriertem Aktor nach Anspruch 1, **dadurch gekennzeichnet, dass** der motorisierte Aktor (8) einen Elektromotor umfasst, der mit einem Schneckenantrieb gekuppelt ist, wobei der Schneckenantrieb mit einem Untersetzungsmechanismus gekuppelt ist, um die Welle (42) des Nockens (4) in Drehung zu versetzen, wenn sich der Elektromotor dreht.
 3. Kupplungsvorrichtung mit integriertem Aktor nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der erste Hebel (6) elastische Rückstellmittel (61), wie eine Torsionsfeder oder eine Doppeltorsionsfeder, umfasst, um den ersten Hebel (6) in seine bündige Position zurückzudrücken, sobald der Griffhebel (3) in der Bereit-Position ist.
 4. Kupplungsvorrichtung mit integriertem Aktor nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der Übertragungsmechanismus (T) weiter Folgendes umfasst:
 - eine erste Hebelachse (A6), wobei der erste Hebel (6) um die erste Hebelachse (A6) parallel zu der Nockenachse (42) drehbar ist,
 - einen zweiten Hebel (7), der um eine zweite Hebelachse (A7) drehbar ist,
 - wobei die erste und zweite Hebelachse (A6, A7) parallel und längs voneinander beabstandet sind,
 - mindestens eine Anbindungsstange (81, 82), die ihre Enden mit dem ersten Hebel (6) verbunden, und dem zweiten Hebel (7) in gelenkigen Verbindungen (801, 802) aufweist,
 - mindestens eine der Verbindungen (801, 802) ein erstes geschlitztes Loch (811) parallel zur Anbindungsstange (81, 82) umfasst,
 - der erste Hebel (6), der zweite Hebel (7), die Anbindungsstange (81, 82) und der Griffhebel (3) eine Kinematik-Baugruppe bilden, deren Verformung imstande ist, den Griffhebel (3) translatorisch zu verschieben.
 5. Kupplungsvorrichtung mit integriertem Aktor nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** der erste Hebel (6) um eine erste Hebelachse (A6) parallel zur Nockenachse (42) drehbar ist, und direkt mit dem Griffhebel (3) gekoppelt ist, sodass der Nocken (4), der erste Hebel (6) und der Griffhebel (3) eine Kinematik-Baugruppe bilden, deren Verformung imstande ist, den Griffhebel (3) drehend zu verschieben.
 6. Kupplungsvorrichtung mit integriertem Aktor nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Verbindungsstange (2) aus einer zentralen Stange (22) gefertigt ist, die an ihren beiden Enden zwei Arme (21, 23) aufweist, die jeweils einen rechten Winkel mit der zentralen Stange (22) bilden.
 7. Kupplungsvorrichtung mit integriertem Aktor nach Anspruch 6, **dadurch gekennzeichnet, dass** die beiden Arme (21, 23) der Verbindungsstange (2) parallel sind.
 8. Kupplungsvorrichtung mit integriertem Aktor nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der erste Hebel (6) mindestens einen Arm (62) umfasst, wobei der Arm (62) ein geschlitztes Loch (62a) zum Kuppeln mit der Verbindungsstange (2) aufweist.
 9. Kupplungsvorrichtung mit integriertem Aktor nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Drück-Drück-Einheit (9) an ihrem Ende gegenüber dem einen, das mit der Verbindungsstange (2) gekoppelt ist, auch mit einem Rücksetzhebelsystem (10) gekoppelt ist, das durch den Nocken (4) verschiebbar ist, um die Drück-Drück-Einheit (9) zurück in ihren vorgespannten Zustand zu drücken, und den ersten Hebel (6) zu ziehen, um den Türgriffhebel (3) zurück in seine ursprüngliche bündige Position zu bringen.
 10. Kupplungsvorrichtung mit integriertem Aktor nach Anspruch 9, **dadurch gekennzeichnet, dass** Rücksetzhebelsystem (10) umfasst:
 - einen drehbaren Verbindungshebel (106), der einen zentralen Abschnitt (106a), und an seinen Enden zwei radiale Arme (106b, 106c) aufweist, die um die Achse (110) des Verbindungshebels (106) drehbar sind, wobei der erste radiale Arm (106c) mit der Drück-Drück-Einheit (9) gekuppelt ist,
 - einen Nockenhebel (101) mit einem zentralen Abschnitt (101a) und zwei Enden (101b, 101c), wobei das erste Ende (101c) auf drehbare Weise um eine Achse (111) mit den zweiten radialen Armen (106b) des Verbindungshebels (106) ge-

koppelt ist, und sich das zweite Ende (101b) senkrecht zum zentralen Abschnitt (101a) erstreckt und durch den Nocken (4) verschiebbar ist, wobei die Drehachse (110) des Verbindungshebels (106) und die Drehachse (111) des Nockenhebels (101) parallel sind und beide senkrecht zu der Nockendrehachse (42) sind.

11. Kupplungsvorrichtung mit integriertem Aktor nach Anspruch 10, **dadurch gekennzeichnet, dass** der Nocken (4) mindestens einen radialen Arm (4a, 4b) zum Verschieben des zweiten Endes (101b), eine Fase (41) umfassend, aufweist, und dadurch, dass das zweite Ende (101b) des Nockenhebels eine schräge Fläche (101d) ergänzend zu der Fase (41) umfasst, sodass bei der motorisierten Betätigung zum Rücksetzen der Drück-Drück-Einheit (9) der Nocken (4) imstande ist, sich zu drehen, danach das zweite Ende (101b) längs verschiebt, bevor er das zweite Ende (101b) durch Folgen der schrägen Fläche (101d) umlenkt.
12. Kupplungsvorrichtung mit integriertem Aktor nach Anspruch 11, **dadurch gekennzeichnet, dass** die um die Achse (111) zwischen dem ersten Ende (101c) des Nockenhebels und den zweiten radialen Armen (106b) des Verbindungshebels drehbare Kupplung eine Rückstellfeder (102) zum Vorspannen des zweiten Endes (101b) des Nockenhebels in seine ursprüngliche Position nach dem Umlenken umfasst.

Revendications

1. Dispositif d'accouplement intégré d'actionneur (C) comprenant une poignée de porte de véhicule (1), la poignée de porte (1) ayant un levier de poignée (3) mobile entre :
 - une position d'affleurement dans laquelle il affleure une surface extérieure de panneau de porte (100),
 - une position d'utilisation dans laquelle il est en saillie et peut être saisi par un utilisateur,
 - et une position d'encliquetage vers l'intérieur dans laquelle le levier de poignée (3) est dans une position de rétraction à l'intérieur de la porte de véhicule (100), ledit dispositif d'accouplement comprenant :
 - une came (4) pouvant tourner autour d'un axe (42),
 - un actionneur motorisé (8) pour faire tourner ladite came (4),
 - un mécanisme de transmission (T) comprenant un premier levier (6) pour s'accoupler à la came (4) pour déplacer le levier de poignée (3) entre lesdites positions d'affleurement et d'utilisation,
2. Dispositif d'accouplement intégré d'actionneur selon la revendication 1 **caractérisé en ce que** l'actionneur motorisé (8) comprend un moteur électrique accouplé à un entraînement à vis sans fin, ledit entraînement à vis sans fin étant accouplé à un mécanisme de réduction pour mettre en rotation l'arbre (42) de la came (4) lorsque le moteur électrique tourne.
3. Dispositif d'accouplement intégré d'actionneur selon la revendication 1 ou 2 **caractérisé en ce que** le premier levier (6) comprend des moyens de rappel élastique (61), tels qu'un ressort de torsion ou un double ressort de torsion, pour repousser ledit premier levier (6) vers sa position d'affleurement une fois que le levier de poignée (3) est dans la position d'utilisation.
4. Dispositif d'accouplement intégré d'actionneur selon l'une quelconque des revendications précédentes **caractérisé en ce que** le mécanisme de transmission (T) comprend en outre :
 - un premier axe de levier (A6), le premier levier (6) pouvant tourner autour dudit premier axe de levier (A6) parallèle à l'axe de came (42),
 - un deuxième levier (7) pouvant tourner autour d'un deuxième axe de levier (A7),
 - les premier et deuxième axes de leviers (A6, A7) étant parallèles et distants longitudinalement l'un de l'autre,
 - au moins une tige de liaison (81, 82) dont les

- extrémités sont raccordées au premier levier (6) et au deuxième levier (7) dans des raccords articulés (801, 802),
- au moins l'un desdits raccords (801, 802) comprenant un premier trou fendu (811) parallèle à ladite tige de liaison (81, 82),
 - le premier levier (6), le deuxième levier (7), la tige de liaison (81, 82) et le levier de poignée (3) formant un ensemble cinématique dont la déformation est apte à déplacer ledit levier de poignée (3) en translation.
- 5
- 10
5. Dispositif d'accouplement intégré d'actionneur selon l'une quelconque des revendications 1 à 3 **caractérisé en ce que** le premier levier (6) peut tourner autour d'un premier axe de levier (A6) parallèle à l'axe de came (42), et est directement accouplé au levier de poignée (3) de sorte que la came (4), le premier levier (6) et le levier de poignée (3) forment un ensemble cinématique dont la déformation est apte à déplacer ledit levier de poignée (3) en rotation.
- 15
- 20
6. Dispositif d'accouplement intégré d'actionneur selon l'une quelconque des revendications précédentes **caractérisé en ce que** la bielle (2) est constituée d'une tige centrale (22) ayant, au niveau de ses deux extrémités, deux bras (21, 23) formant chacun un angle droit avec la tige centrale (22).
- 25
7. Dispositif d'accouplement intégré d'actionneur selon la revendication 6 **caractérisé en ce que** les deux bras (21, 23) de la bielle (2) sont parallèles.
- 30
8. Dispositif d'accouplement intégré d'actionneur selon l'une quelconque des revendications précédentes **caractérisé en ce que** le premier levier (6) comprend au moins un bras (62), ledit bras (62) ayant un trou fendu (62a) pour l'accouplement à la bielle (2).
- 35
- 40
9. Dispositif d'accouplement intégré d'actionneur selon l'une quelconque des revendications précédentes **caractérisé en ce que** l'unité push-push (9) est également accouplée, au niveau de son extrémité opposée à celle couplée à la bielle (2), à un système de levier de réinitialisation (10) pouvant être déplacé par la came (4) de manière à repousser l'unité push-push (9) vers son état précontraint et à tirer le premier levier (6), pour ramener le levier de poignée de porte (3) à sa position d'affleurement initiale.
- 45
- 50
10. Dispositif d'accouplement intégré d'actionneur selon la revendication 9 **caractérisé en ce que** le système de levier de réinitialisation (10) comprend :
- 55
- un levier de raccordement rotatif (106) ayant une partie centrale (106a) et, au niveau de ses extrémités, deux bras radiaux (106b, 106c) pouvant tourner autour de l'axe (110) du levier de raccordement (106), le premier bras radial (106c) étant accouplé à l'unité push-push (9),
 - un levier de came (101) avec une partie centrale (101a) et deux extrémités (101b, 101c), la première extrémité (101c) étant accouplée de manière rotative autour d'un axe (111) aux deuxièmes bras radiaux (106b) du levier de raccordement (106), et la deuxième extrémité (101b) s'étendant perpendiculairement à la partie centrale (101a) et pouvant être déplacée par la came (4), l'axe de rotation (110) du levier de raccordement (106) et l'axe de rotation (111) du levier de came (101) étant parallèles et tous deux perpendiculaires à l'axe de rotation de came (42).
11. Dispositif d'accouplement intégré d'actionneur selon la revendication 10 **caractérisé en ce que** la came 4 a au moins un bras radial (4a, 4b) pour déplacer la deuxième extrémité (101b) comprenant un chanfrein (41) et **en ce que** la deuxième extrémité (101b) du levier de came comprend une surface oblique (101d) complémentaire du chanfrein (41) de sorte que, lors de l'actionnement motorisé pour réinitialiser l'unité push-push (9), la came (4) soit apte à tourner, puis à déplacer longitudinalement la deuxième extrémité (101b) avant la déviation de ladite deuxième extrémité (101b) en suivant la surface oblique (101d).
12. Dispositif d'accouplement intégré d'actionneur selon la revendication 11 **caractérisé en ce que** l'accouplement rotatif autour de l'axe (111) entre la première extrémité (101c) du levier de came et les deuxièmes bras radiaux (106b) du levier de raccordement comprend un ressort de rappel (102) pour solliciter la deuxième extrémité (101b) du levier de came vers sa position initiale après déviation.

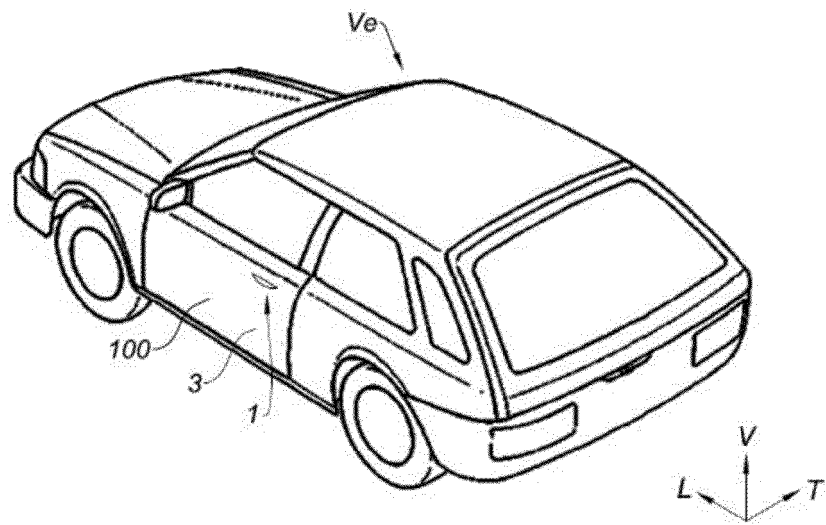


Fig. 1

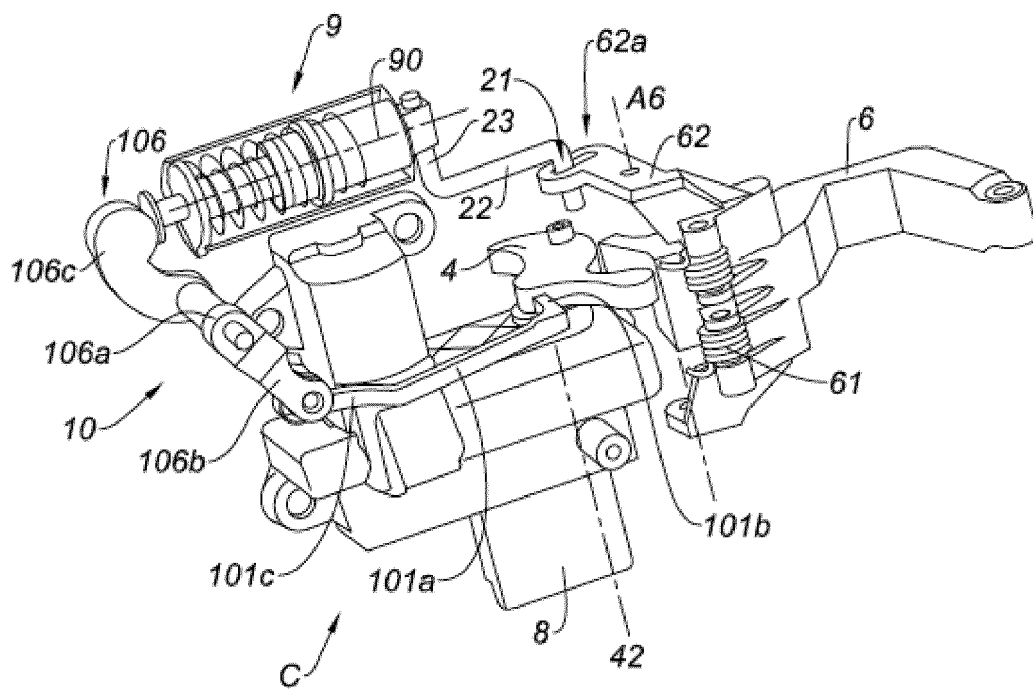


Fig. 2

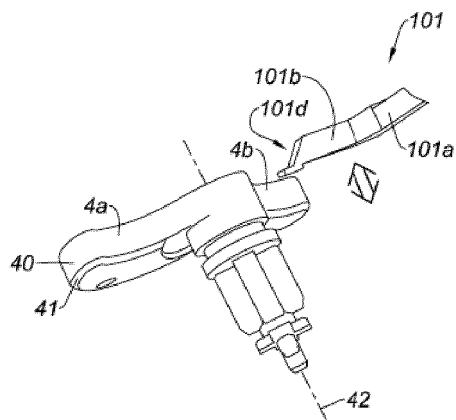


Fig. 3

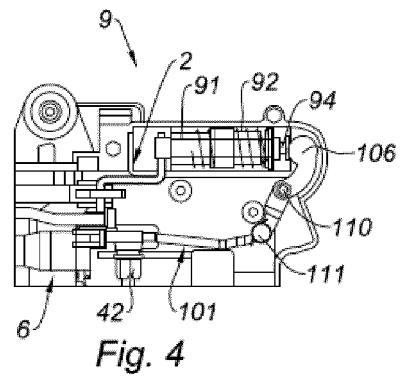


Fig. 4

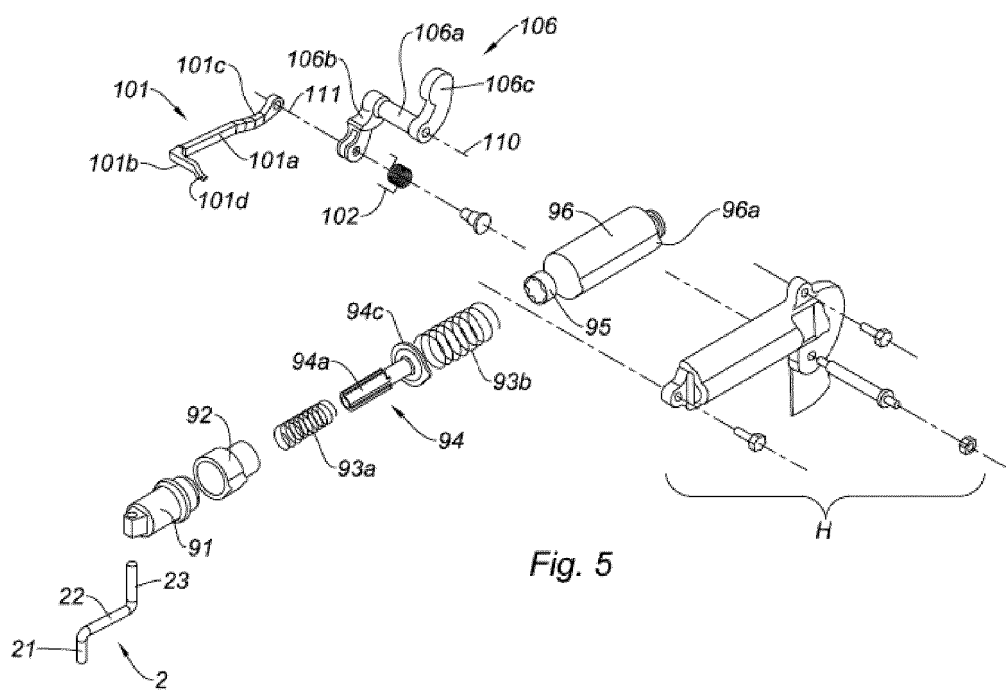


Fig. 5

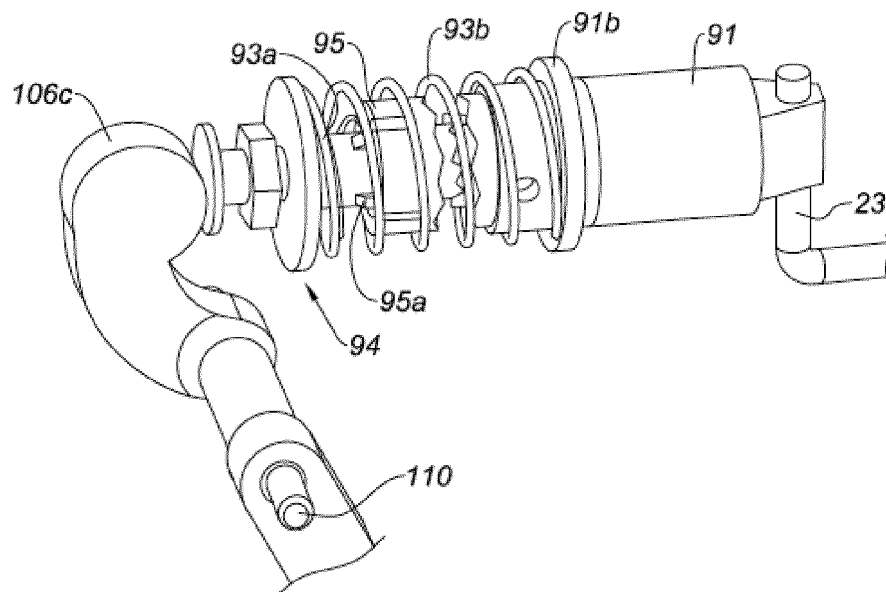


Fig. 6

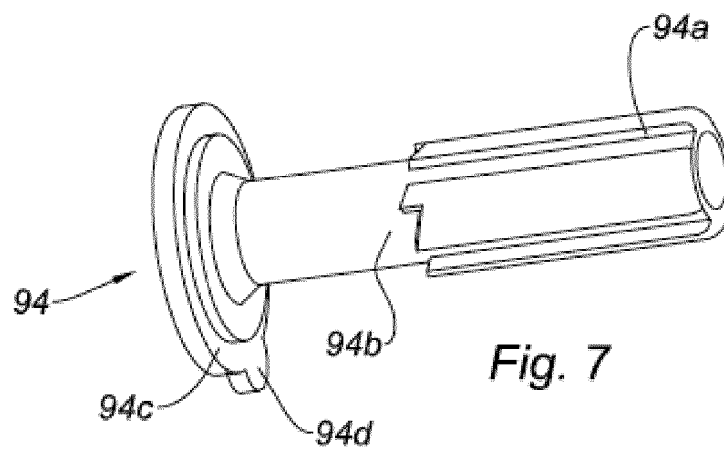
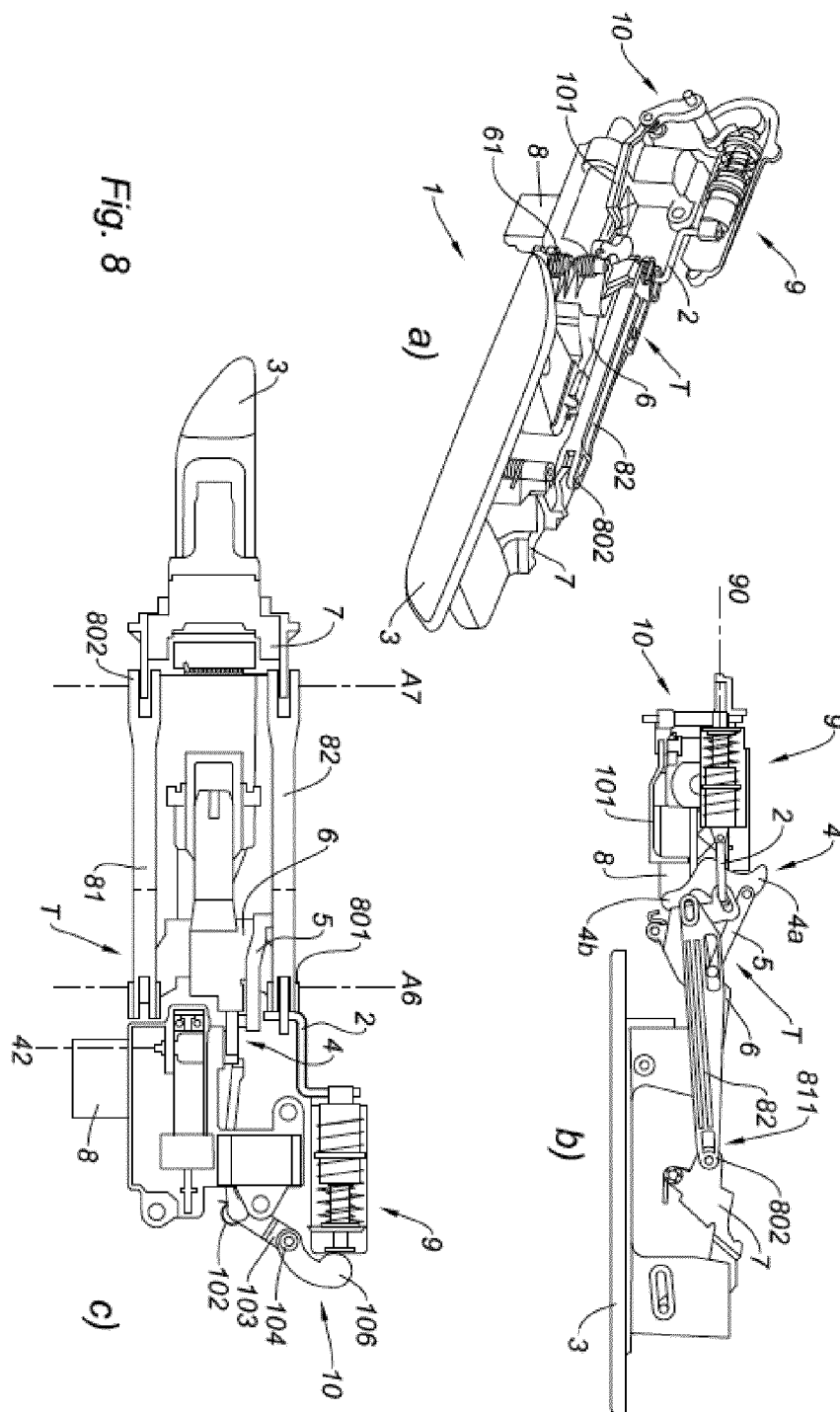
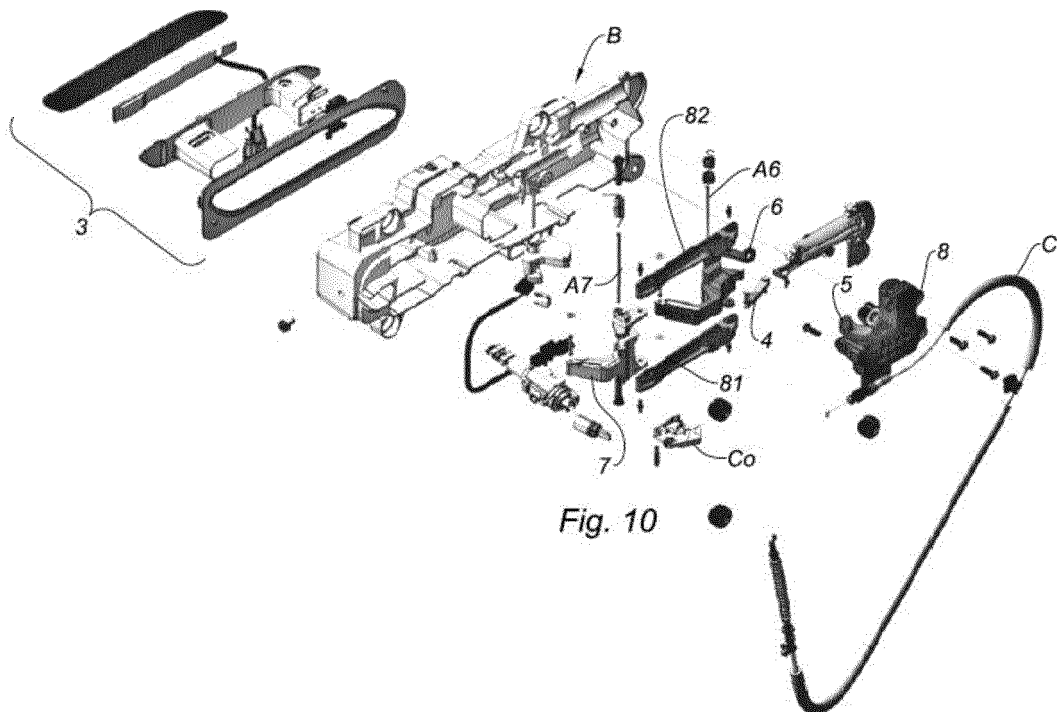
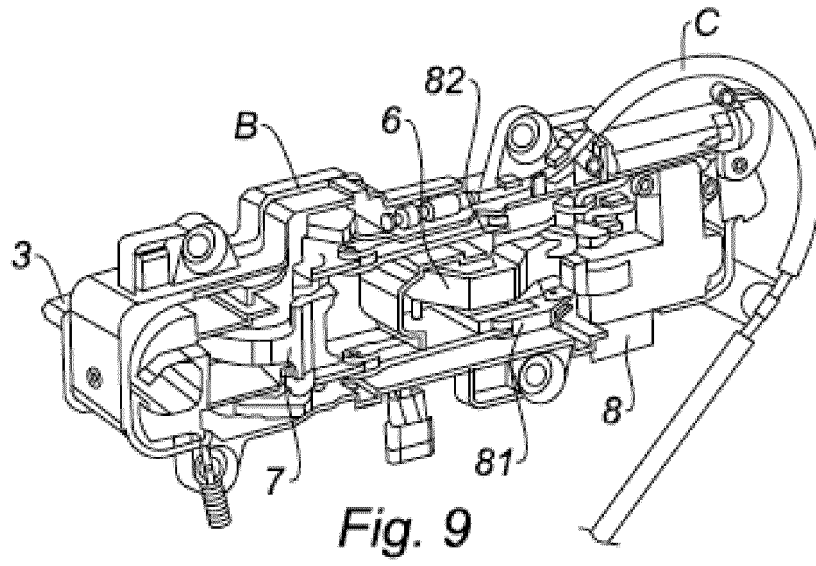


Fig. 7





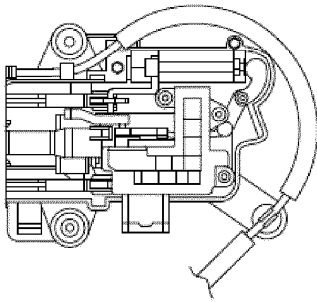


Fig. 11

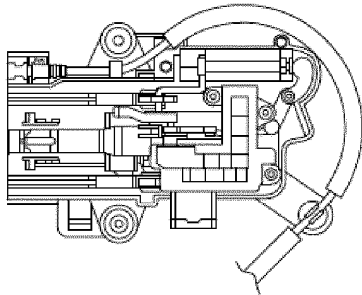
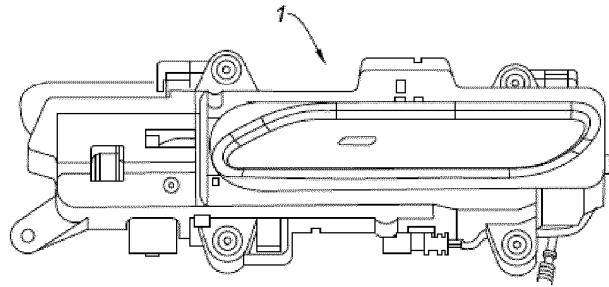


Fig. 12

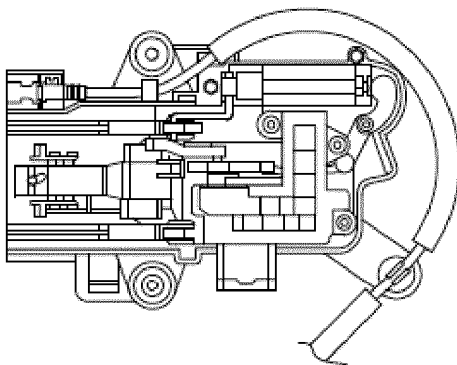
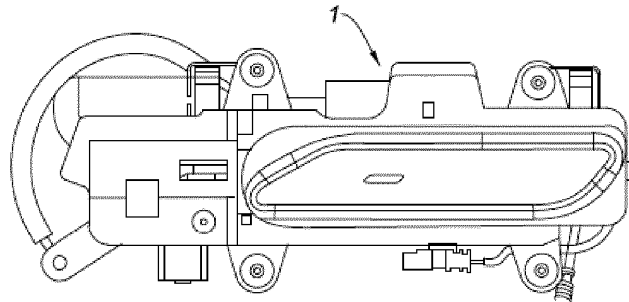


Fig. 13

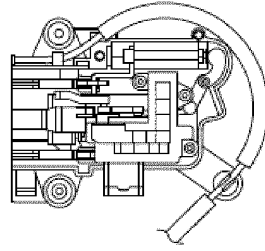
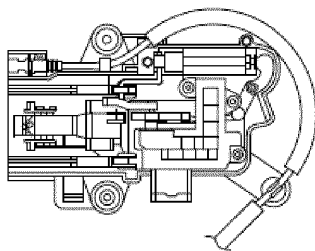
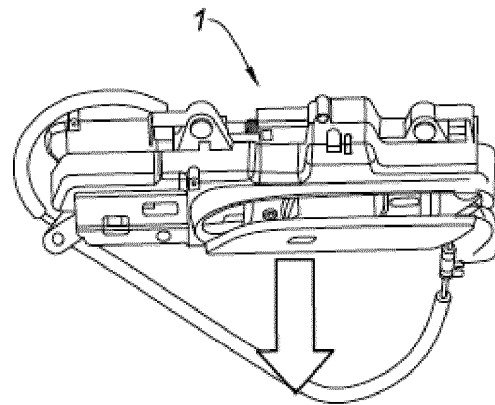
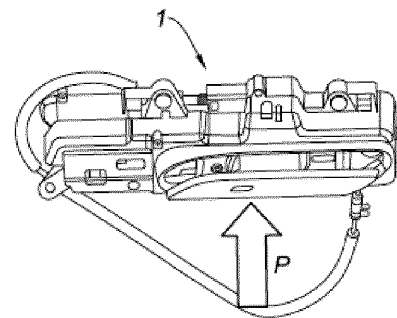


Fig. 14



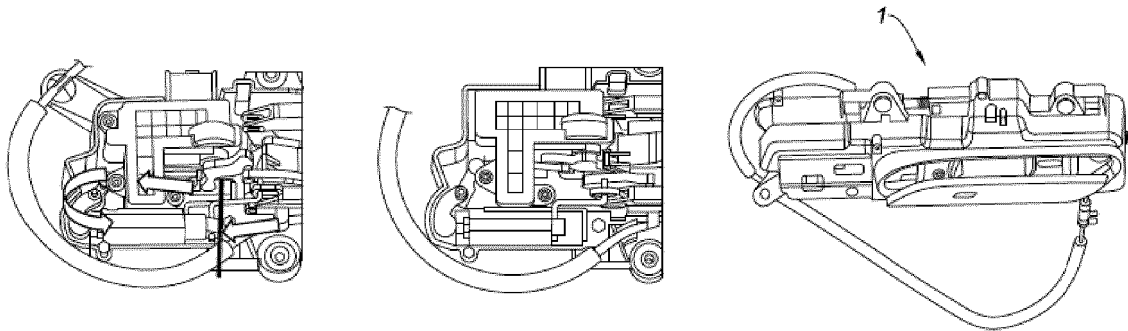


Fig. 15

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2016290018 A [0004] [0009]
- US 2016369537 A [0007] [0009]
- US 20110174102 A [0033]