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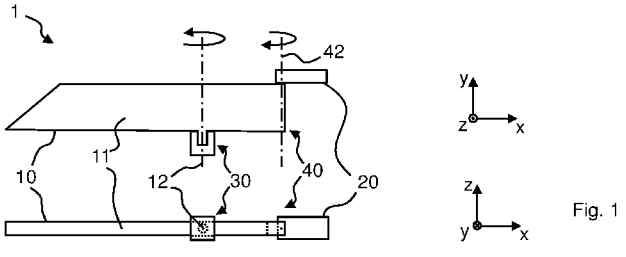


Fig. 1

(57) Abstract: An inner door handle device (1) for a vehicle for opening a vehicle door lock, wherein the device (1) has an inner door handle (10) with a handle portion (11) to be gripped manually, wherein the inner door handle (10) has a first connecting region (30) via which, in the installed state of the device (1), the handle portion (11) is mounted with respect to a door of the vehicle so as to be pivotable about a pivot axis (12), and wherein the inner door handle (10) has a second connecting region (40) on which a counterweight element (20) is arranged, wherein the counterweight element (20) is configured, during the occurrence of an acceleration acting on the inner door handle (10), to counteract an opening force which acts on the handle portion (11) on account of the acceleration, wherein the counterweight element (20) is mounted at the second connecting region (40) via a movable bearing and is configured to be moved by the acceleration from a rest position into a blocking position relative to the inner door handle (10), wherein, in the blocking position, the counterweight element (20) blocks a pivotable movement of the inner door handle (10) within a predetermined range.

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INNER DOOR HANDLE WITH IMPROVED COUNTERWEIGHT

The invention relates to inner door handles for motor vehicles. DE 10 2014 107 861, which represents a valuable contribution to the prior art and which was not yet published on the filing date, presents, in figure 1, an inner door handle for an automobile, which inner door handle has a handle portion to be gripped manually, and has a pivot bearing portion by means of which the door handle can be mounted on an automobile door so as to be pivotable about a pivot axis between a closed position and an open position which unlocks the automobile door, wherein a metal ball, in particular a steel ball, or a metal cylinder, in particular a steel cylinder, is fastened to the door handle, wherein, during the occurrence of a predetermined lateral acceleration acting on the door handle, the metal ball or the metal cylinder counteracts, as counterweight, an opening force which acts on the handle portion on account of the lateral acceleration.

The inventors have found the prior art to be disadvantageous insofar as, with inner door handles of ever-increasing size, the counterweight must correspondingly "also grow" in order that, for the same required manual door opening force (the same spring stress of the restoring spring of the inner door handle), the same level of safety in a crash situation is ensured, that is to say the counterweight compensates the acceleration of the handle section to such an extent that, up to a predefined crash acceleration, an automatic opening of the door lock by way of the accelerated handle portion is prevented. This gives rise to an increasing weight of an inner door handle device.

It is an object of the present invention to improve the disadvantages of the prior art, in particular to reduce the weight of an inner door handle device with counterweight. The object is achieved by way of the independent claims. The subclaims define advantageous refinements.

In particular, the object is achieved by way of an inner door handle device for a vehicle for opening a vehicle door lock, wherein the device has an inner door handle with a handle portion to be gripped manually, wherein the inner door handle has a first connecting region via which, in the installed state of the device, the handle

portion is mounted with respect to a door of the vehicle so as to be pivotable about a pivot axis oriented substantially perpendicularly to the carriageway plane, and wherein the inner door handle has a second connecting region on which a counterweight element is arranged, wherein the counterweight element is configured, during the occurrence of an acceleration acting on the inner door handle, to counteract an opening force which acts on the handle portion on account of the acceleration, wherein the counterweight element is mounted at the second connecting region via a movable bearing and is configured to be moved by the acceleration from a rest position into a blocking position relative to the inner door handle, wherein, in the blocking position, the counterweight element blocks a pivotable movement of the inner door handle within a predetermined range.

In this way, not only is the pivotable movement counteracted by way of the counterweight function of the counterweight element, but furthermore, and with the same component, specifically the counterweight element, a blocking function is provided. Thus, with the same component outlay, twofold benefit for increasing vehicle safety is achieved, such that, owing to said twofold benefit, the inherent weight of the counterweight element, and thus also the overall weight of the device, can be reduced.

An inner door handle device is a handle device for manual actuation situated on the inner side of a vehicle door side.

A pivot axis oriented substantially perpendicular to the carriageway plane is preferably present if the axis deviates from the perpendicular to the carriageway plane by less than 45°, preferably less than 20°, particularly preferably less than 5°.

The inner door handle may be mounted directly on the automobile door or else may be mounted on a holder arranged, or provided for arrangement, on the automobile door. The inner door handle has a suitable connection to the door lock, for example by way of a Bowden cable. In this way, by virtue of the inner door handle being pivoted, the door lock can be unlocked and the automobile door can be opened. The handle portion may for example be of elongate form. For this purpose, the handle preferably has an extent perpendicular to the pivot axis which is greater than the extent along the pivot axis. In case of doubt, the handle portion is the entire pivotable

region on one side of the pivot axis. The inner door handle may be composed of plastic. It may be formed in one piece.

A movable bearing on the second connecting region is a bearing which permits a relative movement between counterweight element and inner door handle, preferably with relative displacement of centers of gravity, but which otherwise restricts the degree(s) of freedom between counterweight element and inner door handle and thus couples these to one another.

The rest position is the position assumed by the counterweight element in the normal situation (that is to say not in the event of a vehicle collision). The counterweight element is preferably held in the rest position by a spring element.

In the blocking position, the counterweight element blocks a pivotable movement of the inner door handle within a predetermined range, which means that the door handle has a smaller possible pivot angle in the blocked situation. Said pivot angle is expediently restricted such that an opening of the vehicle door lock is not possible.

In a further exemplary embodiment of the present invention, the movable bearing is an articulated bearing with an articulation axis, and the articulation axis is oriented substantially parallel to the pivot axis.

In this way, the movement of the counterweight element into the blocking position, which is a rotational movement, is additionally supported by the pivotable movement of the handle portion. The articulation axis is preferably substantially parallel to the pivot axis if the axis directions deviate from one another by less than 45°, preferably less than 20°, particularly preferably less than 5°. The center of gravity of the counterweight element is preferably spaced apart (eccentrically) from the articulation axis.

In a further exemplary embodiment of the present invention, the articulated bearing has at least one axle element which is in engagement with an inverse articulated element, wherein the at least one axle element is formed integrally with the counterweight element or with the inner door handle.

In this way, costs and installation outlay are saved in relation to a separate axle. An inverse articulated element is for example a hub which may be realized as a bore in the inner door handle. The axle element is preferably arranged on the counterweight element, and the inverse articulated element is preferably arranged on the inner door handle.

In a further exemplary embodiment of the present invention, the at least one axle element has in cross-section a flat portion or two mutually opposite flat portions and is otherwise round and the inverse articulated element has an insertion gap into which the axle element can be inserted only in a predetermined rotational position.

In this way, easy installation of the axle elements is possible by way of a simple sliding-together movement by way of the flat portions, and at the same time, the axle elements are secured against falling apart by the otherwise round cross section. The flat portion(s) is/are preferably straight. Two mutually opposite flat portions are preferably parallel to one another. The counterweight element together with the axle element(s) is preferably brought together with the inner door handle through the insertion gaps and then rotated. The rotational position required for the connection (and thus also disassembly) of the articulated bearing is preferably no longer attainable in the assembled state or in the installed state of the device in the vehicle door, for example by virtue of the device or the vehicle door having a stop which prevents rotation of the articulated bearing into said rotational position.

In a further exemplary embodiment of the present invention, the articulated bearing has two axle elements which are spaced coaxially and from one another and are formed integrally with the counterweight element or with the inner door handle, wherein a spring element holder, into which a spring element can be inserted coaxially with the articulation axis, is formed between the axle elements.

In this way, straightforward installation of the spring element is realized, and furthermore, weight is saved in relation to a continuous separate axle. The spring element holder preferably has two journals which are situated opposite one another along the articulation axis and which preferably point toward one another and which are preferably beveled toward the same side, preferably over at least one third, particularly preferably over at least half of the journal end surface, which further

simplifies the installation of the spring element. The spring element is preferably a spiral spring.

In a further exemplary embodiment of the present invention, the handle portion has a height HG along the direction of the pivot axis and the counterweight element has a height HW along the direction of the pivot axis, and the height HW is at least as large as a quarter, preferably one half, of the height HG, with HW particularly preferably being equal to or even greater than HG.

By means of this dimensioning, the counterweight element has a large volume, such that, with suitable utilization of said volume, an adequate mass of the counterweight element is also available in order to advantageously realize firstly the counterweight function and secondly the blocking function. The higher the weight of the counterweight element, the stronger the spring that moves the counterweight element back into the rest position can be designed to be, such that rattling as a result of undesired movements of the counterweight element is minimized. Here, a person skilled in the art will find a compromise between good rattling characteristics, effectiveness of function and low desired overall weight.

The heights are preferably measured in each case at the lowermost and uppermost points of the handle portion and of the counterweight element with respect to the dimension predetermined by the pivot axis, in each case as a projection of the spacing of said points onto the dimension predetermined by the pivot axis.

In a further exemplary embodiment of the present invention, the first connecting region has two spaced-apart bearing elements for bearing the inner door handle and wherein the counterweight element extends between the bearing elements beyond the center point of the spacing of the bearing elements.

In this way, highly advantageous structural space utilization is achieved – the counterweight element can thus take up the largest possible space and be of correspondingly large dimensions, and thus in turn have a high mass. At the same time, a substantially symmetrical construction is possible which advantageously distributes the forces uniformly to the various components.

A bearing element is for example a bore in the inner door handle, into which bore there is inserted an axle on the vehicle door (or conversely: a bore on the vehicle door). Two bearing elements may also be, for example, two journals. The bearing elements permit the pivotable movement of the inner door handle.

In a further exemplary embodiment of the present invention, the counterweight element consists of a plastic. Here, the invention also encompasses a corresponding method for producing a corresponding counterweight element from plastic, and a method for producing a corresponding inner door handle device.

In this way, production costs are saved. This is made possible for the first time in particular by way of the corresponding dimensioning of the counterweight element (extent of the counterweight element beyond the center point, and minimum height HW), because plastic otherwise has a specific mass too low to advantageously perform the counterweight function and the blocking function.

In a further exemplary embodiment of the present invention, the counterweight element is produced by means of a multi-component injection-molding process from at least one hard and one soft in each case injection-molded material and, in its rest position, the counterweight element bears on a stop region of the inner door handle, wherein the region of the counterweight element which bears on the stop region has a surface consisting of the soft material, which surface is in contact with the stop region when the counterweight element is in its rest position.

In this way, rattling noises are minimized. The counterweight element can thus be optimally produced from weight-imparting (hard-material) constituents and damping (soft-material) constituents in one injection-molding process.

In a further exemplary embodiment of the present invention, the counterweight element has insert-molded metal parts, in particular one or more metal balls or metal cylinders, or parts of said type are insert-molded during the production process.

In this way, it is possible for the weight to be increased if necessary, and in particular in the case of metal balls/metal cylinders being used, this is very inexpensive

because the metal ball or metal cylinder is a standardized component which can be used for a wide variety of inner door handles.

In a further exemplary embodiment of the present invention, in its rest position, the counterweight element bears on a stop region of the inner door handle, wherein at least the stop region of the inner door handle is produced by means of a multi-component injection-molding process from at least one hard and one soft in each case injection-molded material, wherein the stop region has a surface consisting of the soft material, which surface is in contact with the counterweight element when the counterweight element is in its rest position. Here, the invention also encompasses a corresponding method for producing a corresponding inner door handle or stop region of the inner door handle from plastic, and a method for producing a corresponding inner door handle device.

In this way, alternatively or additionally to the weight element injection-molded in a multi-component injection-molding process, rattling noises are minimized. That surface of the stop region of the inner door handle which is composed of soft material is preferably that end side of the inner door handle which is situated opposite the handle portion with respect to the first connecting region.

In a further exemplary embodiment of the present invention, in order to form the blocking position of the counterweight element, the device has at least one blocking element and an associated blocking counterelement.

The blocking element is preferably in the form of a pin. Said pain is preferably arranged on the counterweight element, and is particularly preferably formed in one piece with the counterweight element. The blocking counterelement is preferably a contour designed to guide the pin at least in regions. Said contour is preferably formed out of or formed on a holder, which is preferably part of the inner door handle device and on which the inner door handle is pivotably mounted.

In a further exemplary embodiment of the present invention, the blocking element and the blocking counterelement are formed by a pin and a contour, wherein the contour is configured to guide the pin at least in a predetermined movement subrange of a relative movement between the contour and the pin and thus delimit

its movement, wherein the contour is arranged radially inside the pin with respect to the pivot axis when the counterweight element is in its rest position, and the contour has a valley which opens toward the inner side of the device (proceeding from the valley bottom in a radially outward direction relative to the pivot axis).

In this way, an intensification of the fixing of the counterweight element in the blocking position is achieved by way of a handle pivoting movement that may also arise as a result of the acceleration, because as a result of the handle pivotable movement, the movement of the counterweight element in the direction of the stop of the blocking position (valley bottom of the contour) is assisted or forced. The inner side of the device is preferably the side facing toward the vehicle interior in the installed state.

That region of the contour or that flank of the valley along which the pin travels during a movement of the counterweight element to the stop of the blocking position preferably runs obliquely in the direction of the vehicle interior region at an angle of between 5° and 70°, particularly preferably on average 30° to 40°, with respect to the vehicle door plane. The contour preferably has a convex curvature which transitions into the valley bottom of the contour, which generates highly advantageous assistance in the direction of the blocking position-side stop (valley bottom).

In a further exemplary embodiment of the present invention, the counterweight element has at least two blocking elements which, when the counterweight element is in the blocking position, in each case form a blocking contact with a blocking counterelement.

Increased reliability of the blocking function is achieved in this way.

In a further exemplary embodiment of the present invention, two of the blocking elements are situated opposite one another on two sides of the counterweight element.

In this way, reliability is yet further increased because a more uniform distribution of the blocking load on the two blocking elements is possible. The blocking elements

are preferably arranged on those sides which form end-side terminations of the counterweight element in the articulation axis direction.

The invention will now be illustrated in more detail by way of an example on the basis of drawings, in which:

figure 1 shows a diagrammatic drawing of an inner door handle device according to the invention,

figure 2 shows a diagrammatic drawing of an inner door handle device, based on the inner door handle device from figure 1, with a highly advantageously dimensioned mounted counterweight element,

figure 3a shows an exploded drawing of an inner door handle device, based on the inner door handle device from figure 2, with a particularly advantageously designed second connecting region and particularly advantageous blocking elements of the counterweight element,

figure 3b shows a plan view of the scene illustrated in figure 3a,

figure 3c shows the scene illustrated in figure 3a in the assembled state,

figure 4a and figure 4b show a partially abstracted illustration of an inner door handle device, based on the inner door handle device from figure 2 and/or figures 3a, 3b, 3c, with particularly advantageous blocking counterelements.

Figure 1 shows a diagrammatic drawing of an inner door handle device 1 according to the invention, both in a side view (top) and in a view from below (bottom). The inner door handle device 1 is designed for a vehicle, for the purposes of opening a vehicle door lock. Said inner door handle device has an inner door handle 10 with a handle portion 11 to be gripped manually. The inner door handle 10 has a first connecting region 30 via which, in the installed state of the device 1, the handle portion 11 is mounted with respect to a door of the vehicle so as to be pivotable about a pivot axis 12 oriented substantially perpendicularly to the carriageway plane. The inner door handle 10 has a second connecting region 40 on which a counterweight element 20 is arranged. The counterweight element 20 is configured,

during the occurrence of an acceleration acting on the inner door handle 10, to counteract an opening force which acts on the handle portion 11 on account of the acceleration. It is emphasized that, here, in addition, the counterweight element 20 is mounted at the second connecting region 40 via a movable bearing and is configured to be moved by the acceleration from a rest position into a blocking position relative to the inner door handle 10, wherein, in the blocking position, the counterweight element 20 blocks a pivotable movement of the inner door handle 10 within a predetermined range.

In the event of an accident, in particular in the event of a side-on collision, an acceleration acts on the handle portion 11, which acceleration, owing to the often large mass of the handle portion 11, may lead to a high force or a high pivotable moment (indicated by an arrow about an axis 12) which would then open the door lock in an undesired manner. Since the counterweight element 20 is arranged on the opposite side (with respect to the bearing), an acceleration likewise acts on said counterweight element, and thus the counterweight element 20, owing to its position, exerts a pivotable moment counter to the pivotable moment of the handle portion 11. Furthermore, owing to the acceleration, the counterweight element 20 moves from the rest position into the blocking position (in this case indicated by way of an arrow as a rotation of the counterweight element about an axis 42, said rotation taking place in the opposite direction to the rotation of the inner door handle 10 about the pivot axis 12, likewise indicated by an arrow – a construction with a linear movement of the counterweight element 20 along a linear bearing is however likewise possible) in which the counterweight element 20 effects mechanical blocking of the pivotable movement at least in a range, or to an extent, which prevents the opening of the door lock. In the event of normal actuation of the inner door handle 10 (without acceleration resulting from a collision), the counterweight element 20 pivots with the inner door handle 10, preferably without relative movement between counterweight element 20 and inner door handle 10.

In this way, the counterweight element 20 serves firstly as counterweight and secondly as centrifugal weight, and thus a dual action is achieved by way of one and the same weight-imparting component, such that the counterweight element 20 can, overall, be of more lightweight design because the required action is attributed no

longer only to the function as a counterweight but also, preferably even predominantly, to the blocking function.

Figure 2 shows a diagrammatic drawing of an inner door handle 1, based on the inner door handle device 1 from figure 1, with a highly advantageously dimensioned and arranged counterweight element 20. The movable bearing is an articulated bearing 41 with an articulation axis 42. The articulation axis 42 is oriented substantially parallel to the pivot axis 12. The handle portion 11 has a height HG along the direction of the pivot axis 12, and the counterweight element 20 has a height HW along the direction of the pivot axis 12. The height HW is at least as large as a quarter of the height HG. The first connecting region 30 has two spaced-apart bearing elements 31, 32 for pivotably bearing the inner door handle 10. The counterweight element 20 extends between the bearing elements 31, 32 beyond the center point 33 of the spacing of the bearing elements 31, 32. The reference dimension is thus the direction along the pivot axis 12. Here, the inner door handle 10 preferably has an extent perpendicular to the pivot axis 12 greater than the extent along the pivot axis 12. The center of gravity of the counterweight element 20 is spaced apart (eccentrically) from the articulation axis 12.

Owing to the fact that the axes 12 and 42 are approximately axially parallel, the rotational movement of the inner door handle 10 assists the relative rotation of the counterweight element 20 relative to the inner door handle 10 to a particularly advantageously great extent. Furthermore, highly advantageous utilization of the structural space is realized, such that the weight can take up a large volume, and it is thus possible to also use other, cheaper or more easily moldable materials such as plastic, for example.

Figure 3a shows an exploded drawing of an inner door handle device 1, based on the inner door handle device 1 from figure 2, with a particularly advantageously designed second connecting region 40 and particularly advantageous blocking elements 21.1, 21.2 of the counterweight element 20. The articulated bearing 41 has two axle elements 43.1, 43.2 which are each in engagement with an inverse articulated element 44.1, 44.2 in the assembled state (see figure 3c), wherein the axle elements 43.1, 43.2 are formed integrally with the counterweight element 20.

The axle elements 43.1, 43.2 each have, in cross section, two mutually opposite flat portions 431, 432, with only one flat portion 431, 432 of the respective axle element 43.1, 43.2 being visible in this drawing. Otherwise, said axle elements are of round cross section. The inverse articulation elements 44.1, 44.2, in this case hubs, each have an insertion gap into which the axle element 43.1, 43.2 can be inserted only in a predetermined rotational position. The axle elements 43.1, 43.2 are spaced coaxially and from one another and are formed integrally with the counterweight element 20. A spring element holder 45, into which a spring element 46 can be inserted coaxially with the articulation axis 42, is formed between the axle elements 43.1, 43.2. The spring element holder 45 preferably has, as shown here, two journals which are situated opposite one another along the axis 42 and which are preferably beveled toward the same side over at least one third of the journal end surface, which further simplifies the installation of the spring element 46. The spring element 46 is in this case a preferred spiral spring.

In order form the blocking position of the counterweight element 20, the device 1 has two blocking elements 21.1, 21.2 and two associated blocking counterelements (not shown). The blocking elements 21.1, 21.2 are situated oppositely on two sides of the counterweight element 20, in this case preferably on those sides which form the end-side terminations of the counterweight element in the articulation axis direction. When the counterweight element 20 is in the blocking position, the blocking elements 21.1, 21.2 in each case form a blocking contact with the corresponding blocking counterelement. Here, the blocking elements 21.1, 21.2 are formed as preferred pins which, in this case, are preferably formed integrally with the counterweight element.

Figure 3b shows a plan view of the scene illustrated in figure 3a. The counterweight element 20 is composed of plastic. The counterweight element 20 is produced by means of a multi-component injection-molding process from at least one hard and one soft in each case injection-molded material. Said counterweight element, in its rest position (orientation as shown), bears against a stop region 13 of the inner door handle 10. That region of the counterweight element 20 which bears against the stop region 13 has a surface 22 composed of the soft material, which surface is in contact with the stop region 13 when the counterweight element 20 is in its rest position. It is

preferably the case, as illustrated here, that, likewise or instead, the stop region 13 of the inner door handle 10 is a multi-component injection-molded part with a soft material and hard material, wherein the soft material forms a surface 13.1 which is in contact with the counterweight element 20 when the counterweight element 20 is in the rest state. The surface 13.1 is in this case the preferred end side, situated on the opposite side of the handle portion 11 in relation to the first connecting region 30, of the inner door handle 10.

Figure 3c shows the scene illustrated in figure 3a in the assembled state.

Figures 4a and b show a partially abstracted illustration of an inner door handle device 1, based on the inner door handle device 1 from figure 2 and/or figures 3a, 3b, 3c, with particularly advantageous blocking counterelements 51.1, 51.2. Figure 4a shows only a holder 50 of the device 1. In figure 4b, the holder 50 is illustrated in transparent form in the upper region, and a handle portion 11 is indicated abstractly by the way of dashed lines. The blocking elements 21.1, 21.2 and the blocking counterelements 51.1, 51.2 are formed by pins and contours, wherein in each case, the contour is configured to guide the pin at least in a predetermined movement subrange of a relative movement between the contour and the pin and thus delimit its movement. The contour is arranged radially inside the pin with respect to the pivot axis 12 when the counterweight element 20 is in its rest position. The contour has a valley which opens toward the inner side of the device 1. That flank of the valley or that contour region along which the pin travels during a movement of the counterweight element 20 to the stop of the blocking position (valley bottom 512) in this case preferably runs obliquely in the direction of the vehicle interior region at an angle of between 5° and 70°, here on average 30° to 40°, with respect to the vehicle door plane (x-y plane). Here, said contour also has a preferred convex curvature which transitions into the valley bottom 512 of the contour. Here, the blocking elements 21.1 and 21.2 of the counterweight element 20 are formed as pins, and the blocking counterelements 51.1, 51.2 of the device 1 are contours is arranged on a holder 50. Here, the inner door handle 10 furthermore has an eyelet as preferred fastening element 14 for a Bowden cable which is connected to the door lock.

In the absence of an acceleration acting as a result of a collision, if the handle portion 11 is pivoted manually toward the vehicle interior, the counterweight element 20 pivots with the inner door handle 10 (block arrows) – in the example here, the blocking elements 21.2, 21.1 in this case each move freely through a groove in the holder 50. In the event of a side-on collision, a lateral acceleration greater than the restoring moment of the spring element 46 generates a pivotable movement of the counterweight element 20 relative to the inner door handle 10 (single arrow at the lower contour 51.2), such that a pivotable movement of the door handle about the pivot axis 12 is delimited by the pins or blocking elements 21.2, 21.1, which abut against the contours of the blocking counterelements 51.1, 51.2.

A particularly advantageous inner door handle device has been provided in this way. As a result of the arrangement of a counterweight element on the pivotable inner door handle on the opposite side of the pivot bearing, weight compensation is realized such that the center of gravity is moved closer to the pivot bearing point, wherein furthermore, as a result of the pivotable bearing of the counterweight element, a blocking function of the counterweight element is realized, and thus the counterweight function can be reduced. Through optimum structural space utilization, inexpensive production from injection-molded plastic is possible, and by way of further measures such as an axle-pin-free design and a two-component production process, costs and weight are further reduced, and robustness and comfort are increased.

List of reference designations

1 Inner door handle device
10 Inner door handle
11 Handle portion
12 Pivot axis
13 Stop region
13.1 Surface of the stop region composed of the soft material
14 Fastening element for Bowden cable
20 Counterweight element
21.1 Blocking element
21.2 Blocking element
22 Surface of the counterweight element composed of the soft material
30 First connecting region
31 First bearing element
32 Second bearing element
33 Central point of the spacing of the bearing elements 31, 32
40 Second connecting region
41 Articulated bearing
42 Articulation axis
43.1 Axle element
43.2 Axle element
44.1 Inverse articulated element
44.2 Inverse articulated element
45 Spring element holder
46 Spring element
50 Holder
51.1 Blocking counterelement
51.2 Blocking counterelement
431 Flat portion
432 Flat portion
512 Valley bottom
HG Height of the handle portion along the direction of the pivot axis
HW Height of the counterweight element along the direction of the pivot axis

Patent claims

1. An inner door handle device (1) for a vehicle for opening a vehicle door lock, wherein the device (1) has an inner door handle (10) with a handle portion (11) to be gripped manually, wherein the inner door handle (10) has a first connecting region (30) via which, in the installed state of the device (1), the handle portion (11) is mounted with respect to a door of the vehicle so as to be pivotable about a pivot axis (12) oriented substantially perpendicularly to the carriageway plane, and wherein the inner door handle (10) has a second connecting region (40) on which a counterweight element (20) is arranged, wherein the counterweight element (20) is configured, during the occurrence of an acceleration acting on the inner door handle (10), to counteract an opening force which acts on the handle portion (11) on account of the acceleration,
characterized in that
the counterweight element (20) is mounted at the second connecting region (40) via a movable bearing and is configured to be moved by the acceleration from a rest position into a blocking position relative to the inner door handle (10), wherein, in the blocking position, the counterweight element (20) blocks a pivotable movement of the inner door handle (10) within a predetermined range.

2. The device (1) as claimed in claim 1, wherein the movable bearing is an articulated bearing (41) with an articulation axis (42) and wherein the articulation axis (42) is oriented substantially parallel to the pivot axis (12).

3. The device (1) as claimed in claim 2, wherein the articulated bearing (41) has at least one axle element (43.1, 43.2) which is in engagement with an inverse articulated element (44.1, 44.2), wherein the at least one axle element (43.1, 43.2) is formed integrally with the counterweight element (20) or with the inner door handle (10).

4. The device (1) as claimed in claim 3, wherein the at least one axle element (43.1, 43.2) has in cross-section a flat portion (431, 432) or two mutually opposite flat portions and is otherwise round and the inverse articulated element (44.1, 44.2) has

an insertion gap into which the axle element (43.1, 43.2) can be inserted only in a predetermined rotational position.

5. The device (1) as claimed in either of claims 3 and 4, wherein the articulated bearing (41) has two axle elements (43.1, 43.2) which are spaced coaxially and from one another and are formed integrally with the counterweight element (20) or with the inner door handle (10), wherein a spring element holder (45), into which a spring element (46) can be inserted coaxially with the articulation axis (42), is formed between the axle elements (43.1, 43.2).

6. The device (1) as claimed in one of the preceding claims, wherein the handle portion (11) has a height HG along the direction of the pivot axis (12) and the counterweight element (20) has a height HW along the direction of the pivot axis (12), and wherein the height HW is at least as large as a quarter of the height HG.

7. The device (1) as claimed in one of the preceding claims, wherein the first connecting region (30) has two spaced-apart bearing elements (31, 32) for bearing the inner door handle (10) and wherein the counterweight element (20) extends between the bearing elements (31, 32) beyond the center point (33) of the spacing of the bearing elements (31, 32).

8. The device (1) as claimed in one of the preceding claims, wherein the counterweight element (20) consists of a plastic.

9. The device (1) as claimed in claim 8, wherein the counterweight element (20) is produced by means of a multi-component injection-molding process from at least one hard and one soft in each case injection-molded material and wherein, in its rest position, the counterweight element (20) bears on a stop region (13) of the inner door handle (10), wherein the region of the counterweight element (20) which bears on the stop region (13) has a surface (22) consisting of the soft material, which surface is in contact with the stop region (13) when the counterweight element (20) is in its rest position.

10. The device (1) as claimed in either of claims 8 and 9, wherein the counterweight element (20) has cast-in metal parts.

11. The device (1) as claimed in one of the preceding claims, wherein, in its rest position, the counterweight element (20) bears on a stop region (13) of the inner door handle (10), wherein at least the stop region (13) of the inner door handle (10) is produced by means of a multi-component injection-molding process from at least one hard and one soft in each case injection-molded material, wherein the stop region (13) has a surface (13.1) consisting of the soft material, which surface is in contact with the counterweight element (20) when the counterweight element (20) is in its rest position.

12. The device (1) as claimed in one of the preceding claims, wherein, in order to form the blocking position of the counterweight element (20), the device (1) has at least one blocking element (21.1, 21.2) and an associated blocking counterelement (51.1, 51.2).

13. The device (1) as claimed in claim 12 and claim 2, wherein the blocking element (21.1, 21.2) and the blocking counterelement (51.1, 51.2) are formed by a pin and a contour, wherein the contour is configured to guide the pin at least in a predetermined movement subrange of a relative movement between the contour and the pin and thus delimit its movement, wherein the contour is arranged radially inside the pin with respect to the pivot axis (12) when the counterweight element (20) is in its rest position, and the contour has a valley which opens towards the inner side of the device (1).

14. The device as claimed in either of claims 12 and 13, wherein the counterweight element (20) has at least two blocking elements (21.1, 21.2) which, when the counterweight element (20) is in the blocking position, in each case form a blocking contact with a blocking counterelement (51.1, 51.2).

15. The device (1) as claimed in claim 14, wherein two of the blocking elements (21.1, 21.2) are situated opposite one another on two sides of the counterweight element (20).

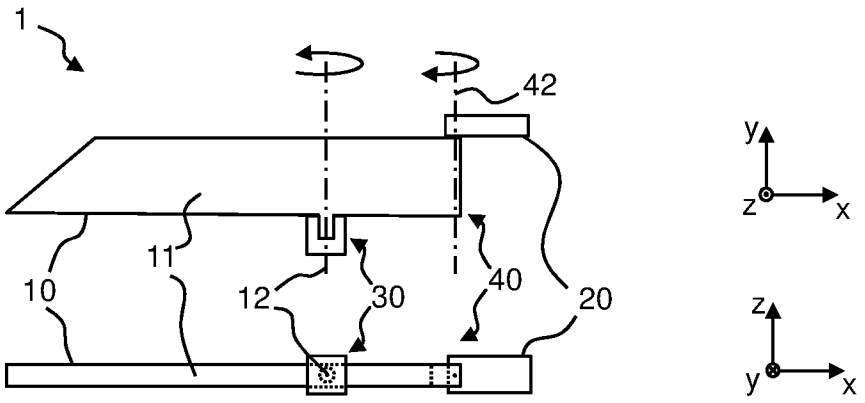


Fig. 1

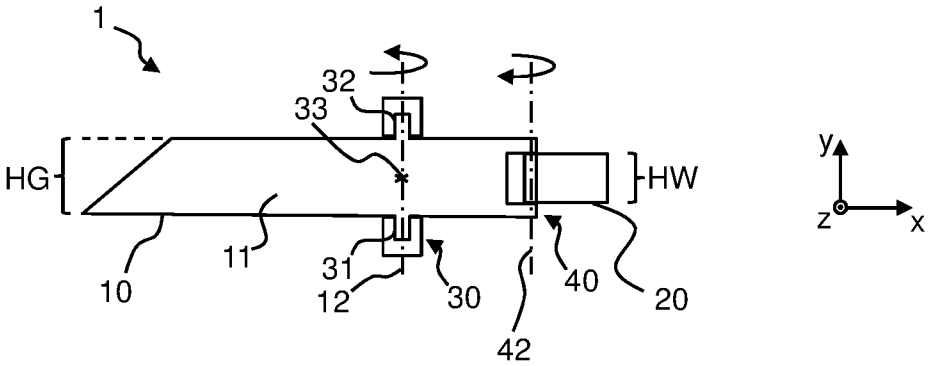


Fig. 2

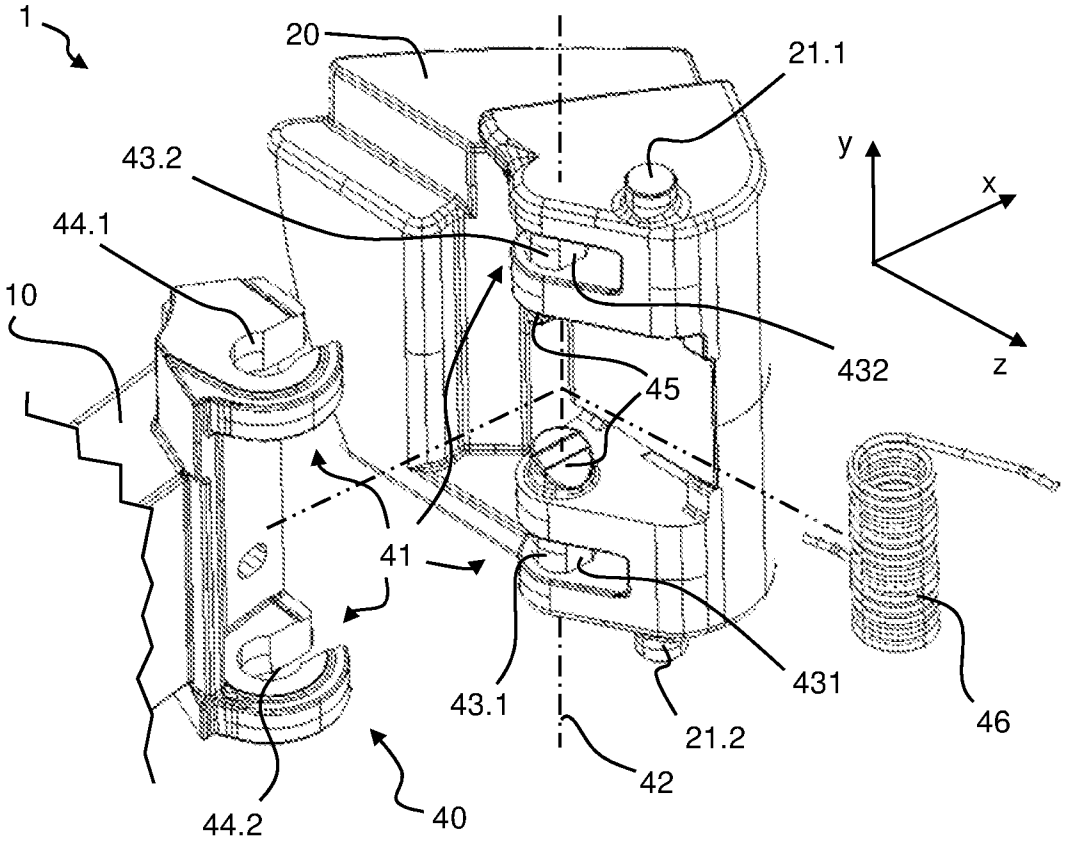

1
20
21.1
43.2
y
x
44.1
10
432
z
45
41
431
43.1
21.2
46
42
44.2
40

Fig. 3a

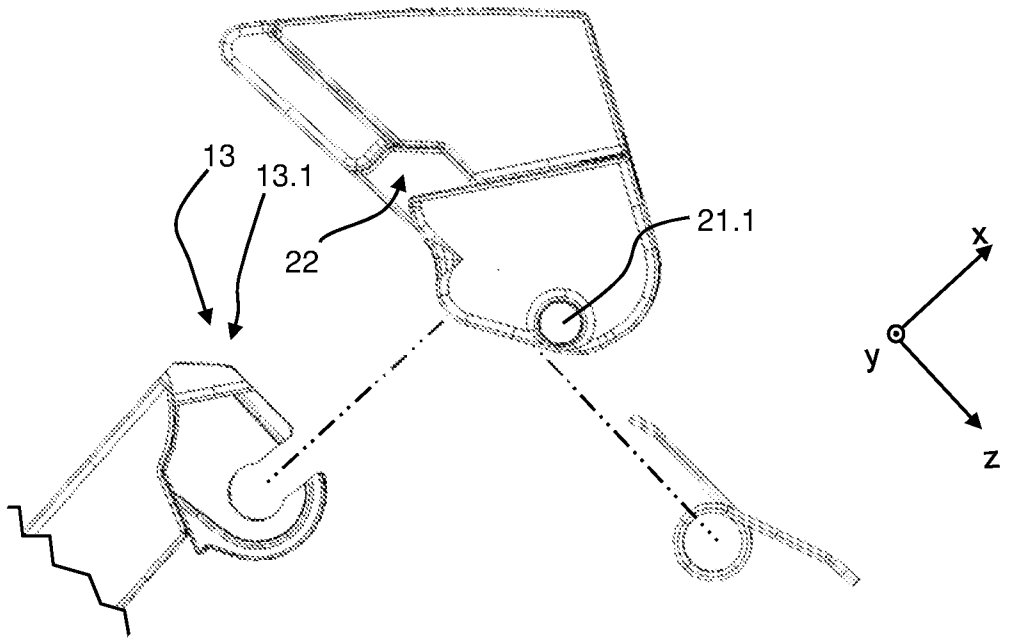

13
13.1
22
21.1
x
y
z

Fig. 3b

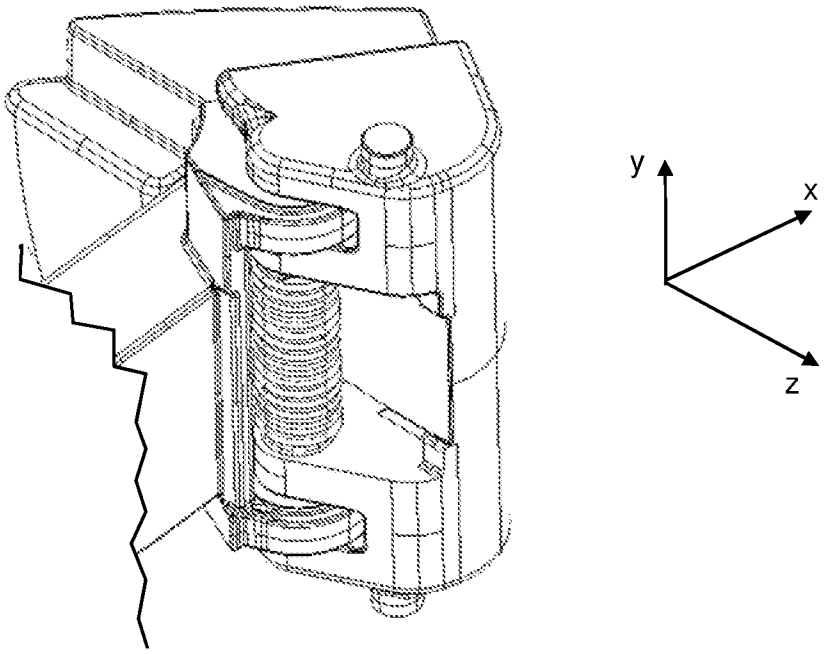


Fig. 3c

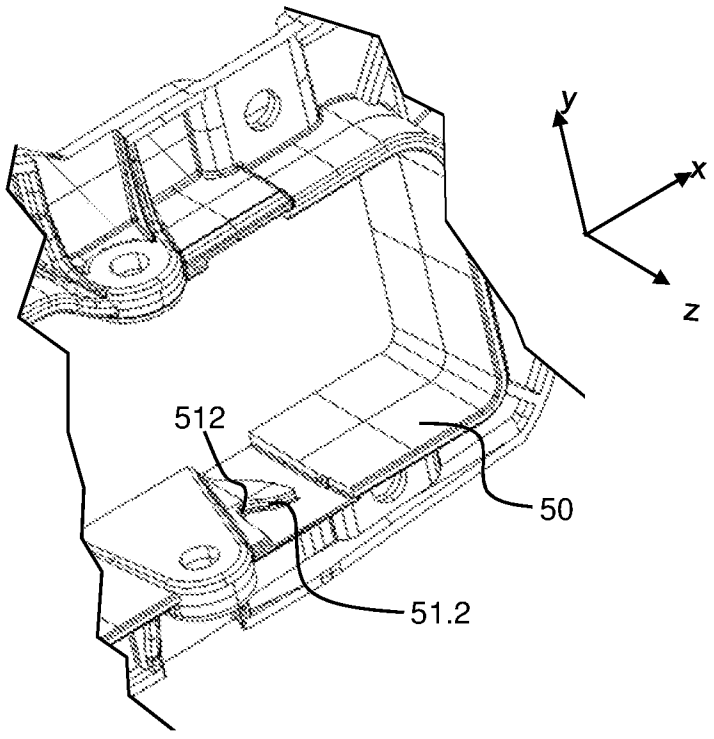


Fig. 4a

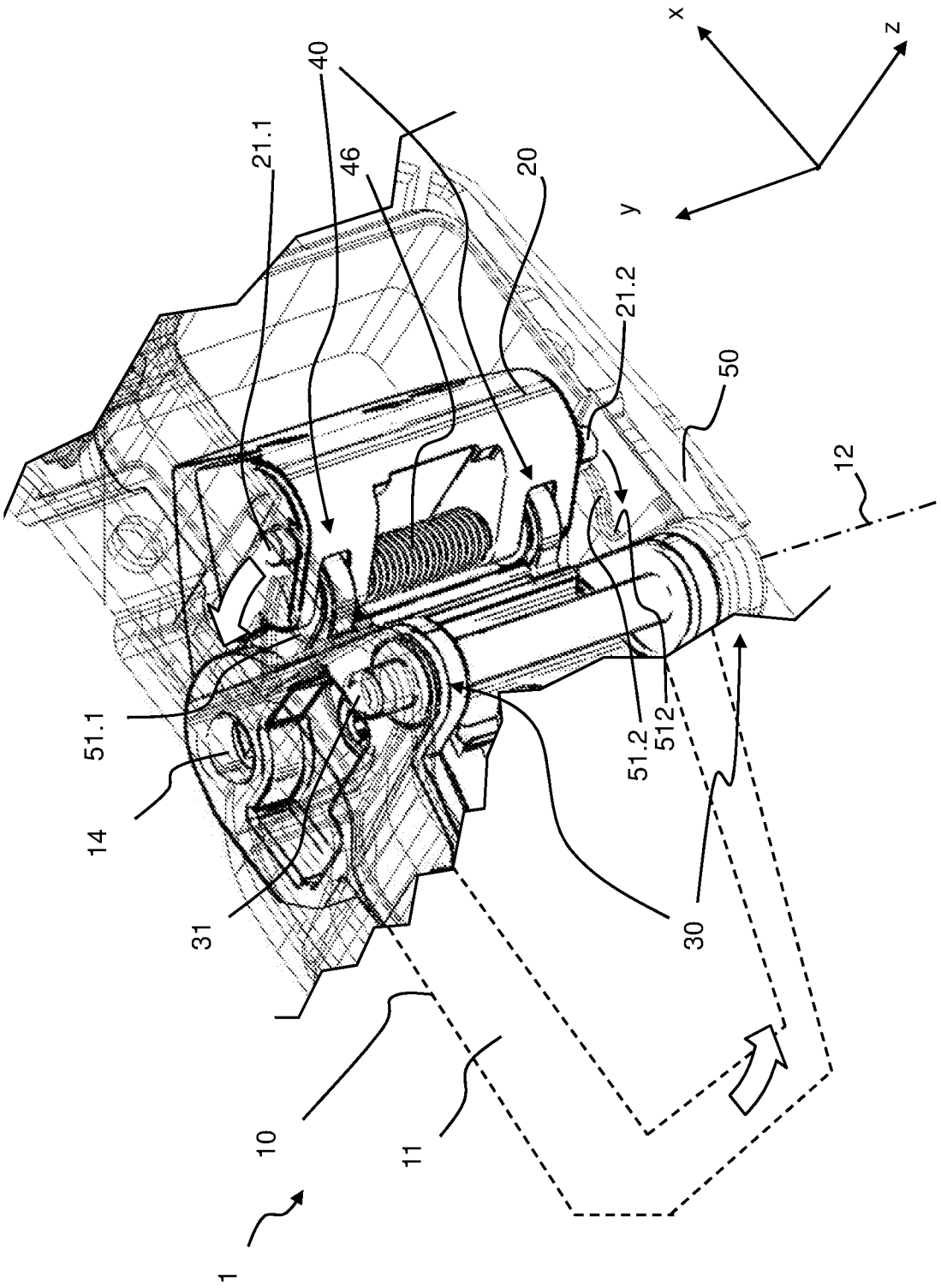


Fig. 4b

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/023859

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05B77/06 E05B85/12
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2011/120022 A1 (PAPANIKOLAOU KOSTA [US] ET AL) 26 May 2011 (2011-05-26) paragraph [0022] - paragraph [0033]; figures 1-11	1,7,8, 10,12 2-6,9, 11,13-15
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A	EP 1 182 310 A2 (MERITOR LIGHT VEHICLE SYS LTD [GB]) 27 February 2002 (2002-02-27) paragraphs [0003], [0020] - [0022]; figures 1-5	1
A	US 5 669 642 A (KANG SUN WON [KR]) 23 September 1997 (1997-09-23) column 3; figures 2-4	1

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 May 2016	09/06/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Ansel, Yannick

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/023859

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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1

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Information on patent family members

International application No
PCT/US2016/023859

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