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(54) SAFETY DEVICE FOR A VEHICLE DOOR HANDLE

(57) The invention relates to a safety device for a vehicle door handle, the device comprising:
- an activation element (2) configured to activate a latch wherein a collision on the safety may cause the activation element (2) to activate the latch
- a blocking element (3) configured, as a result of the collision, to rotate around a blocking axis (30), from a disengaged position to a blocking position in which the blocking element (3) is intended to block the activation element (2) at a blocked position

wherein the activation element (2) comprises a receiving part (4), and the blocking element (3) comprises a blocking part (32) engaging the receiving part (4) in the blocking position

wherein during the collision, the blocking part (32) cooperates successively with a first interception wall (42), a second interception wall (41) and a blocking wall (40) of the receiving part.

The invention further relates to the corresponding handle.

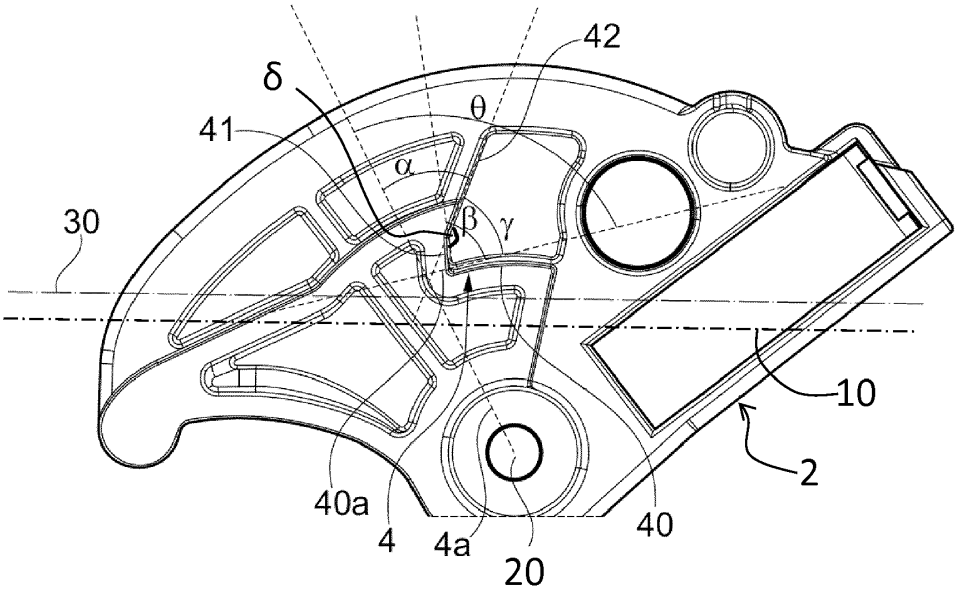

FIG. 2

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Description

[0001] Motor vehicle safety standards require that the doors of the vehicle stays closed in case of a collision.

[0002] To meet these requirements, a safety device has been proposed, the safety device comprising:

- an activation element intended to activate a latch by rotating with respect to a bracket around an activation axis from an initial position to a final position, wherein a collision on the bracket along a collision direction may cause the activation element to rotate from its initial position to its final position,
- a blocking element intended, as a result of the collision, to rotate with respect to the bracket around a blocking axis, from a disengaged position in which the blocking element allows the activation element to reach its final position, to a blocking position in which the blocking element is intended to block the activation element at a blocked position located between the initial position and the final position.

[0003] In this device, the blocking element comprises an inertial mass and a blocking part, wherein the blocking part is configured to intercept an oblique stop of the activation element during a collision.

[0004] The arrangement of the stop corresponds exactly to the one of the blocking part which is disadvantageous in case of delays between the movements of the blocking element and of the activation element. Indeed, the blocking element and the activation element need to be more finely tuned in respect to their shape, mass and cinematic to be synchronized such that the blocking element is not too late to efficiently block the activation element.

[0005] An object of the invention is to propose a safety device comprising a blocking element and an activation element that are finely tuned in respect to their shape, mass and cinematic to be synchronized for an efficient blocking of the activation element, by enabling an early interlocking of the activation element with the blocking part of the blocking element.

[0006] Another object of the invention is to improve further the safety of the device by limiting the opening stroke of the activation element during a collision.

[0007] To this end, the invention proposes a safety device for a vehicle door handle, the device comprising:

- an activation element configured to activate a latch by rotating around an activation axis from an initial position to a final position, wherein a collision on the safety device along a collision direction may cause the activation element to rotate from its initial position to its final position,
- a blocking element configured, as a result of the collision, to rotate around a blocking axis, from a disengaged position in which the blocking element allows the activation element to reach its final position, to a blocking position in which the blocking element is intended to block the activation element at a blocked position located between the initial position and the final position,

wherein the activation element comprises a receiving part, and the blocking element comprises a blocking part configured to interact with the receiving part in the blocking position and to be moved away from the receiving part in the disengaged position,
wherein the receiving part comprises a first and a second interception walls and a blocking wall connected to the second interception wall, the first and the second interception walls being defined each by a plane surface, the planes of the two surfaces being secants,
wherein during the collision, the blocking part cooperates successively with the first interception wall, the second interception wall and the blocking wall.

[0008] Advantageously, the receiving part of the lever of the invention comprises two interception walls extending according to two secant planes. This aspect enables on one hand an early interaction of the receiving part of the activation element with the blocking part of the blocking element.

[0009] Moreover, on the other hands, the interception walls enable to limit the opening stroke of the activation element.

[0010] According to further embodiments which can be considered alone or in combination:

- the blocking wall has a circular shape centered on the activation axis, the blocking wall having a tangent plane at a junction with the first interception wall; and/or
- the first interception wall forms with the blocking wall or with the tangent plane, a blocking angle, and the second interception wall forms with the first interception wall, an interception angle superior to the blocking angle; and/or
- the interception angle is inferior to 180°; and/or
- the blocking angle is inferior to about 90°; and/or
- a projection of the second interception wall forms with a projection of the blocking wall or with the tangent plane, a general angle comprised between about 45° and 90°; and/or
- a radius from the activation axis crosses a projection of the second interception wall and a projection of the blocking surface or the tangent plane,
  and the radius forms with the blocking surface or with the tangent plane , a receiving angle inferior to about 90°; and/or
- the blocking element comprises an inertial mass and is configured to block the activation element in the blocked position when the device is subject to inertial forces; and/or
- the blocking element comprises a retaining lug configured to engage a retaining part so as to maintain the blocking element in the blocking position after

the collision; and/or
- the activation axis is substantially perpendicular to the blocking axis; and/or

[0011] The invention further relates to a handle comprising a safety device according to any of the preceding claims, and a handle grip comprising a gripping part and a column projecting from the gripping part, and the column cooperates with activation element so as to trigger the unlatching of the vehicle door.

[0012] According to further embodiments which can be considered alone or in combination:

- the handle grip is rotatably mounted about a grip axisand/or
- the grip axis is substantially parallel to the blocking axis; and/or
- the grip axis is substantially perpendicular to the activation axis.

[0013] Other features and advantages of the present invention will become apparent from the following description of non-limitative embodiments, with reference to the attached drawings in which:

- figure 1A is a space view of the safety device according to a first embodiment of the invention cooperating with a handle grip, in which the blocking element is in the blocking position;
- figure 1B is an enlarged portion of the device of figure 1A, but in which the blocking element is in the unblocking position;
- figure 2 is a plane view of the activation element of the safety device of the invention;
- figure 3 is a close view of the safety device of the invention showing the blocking part interacting with the receiving part;
- figures 4-7B show movements of the blocking part in the receiving part when the blocking member moves from the unblocking position to the blocking position;
- figure 8 is a space view of the safety device according to a second embodiment of the invention.

[0014] Referring to figures 1A and 1B, the safety device of the invention is configured to be mounted in a handle. The handle generally comprises a handle grip 1 of a longitudinal shape. The handle grip 1 is movably mounted and configured to be actuated, for example pulled outwardly from the vehicle, to unlatch a vehicle door and open the door.

[0015] To this end the handle grip 1 comprises a gripping part 12 and a column 11 projecting from the gripping part 1. The column 11 is configured to cooperate with an activation element 2 placed inside the vehicle door. The activation element 2 in turn cooperates with a latch of the vehicle so as to unlatch the vehicle door.

[0016] The activation element 2 is rotationally mounted about an activation axis 20, between an initial position and a final position. The blocked position corresponds to the state of the activation element 2 in figures 1A, 3 and 8. The initial position is shown in figure 4.

[0017] In the final position, the activation element 2 is configured to actuate the latch so as to unlatch the vehicle door. The final position corresponds to a rotation of the activation element 2 about the activation axis 20 towards the right side of figure 2, i.e.: in a clockwise sense. The amplitude of rotation depends on the arrangement of the handle parts, and especially the latch connected to the activation element 2. Such amplitude needs only to be sufficient to actuate the latch so as to unlatch the vehicle door.

[0018] When returning to the initial position, the activation element 2 comes back to the state shown in figures 4 and 8, thereby releasing the latch.

[0019] The activation element 2 is configured to be driven from the initial position to the final position by the handle grip 1 through the column 11.

[0020] A return system, such as a spring, is preferably mounted to urge the activation element 2 toward the initial position (not represented). A similar return system is also provided for the handle grip 1 (not represented) to urge the handle grip 1 towards an unlatching position.

[0021] The handle parts may be subject to inertial forces, for example in the case of a collision. In this case the handle grip 1 may actuate the activation element 2 so as to unlatch the vehicle door and result in unwanted openings.

[0022] Thus, the safety device comprises a blocking element 3 configured to cooperate with the activation element 2 to block the activation element 2 in the blocked position.

[0023] In the sense of the invention, blocking the activation element 2 in the initial position may include a play of the activation element 2.

[0024] Referring now to figure 2, the activation element 2 comprises a receiving part 4 configured to interact with a corresponding part of the blocking element 3 such that the activation element 2 is blocked in the blocked position.

[0025] The receiving part 4 has a concave receiving portion open in a substantially centrifugal direction with respect to the activation axis 20.

[0026] The concave receiving portion is further open in a direction of the movement of the activation element 2 from the initial position to the final position.

[0027] The receiving part 4 comprises separate first 42 and second 41 interception walls and a blocking wall 40, with specific interception angle δ, blocking angle β, general γ and receiving angle θ detailed below.

[0028] The blocking wall 40 has a circular shape centered on the activation axis 20. The blocking wall 40 forms a base closer to the activation axis 20 than the first 42 and the second 41 interception walls.

[0029] The blocking wall 40 could also be substantially planar.

[0030] The second interception wall 41, which is a right lateral wall 41, is connected to and follows the blocking wall 40 so as to form the blocking angle β. The blocking angle β is measured between the right lateral wall 41 and a tangent plane 40a to the circular blocking wall 40 at the junction between the blocking wall 40 and the right lateral wall 41. The blocking angle β is here of about 86° in the concave receiving portion. More generally, the blocking angle β is comprised between about 70° and 90°.

[0031] Advantageously, a blocking angle β inferior to about 90° enables a satisfactory blocking of the activation element 2.

[0032] The right lateral wall 41 is substantially planar, but could also be substantially circular, and preferably convex in the concave receiving portion. Advantageously, a planar or convex right lateral wall limits residual opening strokes of the activation element 2 as further detailed below.

[0033] The first interception wall 42, which is an oblique lateral wall 42, is connected to and follows the right lateral wall 41 so as to form the interception angle δ, which is here of about 153° in the concave receiving portion. More generally, the interception angle δ is comprised between about 135° and 180°.

[0034] The oblique lateral wall 42 is substantially planar, but could also be substantially circular.

[0035] The oblique lateral wall 42 is in a plane that forms with the tangent plane 40a, the general angle γ, which is here of about 57° in the concave receiving portion. More generally, the general angle γ is comprised between about 45° and 90°.

[0036] Advantageously, a general angle γ comprised between about 45° and 90° enables a satisfactory early interception of the activation element 2.

[0037] The applicant found out that to have an effective blocking in the receiving part 4, a particular angle α needs to be sufficiently great to avoid that the blocking part 32 is moved out of the receiving portion as a result of accelerations during a collision. Indeed, as seen in figure 2, a wider opening of the first 42 and second 41 interception walls towards the left part of the figure may not be sufficient for the blocking element 3 to block the activation element 2 which is moving towards the right part of the figure, when the device is subject to a collision.

[0038] The particular angle α is defined based on the receiving angle θ formed across the concave retaining portion such that the receiving angle θ is the sum of the particular angle α with the general angle y; and the receiving angle θ is inferior or equal to about 90°.

[0039] Referring to figures 1A, 1B and 3, the blocking element 3 is rotationally mounted about a blocking axis 30, preferably substantially perpendicular to the activation axis 20.

[0040] Advantageously, perpendicular blocking 30 and unlatching 20 axes allow a satisfactory interaction of the activation element 2 with the blocking element 3.

[0041] The blocking element 3 is movably mounted between a blocking position and an unblocking position. The blocking position corresponds to the state of the blocking element 3 in figures 1A and 3. The unblocking position corresponds to the state of the blocking element 3 in figure 1B.

[0042] In the blocking position, the blocking element 3 cooperates with the activation element 2 so as to block the activation element 2 in the blocked position. More particularly, the blocking element 3 comprises a blocking part 32 configured to interact with the receiving part 4 so as to block the activation element 2 in the blocked position when the blocking element is in the blocking position.

[0043] In the unblocking position, the activation element 2 is free to move, and can thus go to the final position. More particularly, the blocking part 32 of the blocking element 3 is moved out of the receiving part 4 such that the activation element 2 may move to the final position.

[0044] The blocking part 32 comprises a first face 35 which is an oblique lateral face 35. The oblique lateral face 35 configured to cooperate with the oblique lateral wall 42 of the receiving part 4 when the blocking part 32 interacts with the receiving part 4. The oblique lateral face 35 is substantially plane and oriented parallel to the oblique lateral wall 42.

[0045] The blocking part 32 further comprises a second face 36, which is a base face 36. The base face 36 configured to cooperate with the blocking wall 40 of the receiving part 4 when the blocking part 32 interacts with the receiving part 4. The base face 36 is substantially plane and oriented parallel to the blocking wall 40.

[0046] The oblique lateral face 35 crosses the base face 36 at an edge 37 configured to cooperate with the right lateral wall 41 of the receiving part 4 when the blocking part 32 interacts with the receiving part 4.

[0047] As shown in figures 1A, 1B and 3, the blocking part 32 projects perpendicularly from the blocking axis 30. In particular, the blocking part 32 has the form of a finger. The blocking part 32 comprises a double elbow structure 32a. The double elbow structure 32a enables to have the blocking part 32 reach the receiving part 4 in the arrangement of the invention.

[0048] The blocking element 3 generally comprises an inertial mass 31 configured to move the blocking element 3 to the blocking position when the blocking element 3 is subject to inertial forces due to the collision. When the inertial forces decrease, the blocking element 3 may then return to the unblocking position.

[0049] Such an embodiment has the advantage of temporarily blocking the activation element 2 during the collision, and enabling to reuse the safety device after the collision.

[0050] According to another embodiment (not represented), the blocking element may be motorized and actuated when the collision occurs.

[0051] The handle grip 1 is rotationally mounted about a grip axis 10. The grip axis 10 is substantially perpendicular to the activation axis 20.

[0052] Advantageously, perpendicular grip 10 and ac-

tivation 20 axes allow a satisfactory interaction of handle grip 1 and the activation element 2.

[0053] The grip axis 10 is thus substantially parallel to the blocking axis 30. Advantageously, such a configuration enables to align the grip member 1 and the blocking element 3 according to a plane perpendicular to the grip 10 and blocking 30 axes, thereby limiting the space requirement of the blocking element 3.

[0054] The interaction between the blocking element 3 and the activation element 2 will now be described in reference to figures 4 to 7B. Figures 4 to 7B show relative movements of the blocking part 32 of the blocking element 3 with respect to the activation element 2.

[0055] In operation, the activation element 2 is generally in the initial position when there is no collision and the handle grip is not actuated. The blocking element 3 is in the unblocking position such that the blocking part 32 is placed out of the retaining part 4 of the activation element 2. This step of the operation is shown in figure 4.

[0056] When the collision occurs, inertial forces are applied on the handle parts such that the handle grip 1 may be moved such that the activation element 2 is turned clockwise about the activation axis 20, and triggers an unwanted opening of the door.

[0057] The blocking element 3 is configured to be also actuated due to the same inertial forces and to turn about the blocking axis 30 such that the blocking part 32 is moved towards the receiving part 4. This step of the operation is shown in figure 5.

[0058] The relative movements of the blocking part 32 with respect to the activation element 2 correspond, in figures 4 to 7B, to a combined vertical upward and horizontal leftward displacement of the blocking part 32.

[0059] The vertical upward displacement of the blocking part 32 in figures 4 to 7B actually corresponds to a clockwise rotation of the activation element 2 about the activation axis 20 towards the final position. The horizontal leftward displacement of the blocking part 32 in figures 4 to 7B actually corresponds to a rotation of the blocking element 3 about the blocking axis 30 towards the blocking position.

[0060] As the blocking part 32 enters the receiving part 4 of the activation element 2, the oblique lateral face 35 slides on the oblique lateral wall 42, according to the illustration of figures 6A and 6B. During this step, the activation element 2 actually undergoes a little residual unlatching stroke of rotation about the activation axis 20, i. e. a little clockwise rotation in figures 4 to 7B. This unlatching stroke actually corresponds to the vertical upward displacement of the blocking part 32 in figures 4 to 6B.

[0061] When the oblique lateral face 35 reaches the end of the oblique lateral wall 42 the edge 37 of the blocking part 32 slides on the right lateral wall 41. The base face 36 then rests on the blocking wall 40 as shown in figures 7A and 7B. During this step, the activation element 2 stops any further unlatching stroke of rotation about the activation axis 20, because the vertical upward displacement of the blocking part 32 is stopped.

[0062] As can be seen in figures 4 to 6B, if a similar safety device does not comprise any right lateral wall 41, the oblique lateral wall 42 would be longer and would reach the blocking wall 40, thereby allowing an additional vertical upward displacement with respect to the safety device shown in figures 4 to 7B. This means that the activation element 2 would make an additional unlatching stroke of rotation about the activation axis 20, thereby increasing the risk that such a stroke leads to an unwanted opening of the door.

[0063] The applicant found out that providing a right lateral wall limits the residual unlatching stroke so as to increase the safety of the handle.

[0064] According to another embodiment shown in figure 8, the blocking element 3 can comprise the inertial mass 31 and a retaining lug 33 configured to engage a retaining part 34 so as to maintain the blocking element 3 in the blocking position.

[0065] Such an embodiment has the advantage of maintaining the blocking element in a blocking position of the bolt so as to avoid rebounds of the blocking element 3 due to variations of inertial forces during a collision, which would lead to an unwanted opening of the door.

[0066] The invention has been described above with the aid of embodiments without limitation of the general inventive concept as defined in the claims.

[0067] Many modifications and variations will suggest themselves to those skilled in the art upon making reference to the foregoing illustrative embodiments, which are given by way of example only and which are not intended to limit the scope of the invention, that being determined solely by the appended claims.

[0068] In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that different features are recited in mutually different dependent claims does not indicate that a combination of these features cannot be advantageously used. Any reference signs in the claims should not be construed as limiting the scope of the invention.

Claims

1. Safety device for a vehicle door handle, the device comprising:

   - an activation element (2) configured to activate a latch by rotating around an activation axis (20) from an initial position to a final position, wherein a collision on the safety device along a collision direction may cause the activation element (2) to rotate from its initial position to its final position,
   - a blocking element (3) configured, as a result of the collision, to rotate around a blocking axis (30), from a disengaged position in which the

blocking element (3) allows the activation element (2) to reach its final position, to a blocking position in which the blocking element (3) is intended to block the activation element (2) at a blocked position located between the initial position and the final position,
wherein the activation element (2) comprises a receiving part (4), and the blocking element (3) comprises a blocking part (32) configured to interact with the receiving part (4) in the blocking position and to be moved away from the receiving part (4) in the disengaged position,
wherein the receiving part (4) comprises a first (42) and a second (41) interception walls and a blocking wall (40) connected to the second interception wall (41), the first (42) and the second (41) interception walls being defined each by a plane surface, the planes of the two surfaces being secants,
wherein during the collision, the blocking part (32) cooperates successively with the first interception wall (42), the second interception wall (41) and the blocking wall (40).

2. Safety device according to the preceding claim, wherein the blocking wall (40) has a circular shape centered on the activation axis (20), the blocking wall (40) having a tangent plane (40a) at a junction with the first interception wall (41).

3. Safety device according to any of the preceding claims, wherein the first interception wall (41) forms with the blocking wall (40) or with the tangent plane (40a), a blocking angle (β), and the second interception wall (42) forms with the first interception wall (41), an interception angle (δ) superior to the blocking angle (β).

4. Safety device according to the preceding claim, wherein the interception angle (δ) is inferior to 180°.

5. Safety device according to claim 3 or 4, wherein the blocking angle (β) is inferior to about 90°.

6. Safety device according to any of the preceding claims, wherein a projection (42a) of the second interception wall (42) forms with a projection of the blocking wall (40) or with the tangent plane (40a), a general angle (γ) comprised between about 45° and 90°.

7. Safety device according to any of the preceding claims, wherein a radius (4a) from the activation axis (20) crosses a projection (42a) of the second interception wall (42) and a projection of the blocking surface (40) or the tangent plane (40a),
wherein the radius (4a) forms with the blocking surface (40) or with the tangent plane (40a), a receiving angle (θ) inferior to about 90°.

8. Safety device according to any of the preceding claims, wherein the blocking element (3) comprises an inertial mass (31) and is configured to block the activation element (2) in the blocked position when the device is subject to inertial forces.

9. Safety device according to any of the preceding claims, wherein the blocking element (3) comprises a retaining lug (33) configured to engage a retaining part (34) so as to maintain the blocking element (3) in the blocking position after the collision.

10. Safety device according to any of the preceding claims, wherein the activation axis (20) is substantially perpendicular to the blocking axis (30).

11. Handle comprising a safety device according to any of the preceding claims, and a handle grip (1) comprising a gripping part (12) and a column (11) projecting from the gripping part (12), wherein the column (11) cooperates with activation element (2) so as to trigger the unlatching of the vehicle door.

12. Handle according to the preceding claim, wherein the handle grip (1) is rotatably mounted about a grip axis (10).

13. Handle according to the preceding claim, wherein the grip axis (10) is substantially parallel to the blocking axis (30).

14. Handle according to any of claims 11 to 13, claim 12 applying, wherein the grip axis (10) is substantially perpendicular to the activation axis (20).

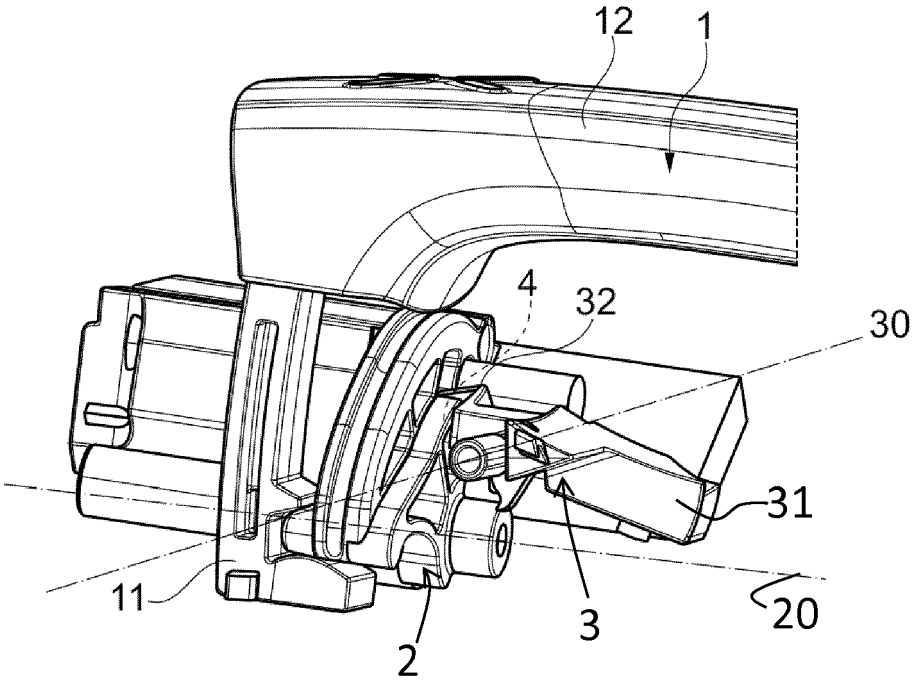

FIG. 1A

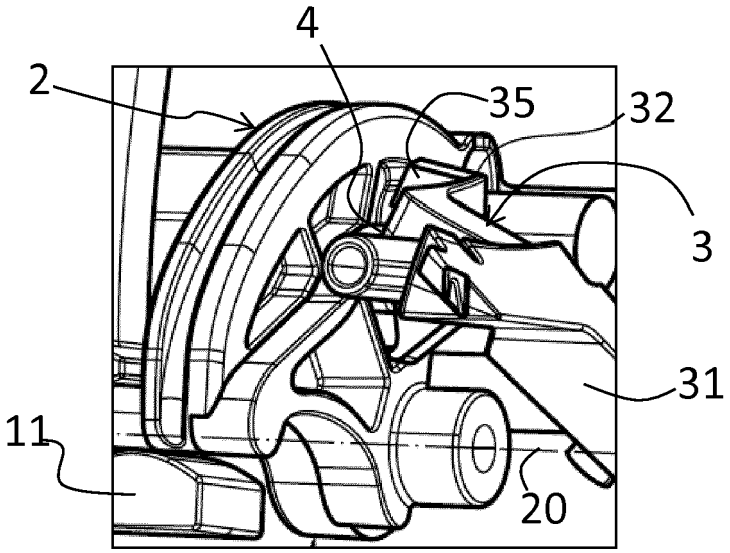

FIG. 1B

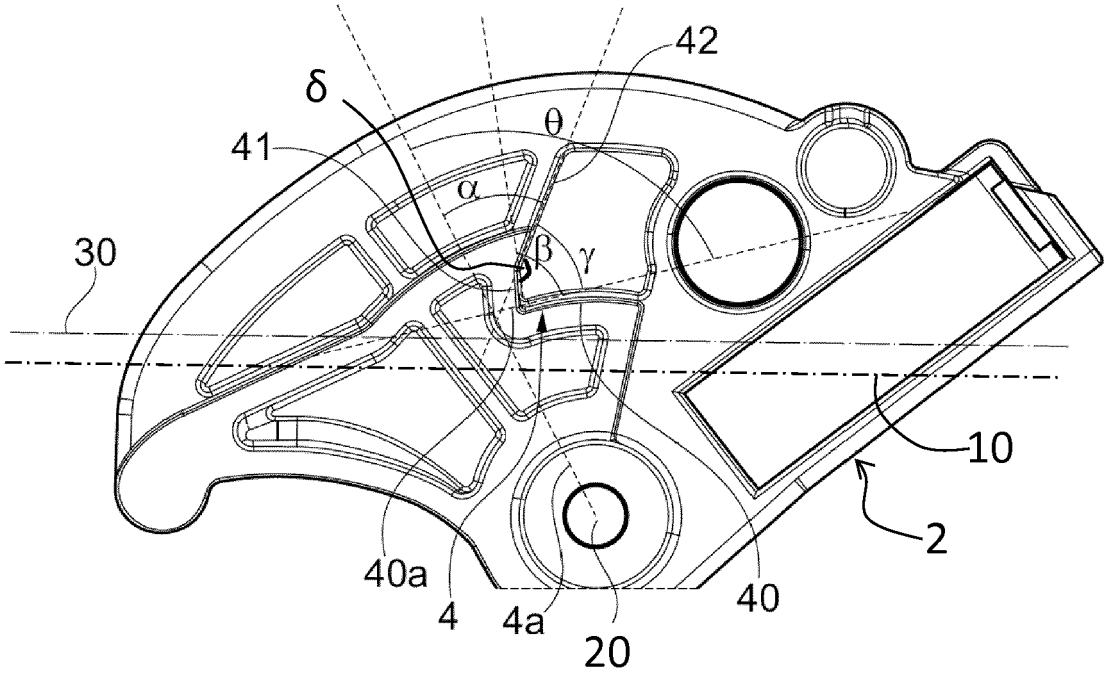

FIG. 2

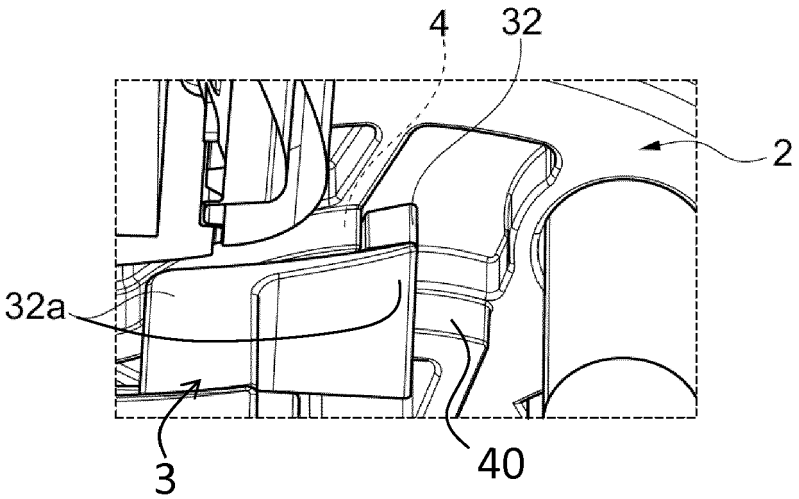

FIG. 3

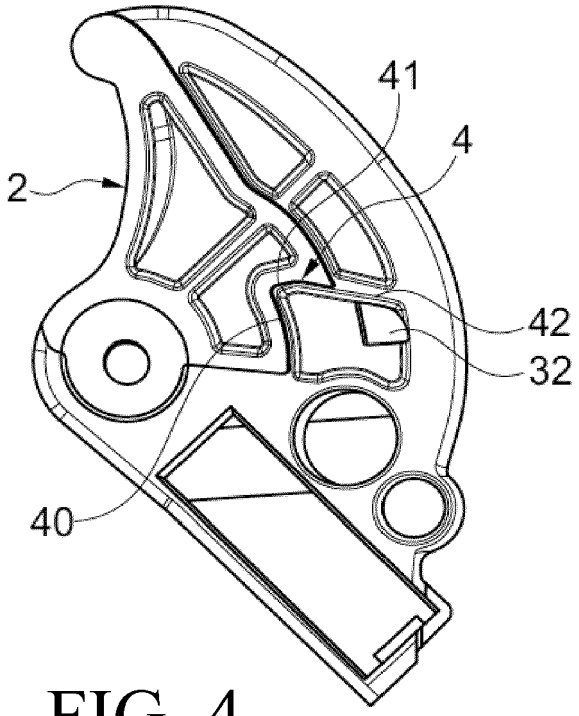

FIG. 4

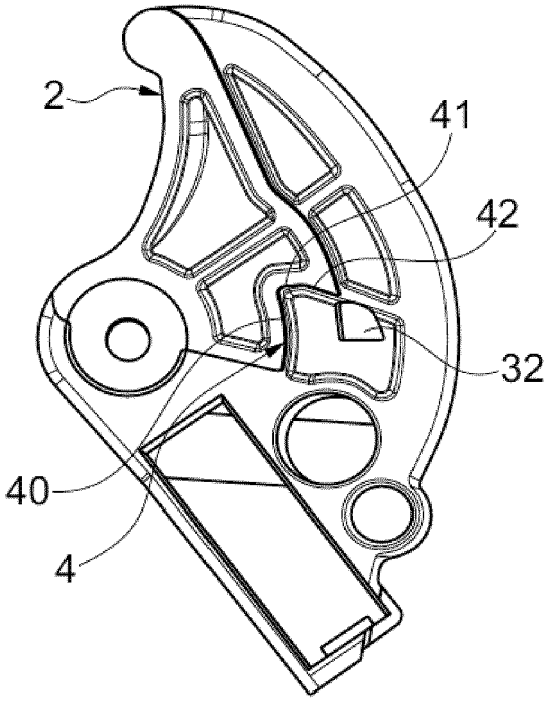

FIG. 5

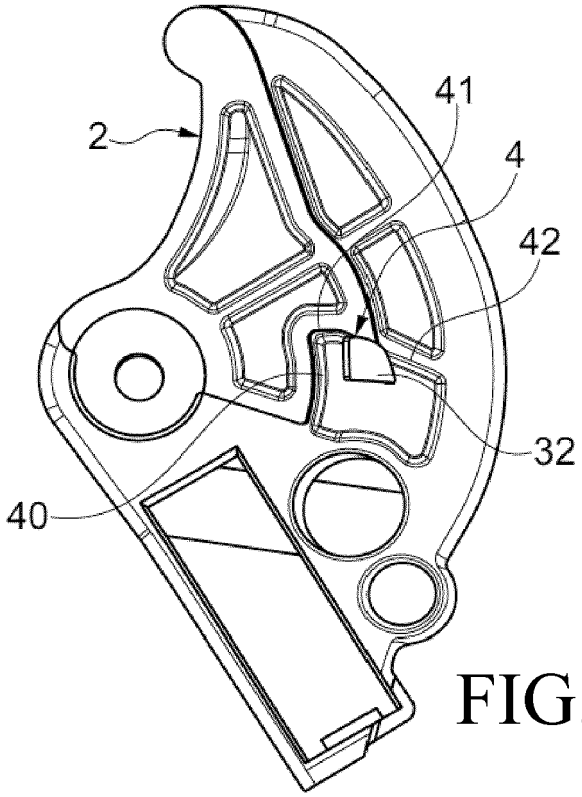

FIG. 6A

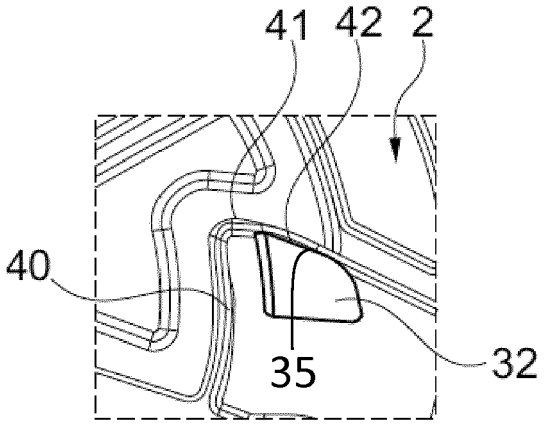

FIG. 6B

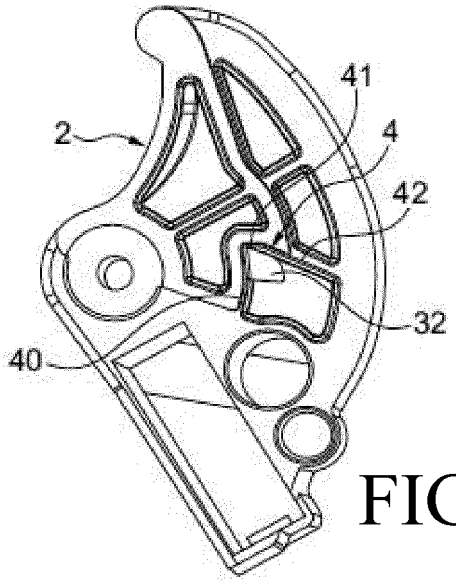

FIG. 7A

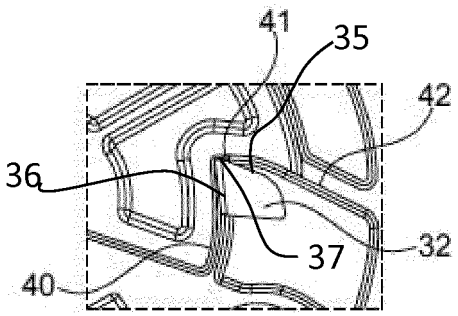

FIG. 7B

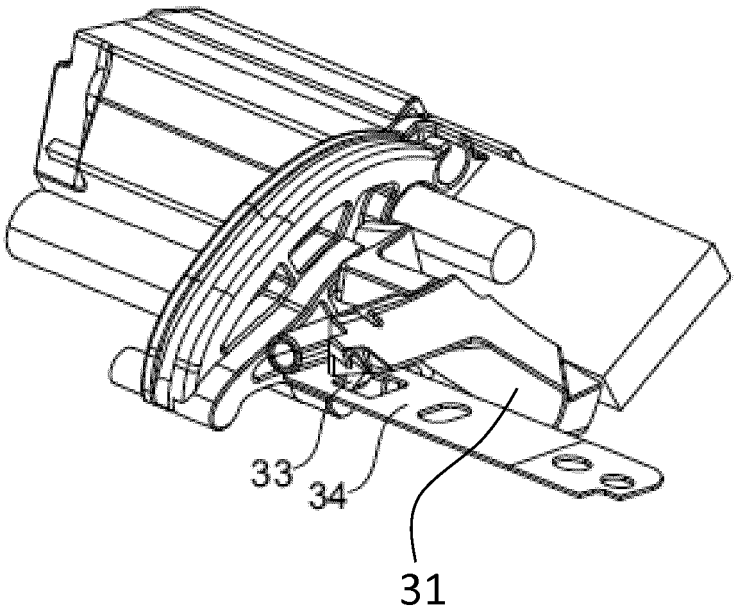

FIG. 8

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 17 7514

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 128 004 A2 (VALEO SICUREZZA ABITACOLO SPA [IT]) 29 August 2001 (2001-08-29) * the whole document *	1,11	INV. E05B77/06 E05B85/10
A	EP 2 325 419 A2 (HUF HUELSBECK & FUERST GMBH [DE]) 25 May 2011 (2011-05-25) * the whole document *	1,11	
A	US 2014/145454 A1 (DA DEPPO LYNN D [US] ET AL) 29 May 2014 (2014-05-29) * the whole document *	1,11	
A	WO 2008/068261 A1 (VALEO SICUREZZA ABITACOLO SPA [IT]; SAVANT FIORENZO [IT]; ILARDO SIMON) 12 June 2008 (2008-06-12) * the whole document *	1,11	

TECHNICAL FIELDS SEARCHED (IPC)

E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 January 2016	Westin, Kenneth

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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T : theory or principle underlying the invention
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