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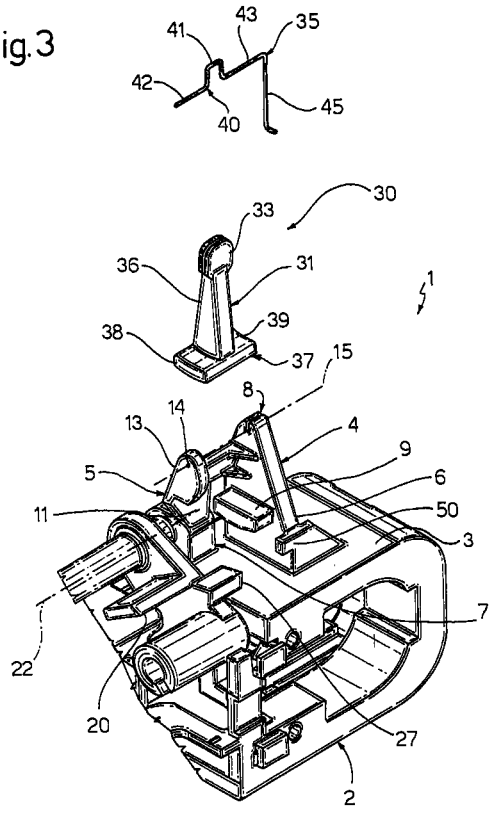
(54) Vehicle door handle

(57) A handle (1) for a vehicle door has a supporting structure (2); a transmission lever (20) activated externally by means of a control member (16) to rotate between an angular rest position, and an angular work position to open a lock on the door; and a safety locking device (30) for keeping the lever (20) in the rest position in the event of lateral impact on the vehicle; the device (30) has a fixed appendix (9) integral with the structure (2), a movable appendix (27) integral with the lever (20), and a pendulum-type inertial body (31) hinged to the structure (2) about an axis (15) and having an end tongue (37) for making the appendixes (9, 27) integral with each other.

Fig.3



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Description

[0001] The present invention relates to a vehicle door handle.

[0002] Handles are known comprising a user-activated control lever movable between a rest position maintained by a preloaded return spring, and a work position to open a lock on the door by means of a transmission lever interposed between the control lever and the lock. In some applications, the handles are provided with safety devices for preventing control of the lock, and so preventing the door from opening spontaneously, in the event of a side-on collision.

[0003] In particular, inertial safety devices are used comprising a mass or counterweight connected integrally to, and eccentric with respect to the axis of rotation of, the transmission lever to balance the inertial forces generated at least by the control lever and tending to rotate the transmission lever.

[0004] Known handles of the above type are far from satisfactory, owing to the inertial mass, movable integrally with the transmission lever, generating on the lever - when the control lever is activated - an inertial moment which is added to the moment exerted by the spring, thus increasing the opening force required, and - when the control lever is released - a force which, at the end of the travel of the control lever, generates a backward thrust and impact resulting in undesired noise.

[0005] Moreover, though the door involved in the collision is kept closed, known inertial devices do not always succeed in keeping the opposite door closed.

[0006] Inertial safety devices of the type described are also relatively slow to operate, by featuring a necessarily large mass to balance the inertial forces tending to open the door, and are only effective up to a given maximum impact intensity, beyond which, efficiency is gradually reduced. To increase efficiency, it is necessary to act on the mass, which is sized according to a predicted impact intensity. Beyond a given limit, however, the mass would be excessively large and incompatible with the space available.

[0007] It is an object of the present invention to provide a vehicle door handle designed to provide a straightforward, low-cost solution to the above problems.

[0008] According to the present invention, there is provided a handle for a vehicle door, the handle comprising a supporting structure; a transmission lever activated externally by means of a control member to rotate between an angular rest position, and an angular work position to open a lock on said door; and safety means comprising an inertial mass for keeping said lever in said rest position in the event of lateral impact on the vehicle; characterized in that said safety means also comprise fixed first stop means connected integrally to said structure; movable second stop means carried by said lever; and movable locking means activated by said inertial mass to make said first and second stop means integral with each other.

[0009] A non-limiting embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which:

Figures 1 and 2 show sections of a preferred embodiment of the handle according to the present invention in two different operating conditions;

Figure 3 shows an exploded view in perspective, with parts removed for clarity, of the Figure 1 and 2 handle.

[0010] Number 1 in the accompanying drawings indicates a handle for controlling a vehicle door lock (not shown). Handle 1 comprises a structure 2, which is connected integrally, in known manner not described in detail, to a side door (not shown) of the vehicle.

[0011] With reference to Figure 3, structure 2, when fitted to the respective door, extends in a longitudinal direction, and comprises a longitudinal lateral wall 3 integrally supporting a fork-shaped outer frame 4 comprising two arms 5 and 6 defining a seat 7 in between.

[0012] Arm 6 is plate-shaped, extends from an end portion of wall 3, perpendicularly to wall 3 and crosswise to the longitudinal direction, and comprises a through groove 8 at one end, and an intermediate integral stop appendix 9 projecting inside seat 7 and facing wall 3.

[0013] Arm 5 comprises a longitudinal wall 11 for connection to wall 3; and an end plate 13 facing arm 6 and having a through hole 14 extending coaxially with groove 8 along a longitudinal axis 15.

[0014] With reference to Figures 1 and 2, handle 1 also comprises an external control lever 16, which is gripped by the user to open the respective lock, is hinged in known manner (not shown) to structure 2, and carries an end arm 18. Arm 18 engages structure 2 and supports, at one end, a longitudinal tooth 19 cooperating in sliding manner with a substantially C-shaped transmission lever 20 connectable to the lock.

[0015] Transmission lever 20 is hinged to structure 2 in known manner not shown, and is located on the opposite side of arm 5 with respect to arm 6 to rotate, about a longitudinal axis 22, between an angular rest position (shown in Figure 1), and an angular work position to open the respective lock when lever 16 is activated.

[0016] Lever 20 is housed partly inside structure 2, and supports integrally an outer stop appendix 27 projecting towards arm 6 inside seat 7 and separated longitudinally from appendix 9.

[0017] As shown in the accompanying drawings, handle 1 also comprises an inertial safety locking device 30 for keeping transmission lever 20 in the angular rest position and so preventing the lock from being activated, and the door from opening spontaneously, in the event of an accident involving side-on collision with

the vehicle.

[0018] Device 30 comprises appendixes 9 and 27, and an inertial pendulum body 31, which is upside down T-shaped, is formed in one piece, and engages seat 7.

[0019] With particular reference to Figure 3, body 31 comprises an end tooth 33 hinged to frame 4 by a wire spring 35; and an arm 36, which extends crosswise to wall 3 and supports integrally, at one end, an end portion 37 comprising two portions 38 and 39 extending longitudinally from opposite sides of arm 36. More specifically, portion 39 extends towards arm 6, between appendix 9 and wall 3, and portion 38 extends towards lever 20.

[0020] Spring 35 forms part of device 30, and comprises a hinge portion 40 having an omega-shaped intermediate portion 41 forced onto tooth 33, and two opposite straight portions 42 and 43 engaging hole 14 and groove 8 respectively. Spring 35 also comprises a connecting portion 45, which is connected to portion 43, extends on the opposite side of arm 6 with respect to arm 5, and is connected in known manner (not shown) to arm 6.

[0021] Spring 35 allows body 31 to oscillate inside seat 7, about axis 15 and with respect to transmission lever 20 and structure 2, between a standby position (Figure 1) wherein body 31 is detached from levers 20 and 16, with end portion 37 positioned adjacent to wall 11, and a lock position (Figure 2) locking transmission lever 20, and wherein end portion 37 defines a tongue interposed between appendixes 9 and 27.

[0022] In actual use, in the absence of impact on the side of the vehicle, spring 35 exerts an elastic twisting action to keep pendulum body 31 in the standby position and prevent interference between transmission lever 20 and body 31.

[0023] Conversely, when the vehicle is struck from the side, control lever 16 of handle 1 on the distressed door exerts on transmission lever 20 an inertial opening force to rotate lever 20 anticlockwise in Figure 2, while the inertial mass defined by arm 36 and by end portion 37 generates an inertial force to move body 31 into the lock position.

[0024] More specifically, the design of pendulum body 31 and the torsional elastic coefficient of spring 35 are such that, in the event of impact, the response time of body 31 is less than that of transmission lever 20, so that body 31 rotates before lever 20, and end portion 37 is interposed between appendixes 9 and 27 to make appendixes 9 and 27 integral with each other.

[0025] More specifically, portion 39 of end portion 37 comes to rest against a longitudinal stop tooth 50 integral with arm 6, and portion 38 is positioned facing appendix 27. At which point, as soon as lever 20 tends to rotate about axis 22, appendix 27 comes to rest against portion 38, thus exerting radial thrust on body 31, so that spring 35 is deformed and portion 39 rests on appendix 9 (Figure 2), thus preventing rotation of lever 20, which therefore substantially remains in the rest position.

[0026] In normal operating conditions, therefore, safety device 30 has no effect on the operation of levers 16 and 20, so that, in the absence of lateral impact on the door, the noise level and the force required to operate handle 1 are the same as those of a handle with no safety device.

[0027] Conversely, in the event of lateral impact on the vehicle, the fast response time of device 30 provides for an extremely high degree of efficiency. That is, on the one hand, the body 31-frame 4 connection is subject to very little friction by virtue of spring 35, which acts both as a low-friction hinge pin and as an elastic retaining member; and, on the other, by not being called upon to directly balance the inertial forces acting on levers 16 and 20, the mass of body 31 is smaller than in known solutions, and, for the same reason, need not be sized, unlike known solutions, according to a given predicted impact on the door.

[0028] Moreover, unlike known solutions, in the event of impact, device 30 provides for keeping the distressed door closed, while having no release effect on the opposite door lock.

[0029] Moreover, device 30 comprises only a small number of parts, and is extremely easy to assemble by simply forcing portion 41 of spring 35 onto tooth 33, inserting portion 42 inside hole 14, clicking portion 43 inside groove 8, and connecting portion 45 to frame 4.

[0030] Using a flexible wire spring 35 as a hinge means enables body 31 to spring back automatically into the standby position following impact. That is, the forces acting on lever 20 upon impact are transmitted to structure 2 by end portion 37 positioned simultaneously contacting appendixes 9 and 27, as opposed to via spring 35, which, even after impact, continues to operate elastically to reset body 31 and permit normal control of the lock.

[0031] Clearly, changes may be made to handle 1 as described herein without, however, departing from the scope of the present invention.

[0032] In particular, device 30 may differ from and be located differently from the one described and illustrated herein by way of example; and end portion 37 may be pushed by an inertial mass separate from portion 37.

[0033] Moreover, end portion 37 may be connected to frame 4 otherwise than as described and shown, e.g. by means of a guide device enabling the end portion to slide into the lock position in the event of lateral impact on the vehicle; and spring 35 may be replaced with a different elastic element, e.g. integral with body 31 or frame 4.

Claims

1. A handle (1) for a vehicle door, the handle comprising a supporting structure (2); a transmission lever (20) activated externally by means of a control

member (16) to rotate between an angular rest position, and an angular work position to open a lock on said door; and safety means (30) comprising an inertial mass (36, 37) for keeping said lever (20) in said rest position in the event of lateral impact on the vehicle; characterized in that said safety means (30) also comprise fixed first stop means (9) connected integrally to said structure (2); movable second stop means (27) carried by said lever (20); and movable locking means (37) activated by said inertial mass (36, 37) to make said first (9) and second (27) stop means integral with each other.

2. A handle as claimed in Claim 1, characterized in that said locking means (37) are connected integrally to said inertial mass (36, 37).

3. A handle as claimed in Claim 1 or 2, characterized in that said locking means (37) comprise a tongue (37) which simultaneously contacts said first (9) and second (27) stop means.

4. A handle as claimed in Claim 3, characterized in that said tongue (37) forms part of said inertial mass (36, 37).

5. A handle as claimed in any one of the foregoing Claims, characterized by also comprising elastic means (35) for keeping said inertial mass (36, 37) in a standby position.

6. A handle as claimed in any one of the foregoing Claims, characterized by comprising hinge means (35) interposed between said inertial mass (36, 37) and said structure (2) to enable the inertial mass (36, 37) to rotate about a hinge axis (15).

7. A handle as claimed in Claim 6, characterized in that said inertial mass (36, 37) and said locking means (37) form part of a single pendulum body (31) which oscillates about said hinge axis (15).

8. A handle as claimed in Claim 7, characterized in that said body (31) is substantially upside down T-shaped; and said first (9) and second (27) stop means comprise respective appendixes (9)(27) which contact respective opposite end portions (38)(39) of said body (31).

9. A handle as claimed in Claim 5 and any one of Claims 6 to 8, characterized in that said elastic means (35) and said hinge means (35) are defined by one elastically deformable element (35).

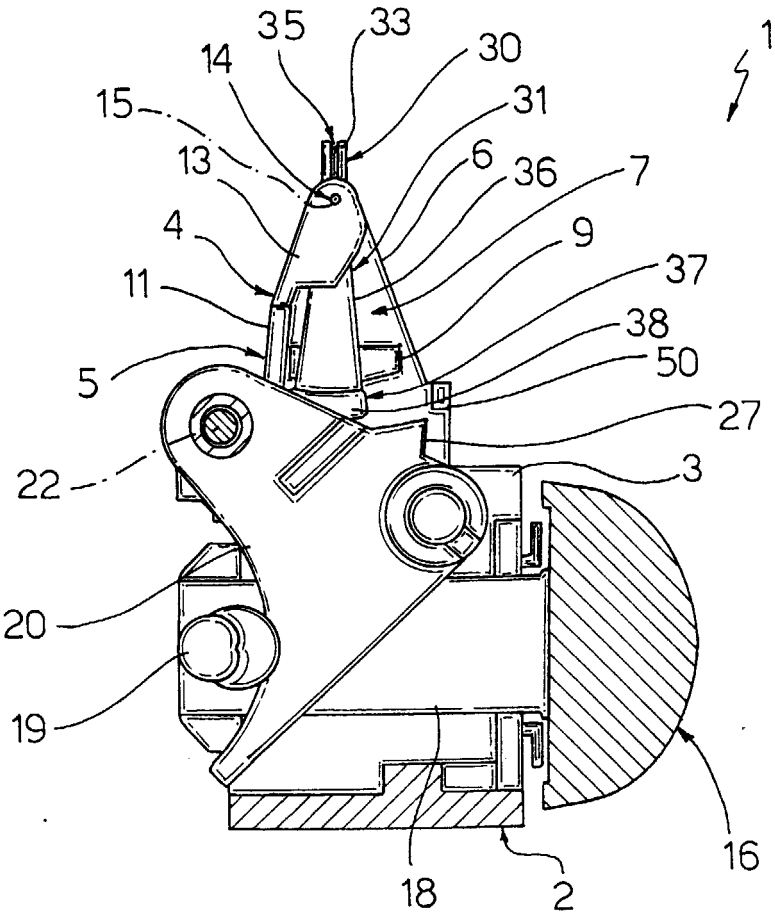
10. A handle as claimed in Claim 9, characterized in that said elastically deformable element (35) is a wire element.

11. A handle as claimed in Claim 10, characterized in that said wire element (35) comprises a hinge portion (40) having an intermediate portion (41) connected to a connecting portion (33) of said inertial mass (36, 37), and two flexible end portions (42)(43) carried by said structure (2).

12. A handle as claimed in Claim 11, characterized in that said intermediate portion (41) is forced onto said connecting portion (33).

13. A handle as claimed in any one of the foregoing Claims, characterized in that said structure (2) comprises a stop portion (50) for arresting said inertial mass (36, 37).

Fig.1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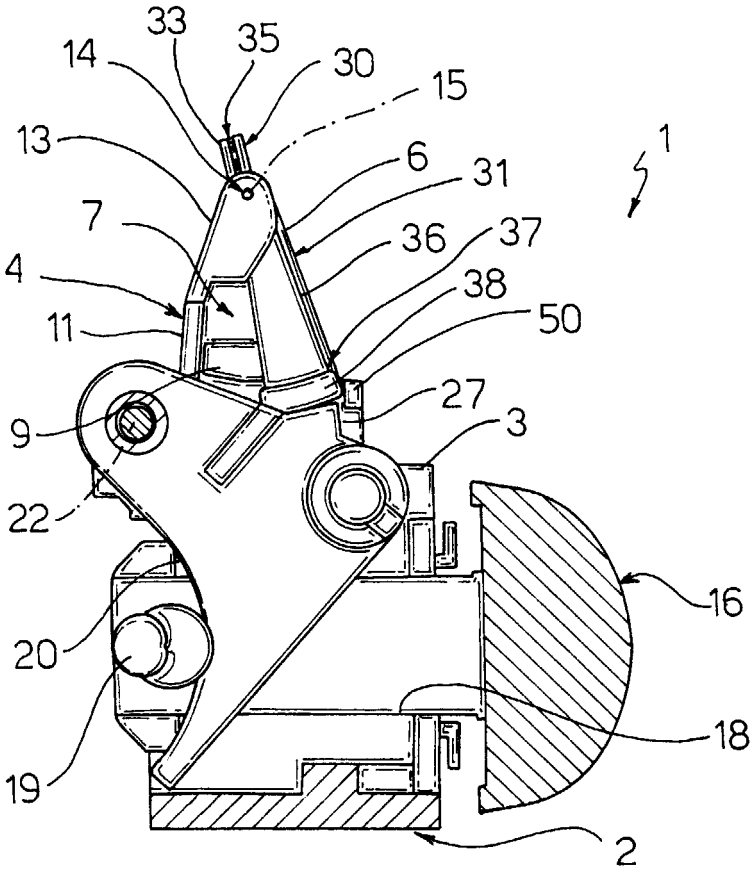
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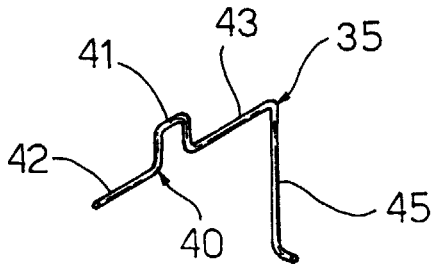
Fig.2

Fig.3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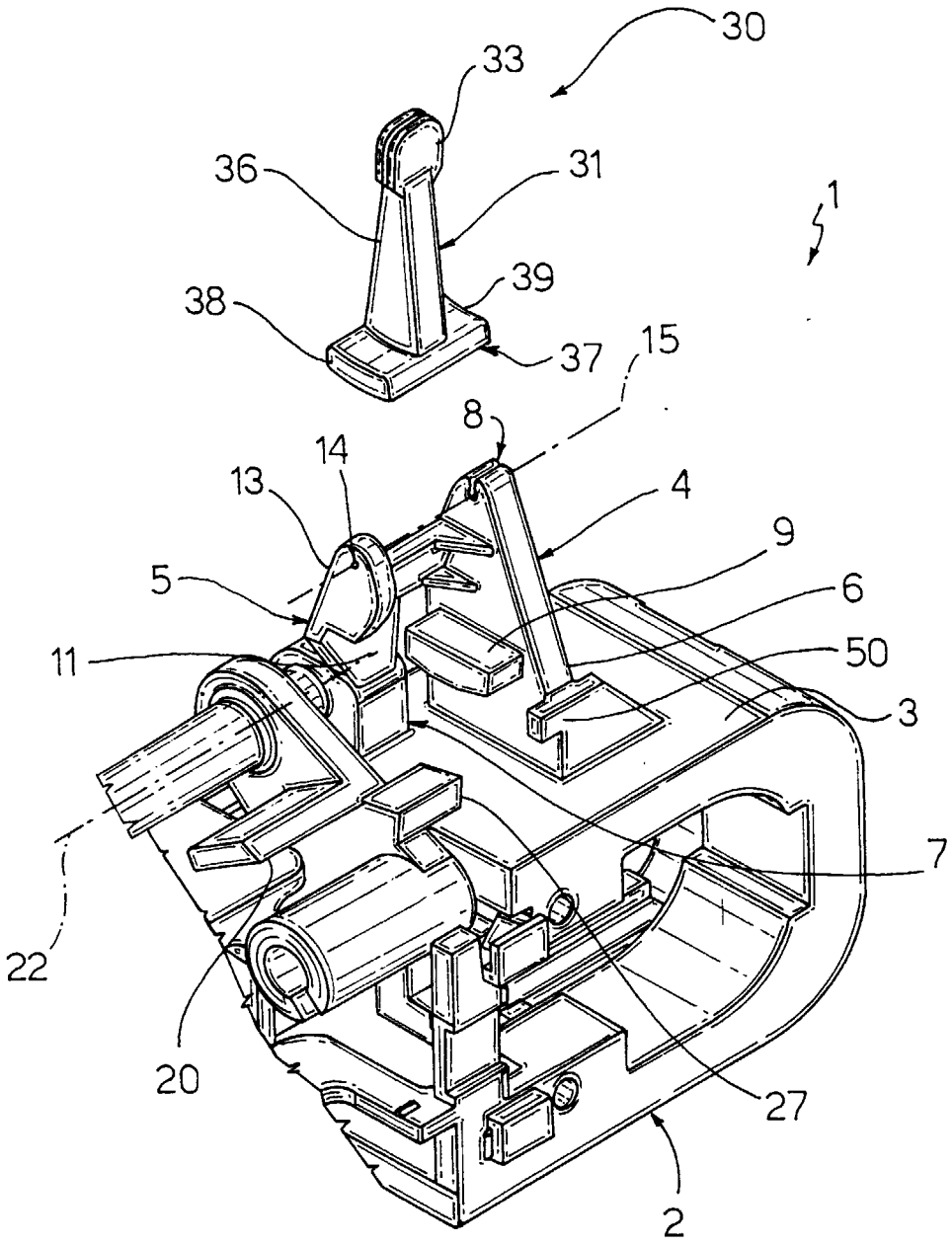
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