Stopping and damping device for carriage units of sliding doors of buildings or furniture and the like

A stopping and damping device for carriage units of sliding doors of buildings or furniture and the like comprises a body (10) mounted in a rail (2) and a retaining device (12) for retaining a carriage (3) which guides and supports elements (4) of sliding doors of buildings or furniture. A retaining lever (120) is movable about an axis of rotation (121) on the body (10) between a first end position and a second end position, the rotation of the retaining lever (120) in a first direction of rotation (D1) from the first end position to the second end position being opposed by a reaction torque generated by elastic opposing means (122). Contact of a first lever arm (123) of the retaining lever (120) with predetermined portions of the carriage (3) starts the rotation of the retaining lever (120) in the first direction of rotation (D1) and the retaining lever (120), under the action of the elastic opposing means (122), is urged into and caused to adopt a retaining position on the carriage (3).
Description

[0001] This invention relates to a stopping and damping device for carriage units of sliding doors of buildings or furniture and the like. The invention also relates to a carriage unit equipped with the stopping and damping device according to the invention.

[0002] To be able to work, sliding doors of buildings or furniture require a carriage unit comprising at least one carriage which supports the sliding element of the door panel and which runs in a slide rail to allow the sliding door panel to move along the slide rail itself.

[0003] Usually, limit stop devices are used to limit the travel of the carriage along the rail to prevent the sliding door panel from impacting violently against the supporting frame structure of the building or furniture unit the door panel forms part of. Normally, these limit stop devices are associated with the rail. To dampen and/or cushion the impact of a carriage against it, the limit stop device is substituted for a special stop device and damper which slows down and retains the carriage when the latter, moving along the guide rail, reaches it.

[0004] Generally speaking, stopping devices and dampers comprise a fastening block which is fixed to the rail and is provided with at least one elastic retaining element. The elastic retaining element is fitted and locked to the fastening block or is made as one with it and is elastically deformed when the carriage comes into contact with it, slowing the motion of the carriage and "gripping" it in such a way as to hold it back. A stopping and damping device may also comprise a cushioning bumper designed to absorb part of the impact of the carriage against the fastening block to assist the damping effect of the elastic retaining element. The elastic retaining element may be a protuberance located on the underside of the fastening block (as described in document CH 2 331 459, where it is made as one with the fastening block, or as in document FR 2 979 934, where it is in the form of a leaf spring fixed to the fastening block) or on the top (as in document CA 2 331 459, where the elastic retaining element is a leaf spring, either fixed to the top of the fastening block or made as one therewith). In these cases, the elastic force applied by the elastic retaining element on the carriage has a non-negligible component which is perpendicular to the horizontal plane defined by the rail on which the carriage runs. In a different version, for example described in document EP 2 128 535, the front of the fastening block may be shaped like a gripper (the two prongs being integral with the fastening block and being elastically deformable) which widens elastically around the carriage (or a protuberance thereof) to slow it down and stop it. The working plane of the gripper defined by the prongs of the fastening block may be either parallel or perpendicular to the plane in which the sliding element supported thereby lies. The structure of prior art stopping devices and dampers is not rigid and, generally speaking, does not allow selection of the retaining force if not by modifying the material of the fastening block or the material and/or the shims and the structure of the elastic retaining element. Further, the elastic retaining element, owing to its elongate shape and the repeated deformation cycles it is subjected to, is exposed to rapid deterioration and/or strain hardening. This may lead to rapid breakage or, at best, to progressive loss of gripping capacity and/or increased noise. Another problem with prior art devices is that it is difficult to fit them with systems for preloading the elastic retaining element (to allow varying the retaining force) without creating strain which, on account of the numerous deformation cycles they are subjected to during their working lives, does not accelerate deterioration and/or strain hardening.

[0005] The aim of this invention is to overcome the above mentioned disadvantages by providing a stopping and damping device for carriage units of sliding doors of buildings or furniture and the like (and a carriage unit equipped with the stopping and damping device) which allows high versatility in choosing the retaining force without necessitating modifications to the shape and/or material of the fastening block and/or of the retaining element. Another aim of this invention is to overcome the above mentioned disadvantages by providing a stopping and damping device for carriage units of sliding doors of buildings or furniture and the like (and a carriage unit equipped with the stopping and damping device) which reduces the risk of rapid deterioration of the device. These aims and others, which shall become more readily apparent in the description that follows, are achieved, in accordance with this invention with a stopping and damping device for carriage units of sliding doors of buildings or furniture and the like (and a carriage unit equipped with the stopping and damping device) having the structural and functional features described in the independent claims herein, further embodiments of it being described in the dependent claims.

[0006] The invention is described in more detail below with reference to the accompanying drawings, which illustrate a preferred, non-limiting embodiment.

- Figure 1 is a side view of a carriage unit with a stopping and damping device according to the invention, where a rail for a sliding element of a door panel is schematically illustrated by dashed lines.
- Figures 2 and 3 are cross sections in a longitudinal plane of the carriage of Figure 1, where, respectively: the stopping and damping device is in an intermediate condition between a rest configuration and a carriage stopped condition immediately before that (Figure 2); the stopping and damping device is in a carriage stopped condition (Figure 3).
- Figure 4 is a schematic perspective view of the carriage unit of Figure 1 in the condition of Figure 3.
- Figure 5 is an exploded view of a stopping and damping device according to the invention (in particular according to an embodiment of it illustrated in Figures 1 to 4).
With reference to the drawings, the numeral 1 containing position preferably by reversing the direction of rotation "D1", the retaining lever 120 is in the retaining position where it retains the carriage 3 the action of the elastic opposing means 122 comprising a helical spring 124 mounted so it is compressible around the axis of rotation 121. The rotatable connection may be obtained in several ways. A first way may be that of using a through pin to hinge the retaining lever 120 and the body 10 to each other. A second way may be that of shaping a protrusion of the retaining lever 120 in such a way that the protrusion can be inserted in a respective seat in the body 10. Other equivalent ways deemed suitable by an expert in the trade may also be used. The retaining lever 120 is movable about an axis of rotation 121 between a first end position and a second end position. Limit stop elements 126 may be provided to determine the first and second end positions. The drawings illustrate by way of non-limiting example an embodiment comprising a beak 127 on the retaining lever 120, inserted in a guide slot 128 formed in the body 10 and whose limits define, for the beak 127, the two end positions of the rotational movement of the retaining lever 120.

The retaining device 12 also comprises elastic opposing means 122 which generate a reaction torque opposing the rotation of the retaining lever 120 in a first direction of rotation "D1" from the first end position to the second end position. The first direction of rotation "D1" thus corresponds to the rotational motion of the retaining lever 120 from the first end position to the second end position. The reaction torque opposes this motion and tends to bring the retaining lever 120 back to the first end position. The rotation of the retaining lever 120 in the first direction of rotation D1 is started by contact of a first lever arm 123 of the retaining lever 120 with predetermined portions of the carriage 3 when the carriage 3 approaches the body 10 during its movement along the rail 2. When the retaining lever 120 starts moving from the first end position towards the second end position, the stopping and damping device 1 leaves a rest configuration (not illustrated) and moves into a condition which is intermediate between the rest configuration and a configuration where the carriage 3 is stopped. During rotation in the first direction of rotation "D1", the retaining lever 120 is in a retaining position where it retains the carriage 3 and, under the action of the elastic opposing means 122 is caused to adopt this retaining position. This condition is illustrated in Figure 3. In it, the stopping and damping device 1 is in the configuration where the carriage 3 is stopped. When, during rotation in the first direction of rotation "D1", the retaining lever 120 is in the retaining position where it retains the carriage 3 the action of the elastic opposing means 122 causes it to adopt this retaining position preferably by reversing the direction of rotation. To move into the retaining position on the carriage 3, the retaining lever 120 preferably travels an angular stretch in a direction of rotation opposite to the first direction of rotation "D1". In this case, after reaching the position as close as possible to the second end position on account of the cam action applied by the predetermined portions of the carriage 3 (Figure 2), the retaining lever 120 is urged by the elastic opposing means 122 towards the first end position in the retaining position on the carriage 3 (Figure 3). The retaining lever 120 is preferably a rigid element. The value of the reaction torque which produces the slowing and retaining action on the carriage 3 by the retaining lever 120 depends on the state and properties of the elastic opposing means 122 which, being a different element from both the body 10 and the retaining lever 120, may be selected to define the most suitable reaction torque without substantial effects on the other components of the system (at least within wide limits of choice). The predetermined portions of the carriage 3 which, upon contact with the first lever arm 123, start the rotation of the retaining lever 120 from the first to the second end position may be parts 30 at the front of the carriage 3. As illustrated in the drawings, the first lever arm 123 may comprise a shaped free end 129 which, when the retaining lever 120 occupies the retaining position on the carriage 3, engages matching shaped portions of the carriage 3 itself (for example, as illustrated in the drawings, the shaft of the wheels 31 of the carriage 3 or a guard or casing thereof, denoted in both cases by the numeral 32 in Figure 4).

The elastic opposing means 122 are operatively interposed between the body 10 and the retaining lever 120. Advantageously, the stopping and damping device 1 further comprises presetting means 13 which act on the elastic opposing means 122 to select and/or set a predetermined value for the reaction torque on the retaining lever 120 at the first end position. This enhances the versatility of the device. Further, since the elastic opposing means 122 constitute a third element distinct from the retaining lever 120 and the body 10, the value of the reaction torque can be preset with precision and relative confidence for the operation and durability of the system. The elastic opposing means 122 may be embodied in several ways: for example by torsion springs operatively associated around the axis of rotation 121. Advantageously and conveniently, the elastic opposing means 122 comprise a helical spring 124 mounted so it is compressible between the body 10 and a second lever arm 125 of the retaining lever 120. The second lever arm 125 is located on the side of the axis of rotation 121 opposite the first lever arm 123. The helical spring 124 is mounted with its own longitudinal axis transverse to the retaining lever 120. In particular, the longitudinal axis of the helical spring 124 is transverse to the second lever arm 125. When the stopping and damping device 1 is mounted in the rail 2, the longitudinal axis of the helical spring 124 is parallel to an axis of the carriage 3 which supports the element 4 of sliding door panels. The presetting
means 13 comprise an adjustment screw 130 which acts on one end of the helical spring 124 either directly or through actuating means 131. The compression of the helical spring 124 at the first end position is set by screwing or unscrewing the adjustment screw 130. In this embodiment, setting the compression of the helical spring 124 is equivalent to setting the reaction torque of the elastic opposing means 122. More specifically and preferably, as illustrated in the drawings, the adjustment screw 130 is engaged by a screw thread in the body 10. The screw thread by which it is engaged is represented in the drawings by way of a non-exclusive example as a nut inserted in the body 10. The adjustment screw 130 acts on a first end 1240 of the helical spring 124 either directly or through actuating means 131. In an embodiment illustrated in Figures 2, 3 and 5, the actuating means 131 comprise a compression disc or washer 132 which is associated with a tip of the adjustment screw 130 and is moved along the axis of the adjustment screw 130 by screwing or unscrewing the latter. At its first end 1240, the helical spring 124 may be constrained to a first pin 1241 associated with the body 10 and, at its second end 1242, to a second pin 1243 associated with the retaining lever 120, and more specifically, with the second lever arm 125. The second pin 1243 may be formed on the adjustment screw 130. The second pin 1243 may be formed on the compression disc or washer 132. The compression disc or washer 132 may be integral with the tip of the adjustment screw 130. The body 10 may be fixed to the rail 2 by means of suitable fastening screws 100. More specifically, by pressing on a first side 20 of the rail 2, the fastening screws 100 push the body 10 against a side 21 of the rail 2 opposite to the first side. If the retaining lever 120 is positioned between the fastening screws 100 and the first side 21, the retaining lever 120 (and more specifically, the second lever arm 125) is provided with through holes 101 through which the fastening screws 100 can pass. The through holes 101 are conveniently countersunk or elongate to prevent the fastening screws 100 from interfering with the rotation of the retaining lever 120 between the first and second end positions.

In an embodiment not illustrated in the drawings, the retaining device 12 comprises a further retaining lever connected to the body 10 rotatably about an axis of rotation parallel to, or coinciding with, the axis of rotation 121 of the retaining lever 120. The further retaining lever forms with the retaining lever 120 a gripper device for retaining the carriage 3 under the action of the elastic opposing means 122. The first end position of the retaining lever 120 corresponds to a least open position of the gripper device and the second end position of the retaining lever 120 corresponds to a most open position of the gripper device.

In an embodiment illustrated in the drawings, the axis of rotation 121 of the retaining lever 120, when the stopping and damping device 1 is mounted in the rail 2, is perpendicular to a plane in which elements 4 of the sliding door panel lie. In an alternative embodiment not illustrated, the axis of rotation 121 of the retaining lever 120 coincides with a straight line which not only lies in a plane of the sliding door panel elements 4 but which is also perpendicular to a line of movement of the carriage 3 in the rail 2 when the stopping and damping device 1 is mounted in the rail 2. This configuration may be advantageously applied when the retaining device 12 is in the form of a gripper like the one described above. The stopping and damping device 1 conveniently comprises a bumper element 11 (made of rubber, for example) to provide a shock absorbing action on the carriage 3.

The carriage unit 200 for sliding doors of buildings or furniture according to the invention comprises a stopping and damping device 1 according to any of the combinations and/or embodiments described above and illustrated and a carriage 3. All the features described above and referring directly or indirectly to the carriage 3 are applicable singly or in combination to the carriage 3 itself. Obviously, the carriage 3 runs in the slide rail 2 which the body 10 is mounted in and is designed to support and guide elements 4 of sliding door panels along the rail 2. The carriage 3 interacts with the retaining device 12 in each of the ways described above, considered singly and/or - where applicable - also in any of the combinations described above.

The invention is particularly versatile in providing the possibility of choosing and/or presetting the retaining and braking force applied to the carriage. The invention gives this result while at the same time increasing durability and reducing part deterioration.

The invention described can be modified and adapted in several ways without thereby departing from the scope of the inventive concept.

Moreover, all details of the invention may be substituted for other technically equivalent elements.

In practice, the embodiments of the invention may be made of any material, and in any size, depending on requirements.

Claims

1. A stopping and damping device (1) for carriage units of sliding doors of buildings or furniture and the like comprising a body (10) mountable in a rail (2) and a retaining device (12) for retaining a carriage (3) which runs in the rail (2) and which guides and supports elements (4) of sliding doors of buildings or furniture, characterized in that the retaining device (12) comprises:

   - a retaining lever (120) connected to the body (10) rotatably about an axis of rotation (121) and movable about the axis of rotation (121) between a first end position and a second end position;
   - elastic opposing means (122) which generate a reaction torque opposing the rotation of the
retaining lever (120) in a first direction of rotation (D1) from the first end position to the second end position;

the rotation of the retaining lever (120) in the first direction of rotation (D1) being started by the contact of a first lever arm (123) of the retaining lever (120) with predetermined portions of the carriage (3) when the carriage (3) approaches the body (10) during its movement along the rail (2); during this rotation, the retaining lever (120) being urged into and, under the action of the elastic opposing means (122), being caused to adopt, a retaining position on the carriage (3), preferably by reversing the direction of rotation.

2. The stopping and damping device (1) according to claim 1, characterized in that the elastic opposing means (122) are operatively interposed between the body (10) and the retaining lever (120).

3. The stopping and damping device (1) according to claim 2, characterized in that it further comprises presetting means (13) which act on the elastic opposing means (122) to select and/or set a predetermined value for the reaction torque on the retaining lever (120) at the first end position.

4. The stopping and damping device (1) according to claim 2 or 3, characterized in that the elastic opposing means (122) comprise a helical spring (124) mounted so it is compressed between the body 10 and a second lever arm (125) of the retaining lever (120), the second lever arm (125) being located on the side of the axis of rotation (121) opposite the first lever arm (123).

5. The stopping and damping device (1) according to claim 4, when dependent on claim 3, characterized in that the presetting means (13) comprise an adjustment screw (130) which is engaged by a screw thread in the body (10) and which acts on one end of the helical spring (124) either directly or through actuating means (131), the compression of the helical spring (124) at the first end position being set by screwing or unscrewing the adjustment screw (130).

6. The stopping and damping device (1) according to any one of the preceding claims, characterized in that when the stopping and damping device (1) is mounted in the rail (2), the axis of rotation (121) of the retaining lever (120) is perpendicular to a plane in which the elements (4) of the sliding door panel lie.

7. The stopping and damping device (1) according to any one of claims 1 to 5, characterized in that the axis of rotation (121) of the retaining lever (120) coincides with a straight line which not only lies in a plane of the folding door panel elements (4) but which is also perpendicular to a line of movement of the carriage (3) in the rail (2) when the stopping and damping device (1) is mounted in the rail (2).

8. The stopping and damping device (1) according to any one of the preceding claims, characterized in that the retaining device (12) comprises a further retaining lever which is connected to the body (10) rotatably about an axis of rotation parallel to, or coinciding with, the axis of rotation (121) of the retaining lever (120), and which forms with the retaining lever (120) a gripper device for retaining the carriage (3) under the action of the elastic opposing means (122), the first end position corresponding to a least open position of the gripper device and the second end position corresponding to a most open position of the gripper device.

9. The stopping and damping device (1) according to any one of the preceding claims, characterized in that it comprises a bumper element (11) to provide a shock absorbing action on the carriage (3).

10. A carriage unit (200) for sliding doors of buildings or furniture, comprising a stopping and damping device (1) according to any one of claims 1 to 9 and a carriage (3) which: runs in the slide rail (2) the body (10) is mounted in and which is designed to support and guide elements (4) of sliding door panels along the rail (2), interacting with the retaining device (12).
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The present search report has been drawn up for all claims.

Place of search: The Hague
Date of completion of the search: 23 June 2015
Examiner: Rémondot, Xavier
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23-06-2015

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