

Title: Sliding door

Description

5 The present invention relates to a sliding door with a door leaf, which is suspended from at least one carriage and is guided to be displaceable along a roller rail profile which is disposed at a wall or at a ceiling, the sliding door having a closing device, which is suitable to displace the door leaf
10 into a closed position in a decelerated manner.

The problem with sliding doors is that very often the doors, when being carelessly opened or closed, they impact on a limit stop; this can be very loud, but can also destroy a
15 door, such as a glass sliding door for example. If the sliding door is closed with too much momentum, it will often bounce against the limit stop, which can only absorb a portion of the energy, such that the sliding door bounces back and remains in a not completely closed position.
20 Closing devices are known for this purpose, which displace the sliding door into a terminal position and simultaneously achieve a damping effect.

When opening a sliding door with too much momentum,
25 this results very often in the problem that the first user is able to easily pass the sliding door, after having triggered

the opening operation, but the sliding door simultaneously returns into the partially closed position and the following user of the sliding door bumps with his shoulder or side into the sliding door; whereby, on the one hand, a risk of injury is given and, on the other hand, the sliding door will start to swing perpendicularly to the opening direction and thus may be prone to damage.

It is the object of the invention to provide a sliding door in which the closing device effects a displacement into a terminal position and simultaneously a damping effect. In this case, the closing device should be as compact as possible and should be retrofittable to existing sliding doors.

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The solution is achieved by the features of claim 1. Advantageous embodiments are realized with the features of the dependent claims.

20 The invention is characterized in that the closing device has at least one spring-damper element, which is disposed near the ground level area at the door leaf by means of a carrier module. Thus a visually appealing and compact solution is achieved, which can be retrofitted to existing sliding doors. In this case, the closing device is mounted to the door leaf, essentially flush with the lower frontal edge,

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such as to give the impression it is a component of a lower terminating profile.

5 Disposing the closing device at the door leaf, near the ground level area, results in the closing device moving along with the door leaf and not having to absorb any static loads.

10 An advantageous embodiment of the invention is achieved, if the closing device has a second carrier module with another spring-damper element which is suitable to displace the door leaf in a decelerated manner into an open position. Via the carrier modules, the closing device may be equipped optionally with pre-mounted spring-
15 damper elements for the open position and/or the closed position. Thereby, depending on the customer need, the closing devices can be equipped in a flexible and variable manner.

20 Another improvement is achieved in that the carrier module has a reversing lever, the latching nose thereof cooperating with a release. The reversing lever allows for an operative connection of the spring-damper element to the release. Depending on the configuration of the reversing lever, in
25 this case, the release may be placed far away from the

passage area of the door, such as not to interfere and not to represent a tripping hazard for the user of the door.

In a preferred embodiment, the reversing lever cooperates
5 with the spring-damper element via a coupling member. In
this case, the coupling member may simultaneously
establish an operative connection with the reversing lever
between one or more spring-damper elements, which are
disposed within the carrier module.

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Another advantageous solution is achieved in that the at
least one carrier module is disposed at the door leaf via a
profile. The connection via the profile allows for a variable
attachment to the door leaf, because the profile is bonded,
15 screwed onto the door leaf or attached to it in a clamping
manner. In this case, the profile may be configured as if it
were a part of a lower frame, which comprises for example
a glass pane.

20 Another simplified attachment of the carrier modules is
achieved in that the profile has at least one track, which
allows for a variable horizontal arrangement of the carrier
module. According to the embodiment, two tracks allow for
sliding the carrier modules in, which – depending on the
25 reversing lever and release – may be aligned variably in
horizontal direction and then be attached stationarily to the

sliding door, respectively to the profile. The horizontal displaceability along the track allows for a very simple, yet precise installation of the closing device.

- 5 The carrier module may have a reception, at or in which the spring-damper elements are disposed. The reception may be configured in the shape of a box, and, after mounting the spring-damper elements, be closed by means of a cover such that soiling or even subsequent
10 manipulation are avoided. It is furthermore possible to stock pre-mounted structural units for the open position or closed position, which are very easy to install.

Hereinafter, further measures enhancing the invention will
15 be illustrated in detail in conjunction with the description of one preferred embodiment of the invention based on the Figures, in which:

Figure 1: shows an illustration of the entire door leaf
20 with the closing device,

Figure 2: shows a detailed view of a carrier module with the cover being removed,

25 Figure 3: shows a perspective illustration of a spring-damper element.

Figure 1 illustrates the lower part of the inventive sliding door, which consists of a door leaf 1, including a non-illustrated carriage, and is guided to be displaceable in a roller rail profile at a wall 4 or at a ceiling. The door leaf 1
5 may consist of glass, wood or another optional material. Near a lower ground level area of the door leaf 1, the closing device is attached to the door leaf by means of a profile 2. This may be realized via bonding, clamping or by means of a screw connection. In this case, the closing
10 device comprises at least one carrier module 10, 10a at which or in which at least one spring-damper element 20 is disposed. One or two tracks 3, which accommodate one or two carrier modules 10, 10a, are disposed at the profile 2. In this embodiment, two carrier modules 10, 10a are
15 inserted between two tracks 3 and attached by means of non-illustrated fastening means. Respectively one or two spring-damper elements 20 are disposed within the carrier modules 10, 10a. The disposition of the one or more carrier modules 10, 10a at or within a track 3 allows for variably
20 positioning the spring-damper elements 20 at the door leaf 1, in that the closing position and the damping can be adjusted by horizontally displacing the carrier modules 10, 10a at or within the track 3. Each carrier module 10, 10a has a reception 11, 11a, which may be configured box-
25 shaped and in which or at which one or two spring-damper elements 20 may be disposed. Each reception 11, 11a is

closed off by means of a cover 12, 12a, which has an elongate slot 13, 13a in the direction of movement of the door leaf 1. One end of a reversing lever 6, 6a is connected to the spring-damper element 20 by means of a coupling member 8, 8a. In this case, the connection or attachment of the reversing lever 6, 6a to the coupling member 8, 8a passes through the slot 13, 13a of the cover 12, 12a such that, in this embodiment, the reversing lever 6, 6a is disposed outside the reception 11, 11a. At another end, the reversing lever 6, 6a has a latching nose 7, 7a, which cooperates with a release 5. On the rear side, in the area of the latching nose 7, 7a, the reversing lever 6, 6a has a non-illustrated nose, bolt or guide, which is guided within the slot 13, 13a.

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The carrier module 10 assists in and dampens the closing operation of the door leaf 1, wherein the spring 21 is compressed by the opening movement. If the door leaf 1 is moved into the opening direction (direction of arrow in Figure 1), initially the release 5 and the latching nose 7 of the reversing lever 6 are connected to each other. This movement compresses the spring 21 of the spring-damper element 20, because the reversing lever 6 is articulately connected to the coupling member 8. Once the spring 21 is compressed by the movement of the door leaf 1, the reversing lever 6 is separated from the release 5. This

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separation is effected by an upwards movement of the reversing lever 6, which is generated by a non-illustrated nose, bolt or guide in a guide contour of a guide, coulisse or within the slot 13.

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If the door is moved in the closing direction (opposite to the direction of the arrow in Figure 1), the latching nose 7 of the reversing lever 6 latches in the release 5 and – depending on the speed of the movement of the door – the
10 deceleration of the door is realized by the damper 22. The spring 21 relaxes at the same time and thereby pushes the door leaf 1 into the terminal position of the closed position.

If the closing device is equipped with a second carrier
15 module 10a, the above described operation takes place in the reversed order. In this case, the spring 21 is compressed by the closing operation and moves the door leaf 1 into the terminal position of the open position, wherein the damper 22 decelerates the door leaf 1 at the
20 same time. For this purpose, the spring-damper element 20 of the carrier module 10a is disposed to be counter-directional to the spring-damper element 20 of the carrier module 10.

Depending on the weight of the door leaf 1, up to two spring-damper elements 20 may be disposed in each carrier module 10, 10a.

- 5 In Figure 3, a spring-damper element 20 is illustrated, which includes a spring 21, a damper 22 and a catch 23. Usually a compression spring is utilized as the spring 21, which takes a non-illustrated piston rod, which protrudes from the damper 22, into a maximum extended position, in
10 which the spring 21 is relaxed. The spring 21 is maintained in a compressed position, in a so-called parking position, until – by displacing the door leaf 1 – the spring 1 is released and relaxes. When relaxing the spring 21 pushes, respectively accelerates the door leaf 1 into an open or
15 closed position. The acceleration force acts against a deceleration force of the damper 22, which slows the door leaf 1 down, and thus the door leaf moves silently and shock-free into an open or closed position.
- 20 The damper 22 may be configured as a pneumatic or hydraulic damper, which has a piston, which is disposed at a piston rod and is displaceably disposed within a cylinder. In this case, the damping action may be achieved in an upper and/or lower terminal position of the piston, in that a
25 liquid or gaseous medium is compressed and/or displaced by the piston.

In order to achieve a closing function and a damping function in both directions of movement of the door leaf 1, the spring-damper elements 20 are disposed to be counter-directional in or at the carrier modules 10, 10a. A distinct
5 release 5 is stationarily disposed near the floor for each spring-damper element 20.

Disposing the closing device on the door leaf 1 allows for retrofitting existing sliding doors without having to install
10 new profiles, which otherwise would result in touching up or renovating the ceiling or wall cladding. In comparison to known stationary closing devices, which are disposed in the wall profile or ceiling profile or in depressions of the floor, the inventive closing device moves along with the
15 door leaf 1. The profile 2 may be kept in stock by the meter and cut according to the width of the door leaf 1. The carrier modules 10, 10a are kept pre-mounted in the warehouse and corresponding to the function (damping for opening or closing) they are installed fast. Another
20 advantage of the invention is that the above described closing device does not have to absorb any static loads resulting from the weight of the leaves. Only the briefly occurring acceleration and deceleration forces need to be absorbed.

List of reference numerals

	1	door leaf
	2	profile
5	3	track
	4	wall
	5	release
	6, 6a	reversing lever
	7, 7a	latching nose
10	8, 8a	coupling member
	10, 10a	carrier module
	11, 11a	reception
	12, 12a	cover
15	13, 13a	slot
	20	spring-damper element
	21	spring
	22, 22a	damper
20	23	catch

Patent claims

1. A sliding door with a door leaf (1), which is suspended from at least one carriage and is guided to be displaceable along a roller rail profile, which is disposed at a wall (4) or at a ceiling, the sliding door having a closing device, which is suitable to displace the door leaf into the closed position in a decelerated manner,
characterized in that the closing device includes at least one spring-damper element (20) which, by means of a carrier module (10), is disposed near a ground level area at the door leaf.
2. A sliding door according to claim 1, **characterized in that** the closing device includes a second carrier module (10a) with another spring-damper element (20), which is suitable to displace the door leaf (1) into an open position in a decelerated manner.
3. A sliding door according to claim 1 or 2, **characterized in that** the carrier module (10, 10a) includes a reversing lever (6, 6a), the latching nose (7, 7a) thereof cooperating with a release.

4. A sliding door according to claim 3, **characterized in that** the reversing lever (6, 6a) cooperates with the spring-damper element (20) via a coupling member (8, 8a).
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5. A sliding door according to claim 1, **characterized in that** the at least one carrier module (10, 10a) is disposed at the door leaf (1) via a profile (2).
- 10 6. A sliding door according to claim 4, **characterized in that** the profile (2) is attached to the door leaf (1) by bonding, screwing or clamping.
- 15 7. A sliding door according to claim 4, **characterized in that** the profile (2) includes at least one track (3), which allows for a variable horizontal disposition of the carrier module (10, 10a).
- 20 8. A sliding door according to claim 1, **characterized in that** the carrier module (10, 10a) includes a reception (11, 11a) at or in which the spring-damper elements (20) are disposed.