

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 final 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 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 door; whereby, on the one hand, a risk of injury is given
5 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
10 which a closing device achieves a displacement into a terminal position and simultaneously a damping effect for both, the opening operation and the closing operation. In this case, the closing device should be as compact as possible, and should be retrofittable to existing sliding
15 doors.

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

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The invention is characterized in that the closing device is disposed at the door leaf and includes a first and a second spring-damper element, which are disposed to be counter-directional to each other, wherein the second spring-damper element is adapted to displace the door leaf into
25 the open position in a decelerated manner. The disposition

of the closing device at the door leaf results in the closing device moving along with the door leaf and being able to be disposed within the profiles. Thus, a visually appealing and compact solution can be achieved, in which the closing device is not visible for the user of the sliding door. Utilizing a second spring-damper element allows for displacing the door leaf, in a decelerated manner, into both the open position and the closed position.

10 An advantageous embodiment of the invention is achieved, if the first and the second spring-damper elements are disposed on a carrying body. A modular set is thereby created, which allows for a quick installation with new sliding doors and for retrofitting with existing sliding doors.

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Another improvement is achieved in that the door leaf has a cut-out in which the closing device is disposed. This allows for a compact arrangement of the closing device at the door leaf, wherein the closing device is covered by the existing profiles such that retrofitting existing sliding doors is possible without having to exchange the profiles.

25 Disposing the closing device between two carriages of a sliding door allows for utilizing the closing device for narrow and for wide sliding doors. In this case, the cut-out is always located in the centre of the door leaf and,

depending on the door width and the opening width, the carriages are moved to the outside towards the border of the door leaf.

- 5 In a preferred embodiment, the carrying body has at least one reception for being attached to the door leaf such as to be able to mount the closing device to the door leaf at minimum installation expense.
- 10 A U-shaped or fork-shaped configuration of the receptions allows for hanging it into the cut-out in the door leaf such as to facilitate a very quick and simple installation and fastening by means of two clamping screws for example.
- 15 Each spring-damper element has a catch, which cooperates with an associated release which are disposed in the guiding profile. The closing-damping function can be thus adjusted separately and independently from each other for both the open position and the closed position. An
20 individual adjustment is likewise achieved in that the releases can be shifted within the guiding profile in displacement direction of the door leaf.

In order to allow for clearly distinct the adjustment of the
25 closing device for the open position and the closed position, the catches are disposed to be offset in height.

Another advantageous solution is achieved in that at least one limit stop, which cooperates with a carriage, is disposed in the roller rail profile. Here again, a solution for an impact protection is made possible, which is invisible for a user of a sliding door.

Hereinafter, further measures enhancing the invention will be illustrated in more 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 with the closing device,

Figure 2: shows a perspective illustration of the closing device,

Figure 3: shows a lateral sectional illustration through the roller rail profile, with a view on a carriage.

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The inventive sliding door, which consists of a door leaf 1 with a carriage 20, 20a and a closing device 30, is illustrated in Figure 1. A guiding profile 3 with a roller rail profile 4, at which the door leaf 1 is guided to be displaceable by means of carriages 20, 20a, is attached to a wall 5 or a ceiling. The door leaf 1 may consist of glass,

wood or another optional material. The one or more carriages 20, 20a essentially consist of a carrier 22, 22a, at which the carrying rollers 21, 21a are disposed, which roll on a non-illustrated running path of the roller rail profile 4.

5 The door leaf 1 is attached to the carrier 22, 22a by means of a clamping device or an attachment device. A closing device 30, which is likewise attached to the door leaf 1, is disposed between the carriages 20, 20a. The door leaf 1 has a cut-out 2 for this purpose, into which the closing

10 device 30 is recessed. Without the cut-out 2, the closing device 30 would have to be disposed above or next to the door leaf 1 in the area of the guiding profile 3 and roller rail profile 4, whereby the height and/or depth of the profiles would have to be dimensioned larger. Disposing the

15 closing device 30 in a cut-out 2 of the door leaf 1 allows for retrofitting existing sliding doors without having to install new profiles, which otherwise would result very often in having to touch up or to renovate the ceiling or wall cladding. In comparison to known stationary closing

20 devices, which are disposed in wall profiles or ceiling profiles or in depressions of the floor, the inventive closing device 30 moves along with the door leaf 1.

It can be seen in Figure 2 that the closing device 30

25 comprises a carrying body 31, at which a first and a second spring-damper element 33, 37 are disposed. Each spring-

damper element 33, 37 has a spring 34, 38, a damper 35, 39 and a catch 36, 40. Usually a compression spring is utilized as the spring 34, 38, which brings a non-illustrated piston rod, projecting from the damper 35, 39, into a maximum extended position, in which the spring 34, 38 is relaxed. In a compressed position, the spring 34, 38 is maintained in a so-called parking position, until – by displacing the door leaf 1 – a release 6, which is stationarily disposed in the guiding profile 3, actuates the catch 36, 40 and thus releases and relaxes the spring 34, 38. When the spring 34, 38 relaxes, it pushes, respectively accelerates the door leaf 1 into an open or closed position. Against the acceleration force acts a deceleration force of the damper 35, 39, which slows the door leaf 1 down, and thus the door leaf moves silently and shock-free into an open or a closed position.

The damper 35, 39 may be configured as a pneumatic or hydraulic damper, which has a piston, which is disposed at a piston rod and is movably 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 liquid or gaseous medium is compressed and/or displaced by the piston.

In order to achieve a closing and damping function in both directions of movement of the door leaf 1, two spring-damper elements 33, 37 are disposed to be counter-directional on the carrying body 31. A separate release 6 is
5 stationarily disposed in the guiding profile 3 for each spring-damper element 33, 37. In this case, the releases 6 are disposed to be offset in height in the guiding profile 3, in order to exclude malfunctioning. It can be seen in Figure 2 that the two catches 36, 40 are likewise disposed to be
10 offset in height on one side of the closing device 30.

Respectively one limit stop 7, against which the carriages 20, 20a abut, is disposed for the open position, respectively the closed position in each roller rail profile 4, in order to
15 prevent the door leaf 1 from impacting against a wall or against a stationary lateral panel.

At each end, the carrying body 31 has a reception 32 by means of which the carrying body 31 is fastened to the
20 door leaf 1. In this embodiment, the receptions 31 are configured to be U-shaped or fork-shaped such that the closing device 30 can be recessed in the cut-out 2 of the door leaf 1 and be clamped to the door leaf 1 by means of non-illustrated fastening means.

In Figure 3, a lateral sectional illustration through the roller rail profile 4 is shown, which allows for a frontal view on a carriage 20. The door leaf 1 is clamped in between the carrier 22 of the carriage 20 and, via the carrying rollers 21, transmits the weight of the door leaf via the roller rail profile 4 onto the guiding profile 3 and into the wall 5. A release 6, which cooperates with a catch (36 or 40) of the first or second spring-damper element 33, 37, is disposed in the guiding profile 3. At least one limit stop 7 is adjustably disposed in the roller rail profile 4. This illustration shows the compact arrangement of the closing device 30, which is disposed in alignment between the two carriages 20, 20a. This compact arrangement is exclusively made possible by the cut-out 2 in the door leaf 1, because otherwise the guiding profile 3 and the roller rail profile 4 would have to be considerably larger or else the closing device 30 would have to be disposed in a visible area.

List of reference numerals

	1	door leaf
	2	cut-out
5	3	guiding profile
	4	roller rail profile
	5	wall
	6	release
	7	limit stop
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	20, 20a	carriages
	21, 21a	carrying rollers
	22, 22a	carrier
15	30	closing device
	31	carrying body
	32	reception
	33	first spring-damper element
	34	spring
20	35	damper
	36	catch
	37	second spring-damper element
	38	spring
	39	damper
25	40	catch

Patent claims

1. A sliding door with a door leaf (1), which is suspended from at least one carriage (20, 20a) and is guided to be displaceable along a roller rail profile (4), which is disposed at a wall (5) or at a ceiling, wherein the sliding door includes a closing device (30), which is suitable to displace the door leaf (1) into a closed position in a decelerated manner, **characterized in that** the closing device (30) is disposed at the door leaf (1), and includes a first and a second spring-damper element (33, 37), which are disposed to be counter-directional to each other, wherein the first spring-damper element (33) is suitable to displace the door leaf (1) into the closed position in a decelerated manner, and the second spring-damper element (37) is suitable to displace the door leaf (1) into an open position in a decelerated manner.
2. A sliding door according to claim 1, **characterized in that** the first and the second spring-damper elements (33, 37) are disposed on a carrying body (31).

3. A sliding door according to claim 1, **characterized in that** the door leaf (1) has a cut-out (2) in which the closing device (30) is disposed.
- 5 4. A sliding door according to claim 1, **characterized in that** the door leaf (1) is suspended from two carriages (20, 20a) between which the closing device (30) is disposed.
- 10 5. A sliding door according to claim 2, **characterized in that** at least one reception (32) is disposed at the carrying body (31) for attachment to the door leaf (1).
- 15 6. A sliding door according to claim 1, **characterized in that** the reception (32) is configured to be U-shaped or fork-shaped.
- 20 7. A sliding door according to claim 1, **characterized in that** each spring-damper element (33, 37) has a catch (36, 40), which cooperates with an associated release (6), which is disposed in the guiding profile (3).
- 25 8. A sliding door according to claim 7, **characterized in that** the releases (6) are shiftable within the

guiding profile (3) in the direction of movement of the door leaf (1).

- 5 9. A sliding door according to claim 7, **characterized in that** the catches (36, 40) are disposed to be offset in height.
- 10 10. A sliding door according to claim 1, **characterized in that** at least one limit stop (7), which cooperates with a carriage (20 or 20a), is disposed in the roller rail profile (4).