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Description

The invention refers to a sliding door, in particular a glass sliding door, with a door leaf having a running device that is guided in a runner rail, a limiting device limiting the path of the door leaf, a damper with a soft-closing function, and coupling part interlocking with a gripper part of the damper, wherein, upon closing the door, the damper first slows down the door leaf and then drives the same in to the closed position.

It is known to provide sliding doors with a damper that slows down the closing movement before the end stop is reached so that a hard impact of the door leaf on the end stop is avoided. The damper absorbs the kinetic energy of the door leaf during the closing movement of the sliding door. However, such a damper does not guarantee that the door leaf reaches its exact closed position and remains there. It could happen that, when bumping against an end stop, the door leaf moves back again. Further, dampers are known which are additionally equipped with a spring pulling the gripper part of the damper toward the damper housing. With such a damper, which can be fixed both on the door leaf and the runner rail or the frame, it is achieved that the engagement of a coupling part at the gripper part of the damper triggers the damper. If the velocity of the door leaf is high, it is slowed down by the damping function of the damper. Thereafter, the tension force of the spring in the damper prevails. The same causes the door leaf to be smoothly driven into its end position against the damping force.

A general problem with sliding doors is the mutual adaptation of those components that are connected with the runner rail, i.e. the stationary components, and those components that are connected with the door leaf. Great care has to be taken upon assembly, so as to achieve that, with a cam-controlled damper, the closed position of the door leaf is reached exactly, which requires an accurate matching of the positions of the gripper part and the coupling part. If these positions are not observed exactly when the sliding door is assembled, posterior adjustment is very troublesome and sometimes impossible.

In DE 20 2007 014 567 U1 a damping and retracting device for sliding doors is described, wherein the damper is provided at the stationary runner rail while a coupler is mounted to the movable door carriage of a sliding door. The coupler has a short horizontal rigid arm which, when the sliding door is moved, interengages with the gripper part of the damper. The damper is coupled with a transmission element in the form of an elongate rod whose plane extends in parallel with the plane of the door.

EP 1426 535 A2 describes a damping and retracting device for sliding doors, wherein the damper is mounted to the stationary runner rail, while an actuating element or coupler is situated at a fitting of the movable sliding door. The coupler is a horizontally projecting arm having a rounded end engaging into a recess in a gripper part of the damper so that the same is tilted about its axis.

It is an object of the present invention to provide a sliding door of simplified assembly or installation, wherein erroneous matching is virtually impossible.

The sliding door of the present invention is defined in claim 1.

According to the invention, the limiting device that forms an end stop is combined into a structural unit with the coupler that causes the triggering of the damper during the sliding movement, the structural unit being adapted for being mounted to the runner rail in its entirety. Thereby, the positions of the end stop and the coupling part or the gripper part are defined with respect to each other and are fixed so that faulty bores or other erroneous mounting cannot lead to errors or inaccuracies. When being mounted or prepared, the structural unit is fixed only to the runner rail. The structural unit bridges the distance from its position of mounting to the triggering point. The triggering point is the point at which the coupling part acts on the gripper part of the damper to release the same from its locked position. The triggering operation first starts the damping operation, whereafter the door leaf is pushed towards the end stop.

According to the invention, the arm extending in parallel with the runner rail is a flat arm which may be formed, for instance, by a strip of sheet metal and whose plane runs in parallel with the plane of the door leaf. The free end of the arm is provided with the coupling part which is a nose directed towards the door leaf and projecting sideways from the arm. The coupling part is stationary in its vertical position. The damper with the gripper part is fastened to the door leaf. After installation, the door leaf generally is adjusted in height to align the edges of the door leaf in parallel with the floor and the door frame. The coupling part, preferably the nose projecting sideways, is significantly bigger in the vertical direction than the gripper part of the damper, so that coupling will be effected safely irrespective of the mounting height of the door leaf or the gripper part. It is not necessary to adjust the vertical position of the coupling part or the gripper part.

According to a preferred embodiment, the arm is prestressed such that the coupling part is pushed away from the door leaf and that a cover attached in front of the runner rail forms a support for the free end portion of the arm for a defined positioning of the coupling part. The arm is resiliently flexible in a horizontal plane and it is bent outward from the plane of the door leaf, whereas the coupling part protrudes inward. Prestressed in this manner, it abuts against the profile of the cover fixed to the runner rail and forming a front lining. At the same time this lining forms a stop part for positioning the free end of the prestressed arm. Thereby, the lateral position of the coupling part, when in its waiting position, is defined and it is guaranteed that the gripper part of the damper meets the coupling part in a manner adequate to its function in order to trigger the damper.

The structural unit may be mounted to a profile rail forming the runner rail or being connected thereto. It is also possible to mount the structural unit in a displaceable (and lockable) manner.

In a preferred embodiment of the invention, the coupling part is a nose projecting sideways from the arm and lockingly engaging a recess in the gripper part of the damper. As an alternative, it is possible to provide a recess in the arm and a corresponding nose at the damper.

According to preferred embodiment of the invention, the structural unit can optionally be mounted on the right end side or the left end side, so as to cooperate with a right end side or a left end side damper of the door leaf. This is advantageous in that a single structural unit is adapted to be selectively mounted either on the right or the left of the runner rail. To achieve this, the structural unit should be designed such that it is pivotable by 180° about the limiting device and in parallel with the plane of the door leaf, and such that it can be fastened in both positions using the same fastening elements such as holes and screws without requiring any working on the material.

The sliding door of the invention is particularly, yet not exclusively, suited as a glass sliding door. The running device is part of an upper metal holder of the glass door leaf. Thus, it is particularly advantageous, if the structural unit as a whole can be mounted in a simple manner in the correct mutual relationship of the components.

The following is a detailed description of an embodiment of the invention with reference to the drawings.

In the Figures:

Figure 1 is a front view of a sliding door,

Figure 2 is a top plan view on the sliding door fitting at the moment of triggering of the damper, and

Figure 3 is a schematic illustration of the damper with withdrawal function.

Referring to Figure 1, a runner rail 10 is provided which is mounted horizontally to a door opening and guides a door carriage 11 to which the door leaf 12 is mounted in a depending manner. In the embodiment illustrated the door carriage 11 is provided with two running devices 13 of which only one is visible. The running

device 13 comprises runners 14 guided in the runner rail 10 where they roll in a frictionless manner.

At each of the two ends, the door carriage 11 is provided with a buffer stop 16 that bumps against a limiting device 15 at the end of the displacement path of the door carriage. The limiting device 15 is fastened to the runner rail 10, preferably in a displaceable and lockable manner.

The door carriage 11 comprises one or two dampers 20. Figure 3 schematically illustrates such a damper. The damper has a cylinder 21 in which a non-illustrated piston is arranged for displacement. A piston rod 22 extends from the cylinder, at the end of which a slide 23 is fastened. A spring 24 engages the slide 23, which spring is connected to the opposite end of the cylinder 21. Thus, the spring 24 tends to pull the piston rod 22 into the cylinder 21. The slide 23 is guided in a rail 25. The latter has a cam contour 26 with a locking position in which the slide can engage the rail. In the position illustrated in Figure 3, the slide 23 is locked at the front end position. The slide 23 forms a gripper part 17 of the damper 20. The latter has a recess 29 between two protrusions 28.

If the slide 23 is pivoted clockwise, as in Fig. 3, by pressing against the protrusion 28 from the recess 29, the slide 23 slides into a triggering position in which is freely displaceable along the rail 25 until it snaps into the recess 29.

As illustrated in Figures 1 and 2, the damper is fixed to the door carriage 11 such that it is accessible from the front side of the sliding door. The front side of the sliding door is provided with another coupler 30 or trigger. The same has an elongated flat arm 31 connected at one end with the limiting device 15 and carrying a transversely projecting nose 32 at the other end. The arm 31 is a flat sheet metal strip which is elastic and functions as a flexible spring. The plane of the flat arm 31 is generally parallel to the plane of the door leaf 12, i.e. vertical. In the top plan view of Fig. 2, the arm 31 is bent slightly outward (downward in the drawing) and abuts against a (non-illustrated) cover forming a front lining that covers both the runner rail 10 and the running device 13. This cover serves as a

stop element for positioning the nose 32 so that the same is reliably hit by the second protrusion 28. Making the coupling part of the arm 31 and the gripper part 17 of the damper meet does not require any vertical adjustment of these elements and in particular requires no vertical adjustment of the door leaf 12. Conversely, a vertical adjustment of the door leaf likewise requires no vertical adjustment of those components.

The nose 32 cooperates with the recess 29 of the gripper part 17. Figure 2 illustrates the engagement of the nose 32 into the recess 29. Further, it can be seen that the coupler 30 forms a structural unit 35 with the limiting device 15, which is mounted as a whole at a suitable position on the runner rail 10, using screws 36, for instance. Thus, a defined distance is guaranteed between the stop surface 37 of the limiting device and the nose 32 of the coupler 30.

The front side of the sliding door fitting, directed downward in Figure 2, is covered with a (non-illustrated) cover that hides the coupler 30 and the door carriage 11.

It shall be assumed that the door carriage is moved manually at a considerable speed from the right to the left, as illustrated in Figures 1 and 2. The damper is in the state illustrated in Figure 3 in which the gripper part 17 is advanced, whereas its slide 23 is in a slightly oblique position. The first protrusion 28 passes the nose 32 of the coupler 30. Yet, the nose 32 bumps against the more prominent protrusion 28 (Figure 2), whereby the gripper part 17 is displaced on the cam contour 26 so that it can move along the rail 25. Due to the high speed of the door carriage, the damper 20, which is a fluid damper, causes a deceleration of the door way proportionate to the speed. At the same time, the spring 24 exerts its effect, pulling the gripper part 17 to the cylinder 21. Thereby, the cylinder 21 fastened to the door carriage is moved to the left, as illustrated in Figure 2. Thus, the spring 24 pulls the door carriage into the closed position in which the buffer 16 bumps against the stop surface 37. In this end position of the door carriage, the spring 24 is in a relatively relaxed state. If the sliding door is opened manually thereafter, the coupler 30 first hold on to the gripper part 17 so that the spring 24 is stressed until the gripper part 17 snaps in at the outer end position (Figure 3).

The invention guarantees that the gripper part 17 is always triggered at the correct position of the displacement path, with the sliding door being guided exactly into its closed position. Should the door leaf still have a residual speed at the end of the damping path, the buffer stop 16 and the stop face 37 will absorb these forces. In the end position of the door leaf, there is a gap between the gripper part 17 of the damper and the nose 32 of the coupling part so that the gripper part is not loaded exceedingly. This overload protection requires an exact positioning of the nose 32, which is also guaranteed by the invention.

Patentkrav

1. Skydedør med en løbeskinne (10), et dørblad (12), der føres derpå med mindst et drivværk (13), en begrænsningsindretning (15), der begrænser dørbladets (12) kørestrækning, en dæmper (20), der er fastgjort på dørbladet (12), med indtrækningsfunktion og en koblingsindretning (30), der er fastgjort på løbeskinnen (10), og som går i låsende indgreb med en gribedel (17) af dæmperen (20), hvor dæmperen først bremser dørbladet (12) ved lukning og derefter driver det ind i den lukkede stilling, hvor

begrænsningsindretningen (15) sammen med koblingsindretningen (30) danner en konstruktionsenhed (35), og koblingsindretningen (30) har en flad arm (31), der strækker sig parallelt med løbeskinnen (10), med en koblingsdel til at gå i indgreb med dæmperens gribedel (17), hvor koblingsdelen er anbragt ved en fri ende af armen (31) og er stationær i højdebeliggenheden,

kendetegnet ved, at

koblingsdelen i den vertikale retning er større end gribedelen (17), således at en pålidelig kobling mellem koblingsdelen og gribedelen (17) fungerer på sikker måde uafhængigt af monteringshøjden af dørbladet (12) eller af gribedelen (17), hvor armens (31) plan forløber parallelt med dørbladets (12) plan.

2. Skydedør ifølge krav 1, **kendetegnet ved, at** den flade arm (31) er en langstrakt arm, hvis plan strækker sig parallelt med dørbladets (12) plan, og koblingsdelen rager ud fra armen (31) på tværs af dørbladets plan og rettet mod dette.

3. Skydedør ifølge krav 1 eller 2, **kendetegnet ved, at** armen (31) er forspændt på en sådan måde, at koblingsdelen presses frem af dørbladet (12), og at en afdækning, der sidder foran armen (31), danner en understøtning for armens (31) frie endeområde til en defineret positionering af koblingsdelen.

4. Skydedør ifølge et af kravene 1 - 3, **kendetegnet ved, at** koblingsdelen er en næse (32), der rager ud fra armen (31), og som går låsende i indgreb i en udsparing (29) af dæmperens (20) gribedel (17).

5. Skydedør ifølge et af kravene 1 - 4, **kendetegnet ved, at** konstruktionsenheden (35) kan monteres valgfrit i højre eller venstre ende på løbeskinnen (10) for at fungere sammen med en dæmper (20) af dørbladet (12) i venstre eller højre ende.

6. Skydedør ifølge et af kravene 1 - 5, **kendetegnet ved, at** dørbladet (12) er en glasskive.

7. Skydedør ifølge et af kravene 1 - 6, **kendetegnet ved, at** konstruktionsenheden (35) kan forskydes i den langsgående retning og låses på løbeskinnen (10).

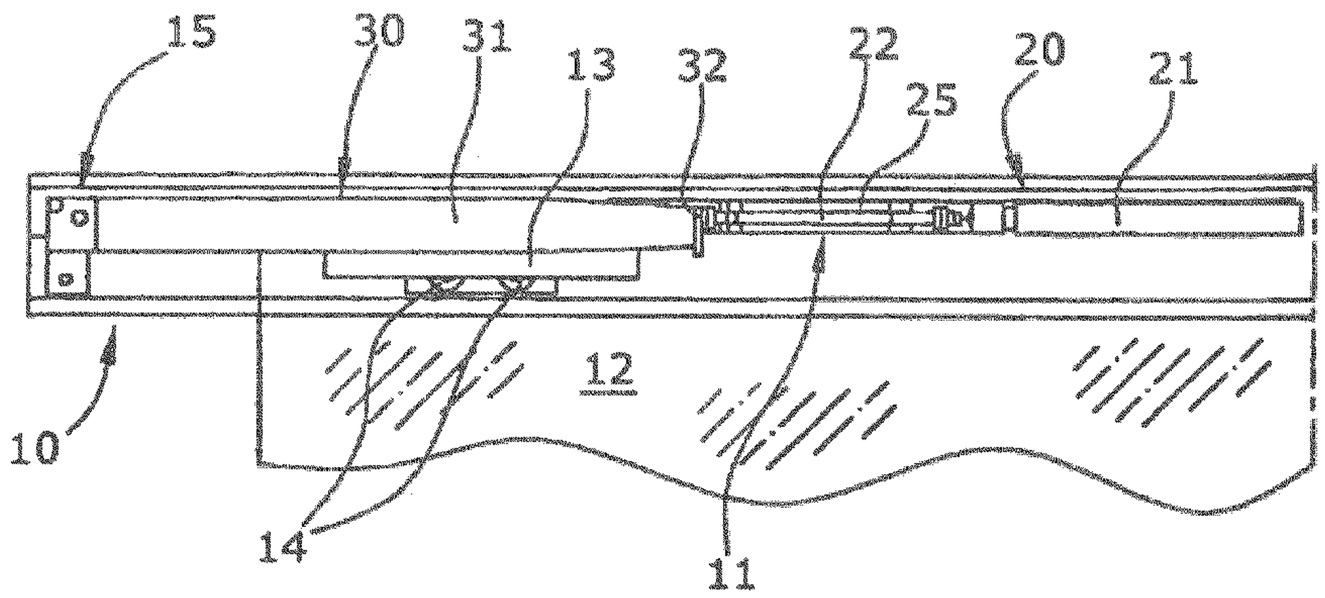


Fig.1

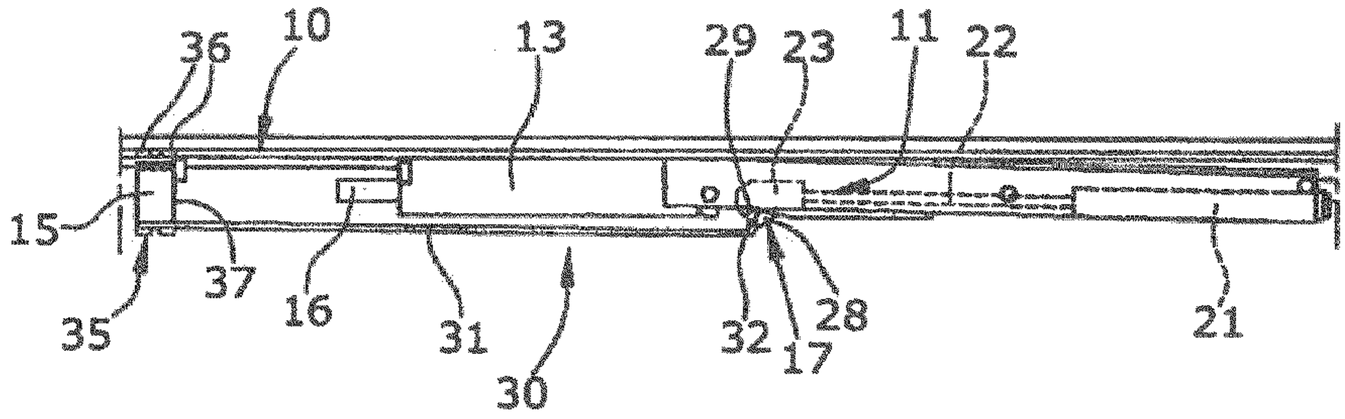


Fig.2

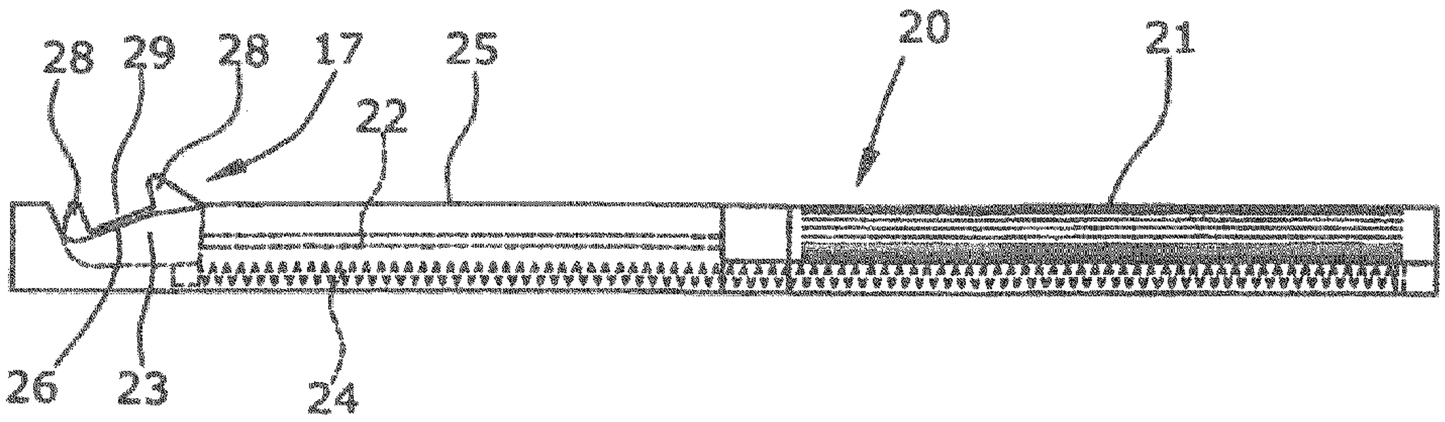


Fig.3