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(54) **Device helping to close sliding doors**

(57) A device helping to close sliding doors, comprising a frame (1) mounted in the inner part of an end of a guiding channel (2a) being finished off by opposing flanges in its ends, which is part of a conventional guide-profile (2) of the assembly of sliding doors (3) and which is inherent in the displacement rail (2b) of the wheels (6) of the sliding door (3), in whose frame (1) a closing damper (4) is installed and a swinging trigger (5) is adapted to engage with a side hook (6a) of the wheel (6) of the sliding door (3), which is forward according to the closing direction, and there is a tension spring (7) having an end attached to the swinging trigger (5) and it is tightened when opening the sliding door; taking into account that the ref-

erence of forward of the device will be understood as the first part the wheel reaches in the advancing direction of the closing of the sliding door, and vice versa. In the device exits a flexible brace (8) having an end attached to the swinging trigger (5) and, in a rear pulley (9), it forms a flat loop along which it extends rearwards in the rear pulley (9), leaves it forwards and it extends out of the frame (1) locating another end being engaged to a removable carriage (10) being susceptible to receive the rear end of an independent tension spring (7) being located out of the frame (1) and having a forward end attached to an outer anchorage (11) being susceptible to be fixed along the guiding channel (2a) selectively.

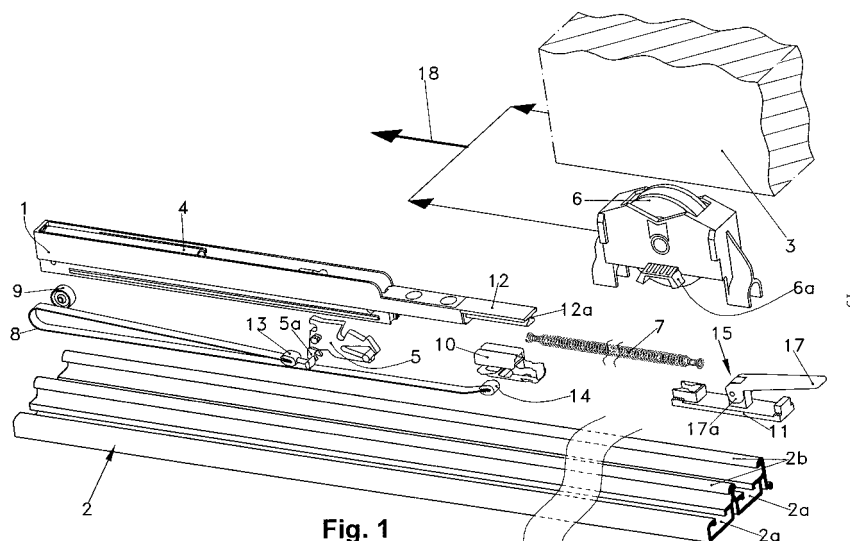


Fig. 1

Description

FIELD OF THE INVENTION

[0001] This invention relates to a device to help to close sliding doors and it is especially useful when they are heavy doors running along upper and lower guide-profiles by means of wheels.

[0002] The operation of this type of devices consists of, by opening the door, the performance of the elastic load of a tension spring and, by closing it, the elastic energy being stored therein is used so that in an end part of the closing travel, the door is engaged by the device and driven forward the end of said travel. To control the driving force of the tension spring and to avoid the door knocking when it reaches the stop of the stroke, it is usual to arrange damping means, such as an oil or gas cylinder.

PRIOR ART

[0003] Devices are known having a general arrangement comprising a frame mounted in the inner part of an end of a guiding channel being finished off by opposing flanges in its ends, which is part of a conventional guide-profile of the assembly of sliding doors and which is inherent in the displacement rail of the wheels of the sliding door, in whose frame a closing damper is installed and a swinging trigger is adapted to engage with a side hook of the wheel of the sliding door which is forward according to the closing direction, and there is a tension spring having an end attached to the swinging trigger and it is tightened when opening the sliding door. Henceforth, the reference of forward of the device will be understood as the first part the wheel reaches in the advancing direction of the closing of the sliding door, and vice versa.

[0004] In this general arrangement, the known designs are of compact type, wherein the tension spring is located in the very frame.

[0005] On the other hand, the manufacturers of sliding doors use manufacturing standards requiring that the device occupies a defined area of the guide-profile and a certain length, and being compatible with the type and position of the wheels in the currently manufactured sliding doors, which entails that the available space in the frame for the tension spring is limited.

[0006] In the force system comprising the damper and the tension spring the elastic energy of the latter is not loaded and unloaded evenly in the whole opening and closing stroke of the sliding door. In the open sliding door position the tension spring is extended as much as possible being allowed by its assembly in the device, accumulating all the possible elastic energy; in the closing travel the release of the energy is more powerful than at the beginning, then it starts to be reduced and it is affected in every moment by the resistance of the damper, which is not even either. In the closed sliding door position the tension spring is withdrawn as much as possible after delivering all the accumulated elastic energy; when start-

ing the opening of the sliding door it is required to perform a smaller effort to start stretching the tension spring and it will be increased as the tension spring is tightened, such effort being bigger when the weight of the sliding door is bigger and it could be lightened if a longer tension spring were used, keeping the rest in the same way.

[0007] When a longer tension spring is necessary due to the weight of the sliding door, it turns out that there is not enough space in the frame because of the constraints of the current manufacturers; which is a restriction to the maximum weight of the sliding door which may be served by the known device helping to close so that it may be used without performing such a big effort that the use is uncomfortable and unwanted.

[0008] An attempt to solve the problem consists of folding the tension spring over itself in a C shape. This allows the tension spring to be housed in the standard length of the frame, although at the expenses of manufacturing a new higher frame, having a more complex assembly and a less reliable operation.

EXPLANATION OF THE INVENTIO AND ITS ADVANTAGES

[0009] The present invention shows a device helping to close sliding doors being applied to a general arrangement as the stated in the first paragraph of the previous epigraph. Particularly, the invention comprises the existence of a flexible brace having an end attached to the swinging trigger and, in a rear pulley, it forms a flat loop along which it extends rearwards in the rear pulley, leaves it forwards and it extends out of the frame locating another end being engaged to a removable carriage being susceptible to receive the rear end of an independent tension spring being located out of the frame and having its forward end attached to an outer anchorage being susceptible to be fixed along the guiding channel selectively.

[0010] This proposed arrangement breaks radically with the presently known, since it gets the tension spring to be an independent element from the frame and to be, and it actually is, out of it; therefore, the frame may continue having the standard measures and occupies the area of the guide-profile having a usual length, while at the same time the tension spring has enough space out of the frame to, without folding over itself, have the required length to be useful for sliding doors being heavier than the ones which can be used with the known devices. It should be highlighted that this is possible because of the functional combination of the pulley and the loop which the flexible brace makes over it.

[0011] Consequently, there is the possibility of using in each case the tension spring having the most convenient length according to the weight of the sliding door, allowing the application of the device to heavier weights than the admitted ones by the presently known and keeping the same conventional frame.

[0012] Further, now it is possible to install the tension spring in such way that it is not completely loosened in

the closed sliding door position, but it may be pre-stressed up to a certain degree favouring a comfortable maneuverability.

[0013] Its building and assembly are simple, its operation is reliable and it is compatible with the frames, guide-profiles and sliding doors in the market.

DRAWINGS AND REFERENCE NUMERALS

[0014] For a better understanding of the nature of the invention, an industrial embodiment being merely illustrative and non limitative exemplary is depicted in the appended drawings.

Figure 1 is a perspective exploded view of a helping device according to the invention.

Figure 2 is a side elevation view of the device of figure 1, shown for the open sliding door position (3) and obviating the guide-profile (2), the sliding door (3) and the wheel (6).

Figure 3 is like figure 2, but without the frame (1).

Figures 4 and 5 are, respectively, like figures 2 and 3, but referred to the closed sliding door position (3).

Figure 6 is the device according to figure 2, depicted as if the frame (1) were transparent, installed in the guide-profile (2) and incorporating a wheel (6) in a fictitious position which, in any case, would correspond to the open sliding door (3).

Figures 7, 8 and 9 are like figure 6, but referred to several illustrative positions of the closing and opening maneuvers of the sliding door (3).

Figure 10 is a side elevation view of the swinging trigger (5) of figure 1.

Figure 11 is the lower floor plan view of figure 10.

Figure 12 is a perspective view of the rear clamp (13).

Figure 13 is a side elevation view of the removable carriage (10).

Figure 14 is the upper floor plan view of figure 13.

Figure 15 is a floor plan view of the outer anchorage (11) comprising a fixing element (15) being quick by means of a lever (17) having an eccentric head (17a).

Figure 16 is a side elevation view of the outer anchorage (11) having the lever (17) in the release position and being installed in the guide-profile (2).

Figure 17 is the outer anchorage (11) of figure 16 having the lever (17) in the tightening position.

Figure 18 is a side elevation view of the outer anchorage (11) in a possible execution, wherein the fixing element (15) consists of a screw.

Figure 19 is the upper floor plan view of figure 18.

Figure 20 shows the device according to figure 2, but installed in the guide-profile (2).

Figure 21 is an enlargement of the section XX-XX.

Figure 22 is an enlargement of the section XXI-XXI.

Figure 23 is an enlargement of the section XXII-XXII being combined with the section of figure 21.

Figure 24 is an enlargement of the section XXIII-XXIII.

[0015] The following references are shown in these figures:

- 1.- Frame
- 2.- Guide-profile
- 2a.- Guiding channel of the guide-profile (2)
- 2b.- Guide-profile (2) rail
- 3.- Sliding door
- 4.- Closing damper
- 5.- Swinging trigger
- 5a.- Lower appendix of the swinging trigger (5).
- 6.- Wheel
- 6a.- Side hook of the wheel (6).
- 7.- Tension spring
- 8.- Flexible brace
- 9.- Rear pulley
- 10.- Removable carriage
- 10a.- Side grooves of the removable carriage (10)
- 10b.- Upper rail of the removable carriage (10)
- 11.- Outer anchorage
- 12.- Forward protuberance
- 12a.- Partition in inverted T shape of the forward protuberance (12)
- 13.- Rear clamp
- 14.- Forward clamp
- 15.- Fixing element
- 16.-Plate
- 17.- Lever
- 17a.- Eccentric head of the lever (17)
- 18.- Advancing direction of the sliding door (3).

EXPLANATION OF A PREFERRED EMBODIMENT

[0016] Regarding the above listed drawings and references, a preferred mode to carry out the object of the invention is illustrated in the attached drawings, referred to a device helping to close sliding doors, of the devices which answer a general arrangement comprising a frame (1) mounted in the inner part of an end of a guiding channel (2a) being finished off by opposing flanges in its ends, which is part of a conventional guide-profile (2) of the assembly of sliding doors (3) and which is inherent in the displacement rail (2b) of the wheels (6) of the sliding door (3), in whose frame (1) a closing damper (4) is installed and a swinging trigger (5) is adapted to engage with a side hook (6a) of the wheel (6) of the sliding door (3) which is forward according to the closing direction, and there is a tension spring (7) having an end attached to the swinging trigger (5) and it is tightened when opening the sliding door (3).

[0017] In the field of said general arrangement, the proposed device comprises (figure 1) the existence in the device of a flexible brace (8) having an end attached to the swinging trigger (5) and, in a rear pulley (9), it forms a flat loop along which it extends rearwards in the rear pulley (9), leaves it forwards and it extends out of the frame (1) locating another end engaged to a removable carriage (10) being susceptible to receive the rear end

of an independent tension spring (7) being located out of the frame (1) and having a forward end attached to an outer anchorage (11) being susceptible to be fixed along the guiding channel (2a) selectively.

[0018] As it might be appreciated, the frame (1) and other elements of the device allow the use of the tension spring (7) of different modules and/or sizes, due to the fact that the tension spring (7) is an independent element being located in the outer part of the frame (7), instead of along the guide-profile (2) which is conveniently chosen by only producing the outer anchorage fixing (11) therein; regarding this, according to the invention, the position of the outer anchorage (11) along the guiding channel (2a) is the function of the length and the tension of the tension spring (8). The above stated can be checked in the figure 1 regarding the possibility of that because of the functional combination of the rear pulley (9) and the kind of loop which the flexible brace makes over it.

[0019] Therefore, on one hand it is achieved to use a frame (1) having the usual measures and to locate it in the guide-profile area (2) used in compatibility to the currently manufactured sliding doors (2) and to the position of the wheel (6) in them; on the other hand, now there is space by far along the guide-profile (2) to locate the tension spring (7) and, therefore, it is possible to choose the suitable length thereof according to the weight of the sliding door (3) to be handled; and on the other hand, it is also possible to pre-stress the tension spring (7) in order to favour its functionality.

[0020] According to a preferred mode of execution, the flexible brace (8) has a band or strip shape. Another mode of execution comprises the flexible brace (8) having a thread shape. As it is seen (figures 1, 10, 11, 12) the rear end of the flexible brace (8) is trapped by means of a rear clamp (13) being articulated with the appendix (5a) according to a turning axis perpendicular to the longitudinal middle plan of the swinging trigger (5); likewise, the forward end of the flexible brace (8) is trapped (figures 1 and 13) by means of a forward clamp (14) incorporated into the removable carriage (10).

[0021] One feature of the invention is that the outer anchorage (11) comprises a fixing element (15) which allows the immobilization of said outer anchorage (11) in the desired point of the guiding channel (2a). In order to perform said immobilization, the outer anchorage (11) has a fixing element (15) being quick by means of a lever (17) being articulated to the body of the outer anchorage (11) by means of an eccentric head (7a). This arrangement allows the fixation of the outer anchorage (11) in an easy and quick way along the guiding channel (2a), so avoiding the use of driving tools such as a screwdriver. Another optional mode of execution (figures 17 and 18) comprises a screw that, through the outer anchorage (11), is screwed in the plate (16) which, between the latter and the anchoring body (11), catch the opposing flanges of the guiding channel (2a).

[0022] According to the invention (figures 3 and 5) the

end of the flexible brace (8) is attached to the swinging trigger (5) in a lower appendix (5a) of the swinging trigger (5), and the end of the flexible brace (8) is attached to the removable carriage (10) in a lower part of the removable carriage (10).

[0023] As it is more clearly detailed by figures 19, 21 and 22, another special feature of the invention is that in the forward end, opposed to the outer anchorage (11), the frame (1) has a forward protuberance (12) extending over the removable carriage (10) when this is in the coherent position with the closed sliding door (3); and, along its lower face, said forward protuberance (12) has a partition (12a) having an inverted T shape; and, at the same time, the removable carriage (10) (figure 14) has in its upper face a rail (10b) having an inverted T shape which is reciprocal to the inverted T partition (12a) of the forward protuberance (12). The purpose of said means is to allow the fastening of the removable carriage (10) to the frame (1) until the moment of performing the installation of the device in the guide-profile (2). In this respect, a mode of execution comprises the forward protuberance (12) being a false element fixed to the frame (1) by screwing (figure 20) or by another known technique.

[0024] For its guiding along the guide-profile (2) the removable carriage (10) (figure 3) has both side grooves (10a) being complementary to the flanges of the guiding channel (2a).

[0025] The operation of the device is illustrated by the figures 6 to 9, all of them having ambivalent meaning. Figure 6 is useful to depict a moment of the closing travel before reaching the swinging trigger (5), or a moment of the opening travel when the swinging trigger (5) has been already left. Figure 7 shows the precise moment when the side hook (6a) of the wheel (6), in the closing travel, has reached the position of the swinging trigger (5), not hooked yet, or the precise moment of the opening travel when the swinging trigger (5) is left. Figure 8 is a little later moment than the one in figure 7 during the closing or opening travels. Figure 9 is similar to the previous one, but showing the rail (10b) of the removable carriage (10) being engaged with the partition (12a) of the forward protuberance (12).

Claims

1. A device helping to close sliding doors, comprising a frame (1) mounted in the inner part of an end of a guiding channel (2a) being finished off by opposing flanges in its ends, which is part of a conventional guide-profile (2) of the assembly of sliding doors (3) and which is inherent in the displacement rail (2b) of the wheels (6) of the sliding door (3), in whose frame (1) a closing damper (4) is installed and a swinging trigger (5) is adapted to engage with a side hook (6a) of the wheel (6) of the sliding door (3) which is forward according to the closing direction, and there is a tension spring (7) having an end attached to the swing-

- ing trigger (5) and it is tightened when opening the sliding door (3); taking into account that the reference of forward of the device will be understood as the first part the wheel (6) reaches in the advancing direction (18) of the closing of the sliding door (3), and vice versa, and **characterized in** the existence in the device of a flexible brace (8) having an end attached to the swinging trigger (5) and, in a rear pulley (9), it forms a flat loop along which it extends rearwards in the rear pulley (9), leaves it forwards and it extends out of the frame (1) locating another end being engaged to a removable carriage (10) being susceptible to receive the rear end of an independent tension spring (7) being located out of the frame (1) and having a forward end attached to an outer anchorage (11) being susceptible to be fixed along the guiding channel (2a) selectively.
2. Device helping to close sliding doors, according to the first claim, **characterized in that** the flexible brace (8) has a band or strip shape.
 3. Device helping to close sliding doors, according to the first claim, **characterized in that** the flexible brace (8) has a thread shape.
 4. Device helping to close sliding doors, according to the previous claims, **characterized in that** it is foreseen that the frame (1) and other elements of the device allow the use of a tension spring (7) of different modules and/or sizes.
 5. Device helping to close sliding doors, according to the previous claims, **characterized in that** it is foreseen that the outer anchorage (11) is provided with a fixing element (15) which allows the immobilization of said outer anchorage (11) in the desired point of the guiding channel (2a).
 6. Device helping to close sliding doors, according to the previous claims, **characterized in that** the end of the flexible brace (8) is attached to the swinging trigger (5) in a lower appendix (5a) of the swinging trigger (5).
 7. Device helping to close sliding doors, according to the previous claims, **characterized in that** the end of the flexible brace (8) is attached to the removable carriage (10) in a lower part of the removable carriage (10).
 8. Device helping to close sliding doors, according to the previous claims, **characterized in that** the position of the outer anchorage (11) along the guiding channel (2a) is a function of the length and tension of the tension spring (8).
 9. Device helping to close sliding doors, according to the previous claims, **characterized in that** in the forward end, opposed to the outer anchorage (11), the frame (1) has a forward protuberance (12) extending over the removable carriage (10) when this is in the coherent position with the closed sliding door (3).
 10. Device helping to close sliding doors, according to claim 9, **characterized in that** along its lower face the forward protuberance (12) has a partition (12a) having an inverted T shape.
 11. Device helping to close sliding doors, according to the previous claims, **characterized in that** the removable carriage (10) has both grooves (10a) being complementary to the flanges of the guiding channel (2a).
 12. Device helping to close sliding doors, according to the previous claims, **characterized in that** the removable carriage (10) has in its upper face a rail (10b) having an inverted T shape which is reciprocal to the inverted T partition (12a) of the forward protuberance (12).
 13. Device helping to close sliding doors, according to the previous claims, **characterized in that** the rear end of the flexible brace (8) is trapped by means of a rear clamp (13) being articulated with the appendix (5a) according to a turning axis perpendicular to the longitudinal middle plan of the swinging trigger (5).
 14. Device helping to close sliding doors, according to the previous claims, **characterized in that** the forward end of the flexible brace (8) is trapped by means of a forward clamp (14) incorporated in the removable carriage (10).
 15. Device helping to close sliding doors, according to the claims 1 to 14, **characterized in that** the outer anchorage (11) has a fixing element (15) being quick by means of a lever (17) being articulated to the body of the outer anchorage (11) by means of an eccentric head (7a).
 16. Device helping to close sliding doors, according to the previous claims 1 to 14, **characterized in that** it is foreseen that the outer anchorage (11) is provided with a fixing element (15) comprising a screw that, through the outer anchorage (11), is screwed in the plate (16) which, between the latter and the anchoring body (11), catch the opposing flanges of the guiding channel (2a).
 17. Device helping to close sliding doors, according to the previous claims, **characterized in that** the forward protuberance (12) is a false element fixed to the frame (1) by screwing or by another known technique.

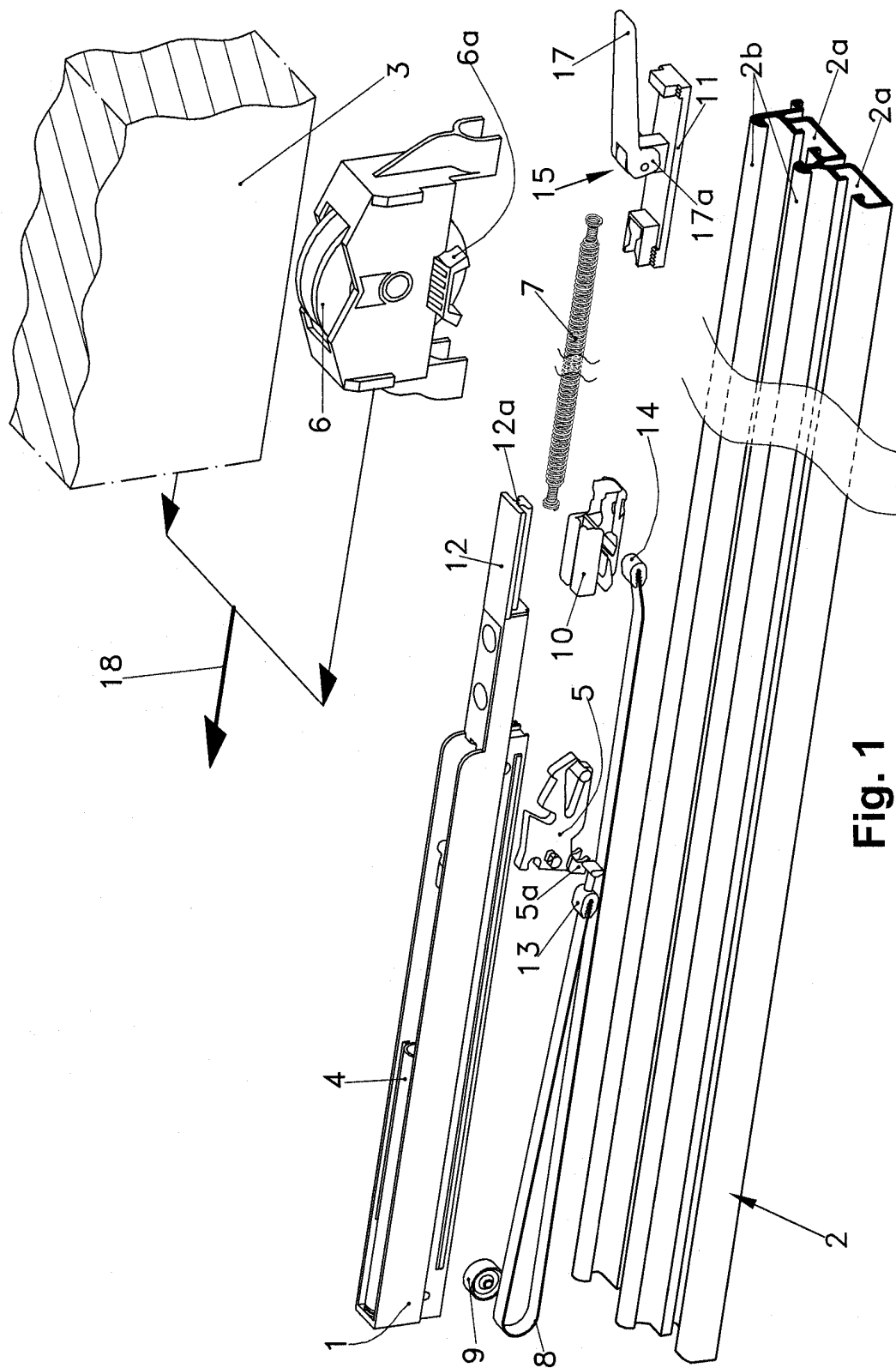


Fig. 1

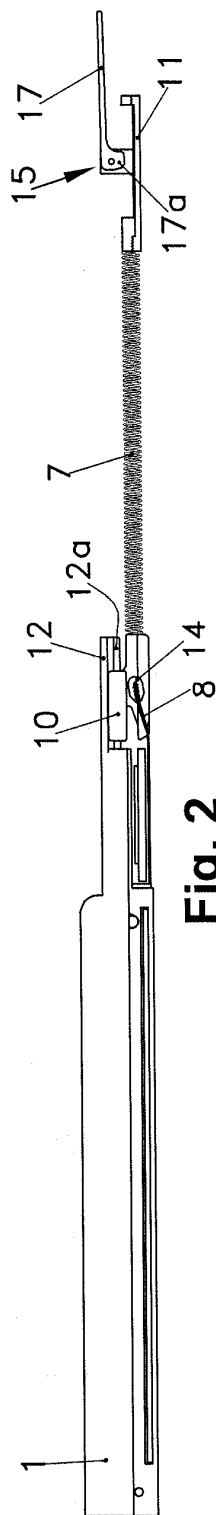


Fig. 2

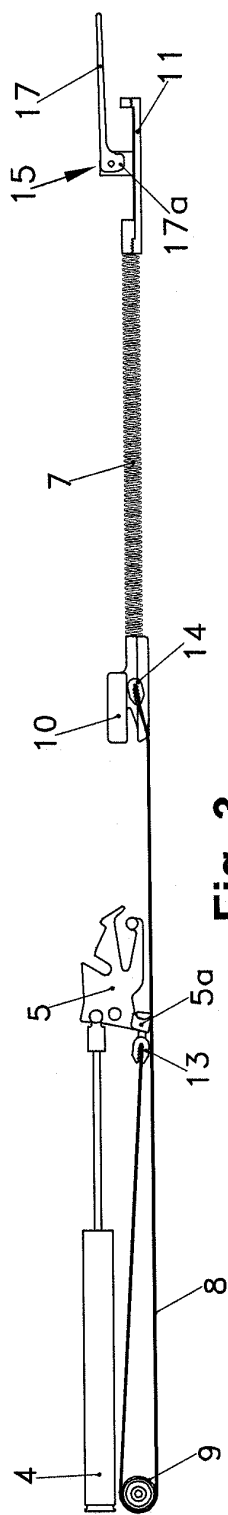


Fig. 3

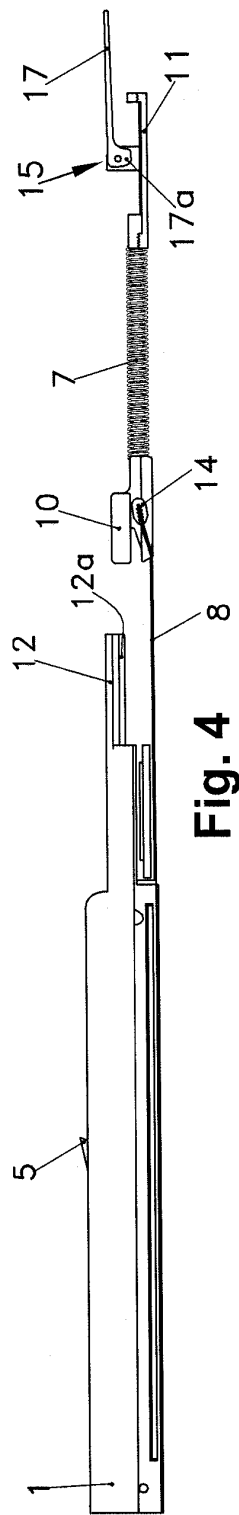


Fig. 4

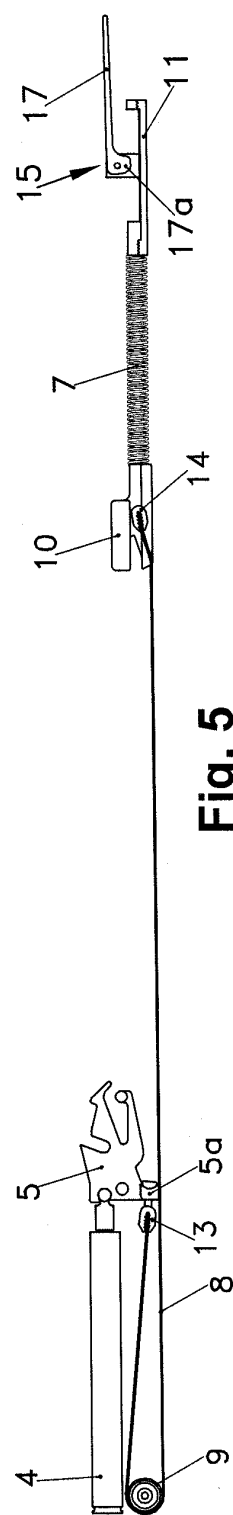


Fig. 5

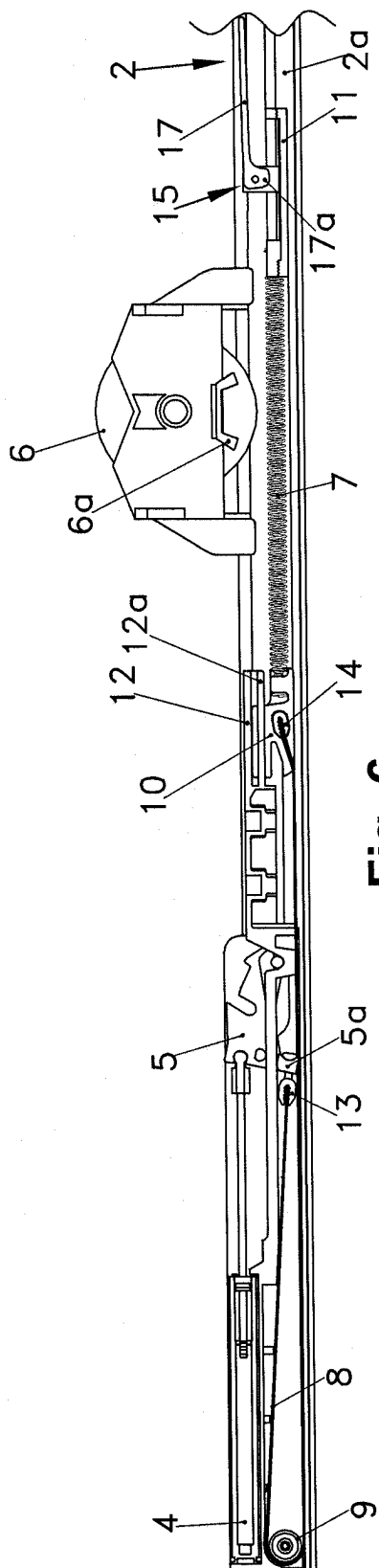


Fig. 6

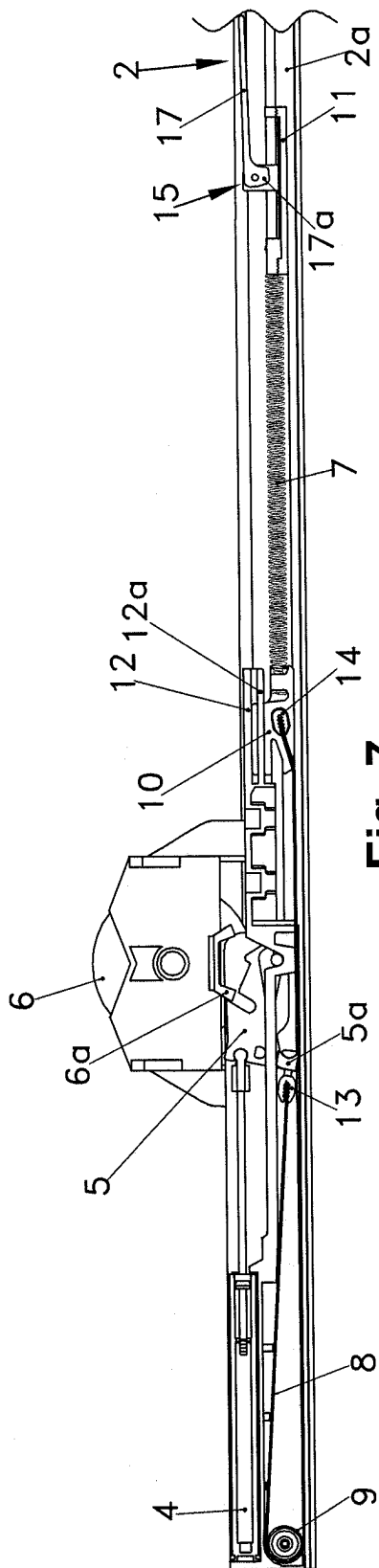
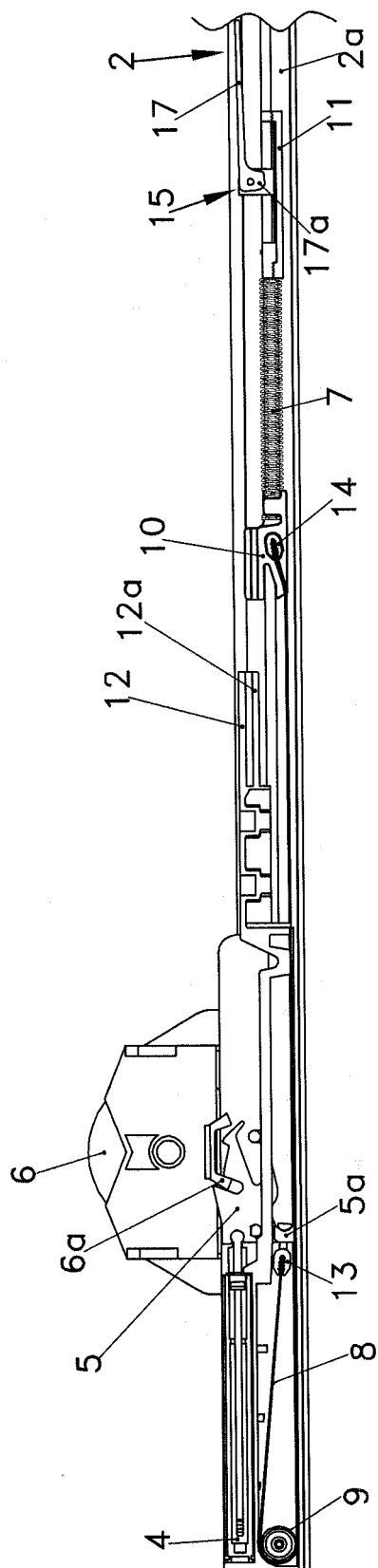
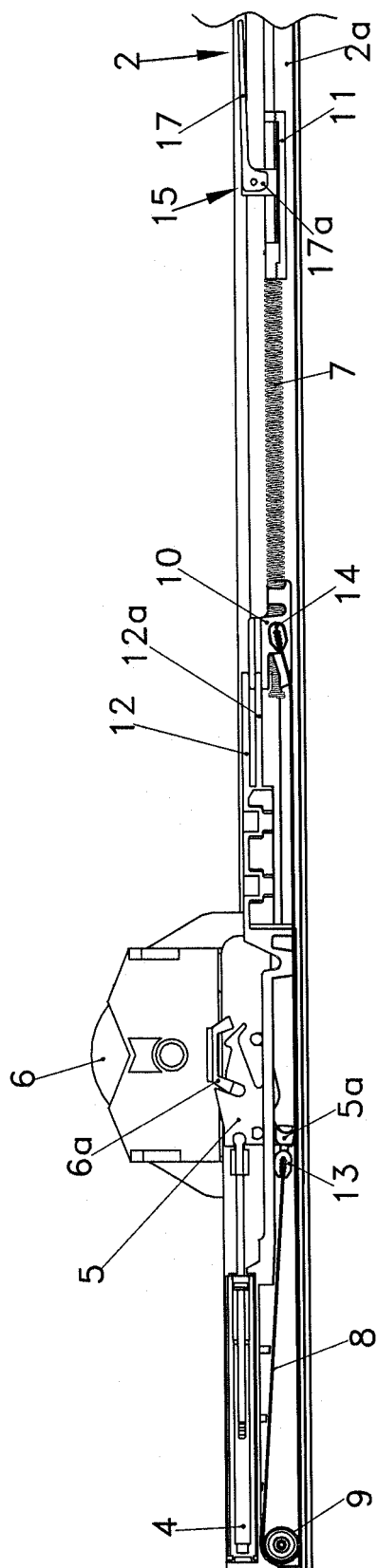


Fig. 7



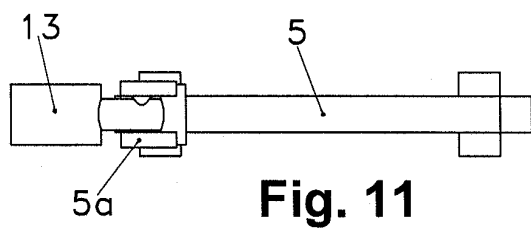


Fig. 11

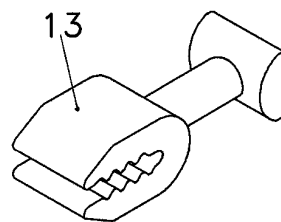


Fig. 12

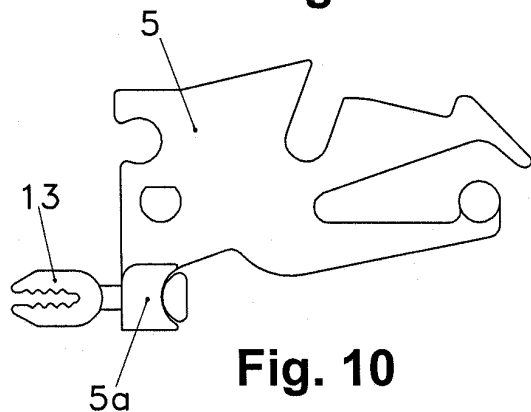


Fig. 10

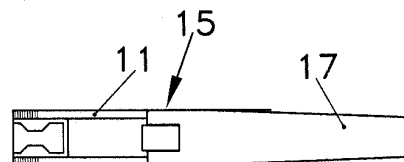


Fig. 15

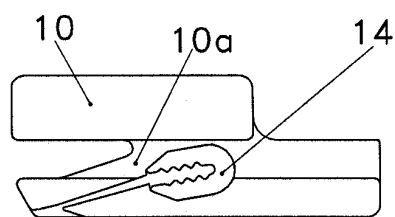


Fig. 13

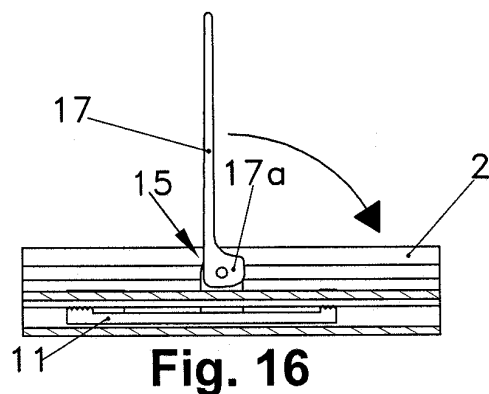


Fig. 16

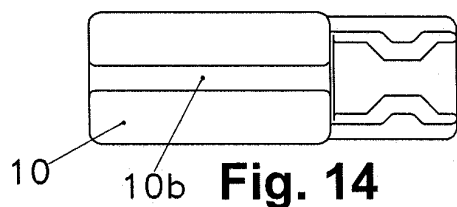


Fig. 14

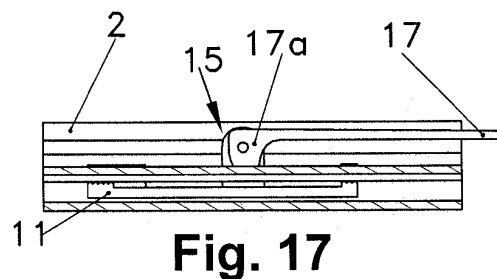


Fig. 17

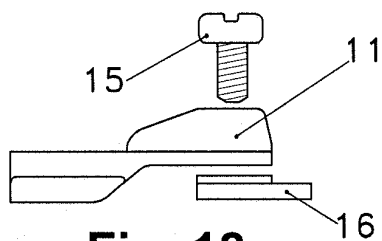


Fig. 18

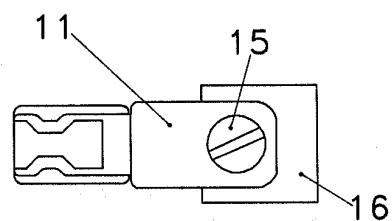


Fig. 19

