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(54) **Shock absorbing stopping device for sliding panels and doors**

(57) A shock absorbing stopping device (10) for sliding panels, combined with metal section bars wherein carriages (68) fixed to said doors slide, comprises a footing or plate-shaped support (12), made of metal or other suitable material and of substantially rectangular shape, wherealong a shock absorbing piston (16) of the silicone, air or equivalent type is arranged in longitudinal direction; said piston interacts with a spring (52) which develops about the piston itself along two opposite sides and a head of the same. At the opposite sides thereof, the spring (52) engages with a pin (46) arranged transversally in a linear slot (28) obtained along a kerb (30) obtained in the central-front side of the support (12), orthogonal to the footing (12).

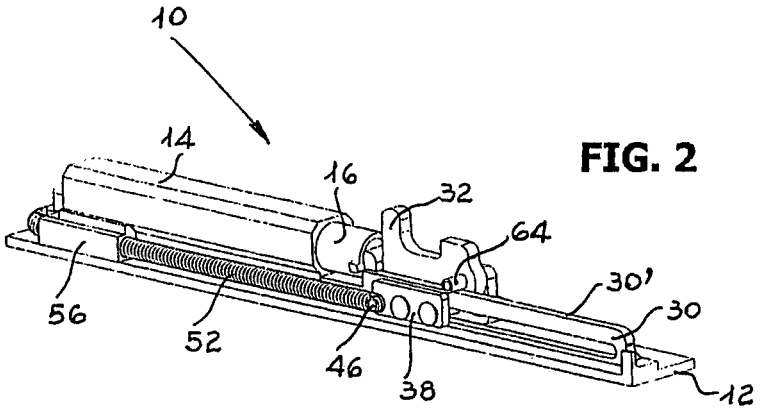


FIG. 2

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## Description

**[0001]** This invention relates to a shock absorbing device for sliding panels and doors.

**[0002]** More in particular, this invention relates to a device as defined above, especially suitable for sliding panels of furniture, doors and closing panels in general.

**[0003]** As is known, especially in the manufacture of furniture, the solution that envisages sliding rather than outwards projecting opening panels is widely used; it is an appreciated type as it limits the overall dimensions of furniture and moreover, for the fact that no hinges that could alter the overall appearance remain visible.

**[0004]** Sliding doors that are used for the partition of rooms are also appreciated for the same reasons and also for the fact that once opened, they can be hidden in spaces created between adjacent walls.

**[0005]** Doors and panels are provided with top and bottom carriages sliding along section bars fixed to the furniture frame during the manual movement for opening or closing.

**[0006]** During these operations it often happens that the user pushes the panels or doors in a too strong manner, with the result that they reach the travel end in opening or closing violently colliding with the vertical abutment stop.

**[0007]** Situations of this type can cause serious drawbacks, since the carriages may exit from the respective guides and get damaged; especially very high furniture panels, thus very heavy, could detach at the top part of the piece of furniture itself, with the risk of falling on the ground or colliding with the opposite wall.

**[0008]** In the attempt to obviate this drawback, travel end stopping devices have been devised for sliding panels provided with elastic or shock absorbing means, suitable for slowing down the travel thereof. Such devices typically comprise one or more silicone pistons, cooperating with helical springs acting in towing on the panel or on the door, and however they have an important drawback. In fact, it has been proved that said known devices are only effective with light panels and doors, the height whereof is therefore limited. On the other hand, in the case of panels or doors extending at full height, which sometimes also have a mirror, the traditional devices alone are not capable of carrying out a suitable shock absorbing function and therefore require a considerable care by the user during the movement of the panels and doors themselves. In order to meet this requirement, said devices are sometimes provided with additional members suitable for increasing the shock absorbing effect, for example composed of braking gears combined with toothed cursors or the like, or of greater size pistons; however, a solution of this kind implies an unavoidable increase of production costs, as well as of the overall dimensions that make the installation of the devices as a whole more difficult.

**[0009]** The object of this invention is to obviate the disadvantages mentioned hereinabove.

**[0010]** More in particular, the object of this invention is to provide a shock absorbing stopping device for sliding panels or doors which allows obtaining a suitable shock absorbing effect especially on panels of large weight and size.

**[0011]** A further object of the invention is to provide a shock absorbing stopping device which comprises a limited number of components and is therefore of limited overall dimensions for an easy and quick installation thereof.

**[0012]** A further object of the invention is to provide the users with a shock absorbing stopping device for sliding panels and doors suitable for ensuring high level of resistance and reliability over time, also such as to be easily and inexpensively constructed.

**[0013]** These and other objects are achieved by the shock absorbing stopping device for sliding panels and doors of this invention according to claim 1.

**[0014]** The construction and functional features of the shock absorbing stopping device for sliding panels and doors of this invention will be better shown in the following detailed description, wherein reference is made to the annexed drawing tables showing a preferred and non-limiting embodiment thereof, wherein:

figure 1 shows a schematic exploded view of the shock absorbing stopping device for sliding panels and doors of this invention;
figure 2 shows a schematic perspective view of the same device in the position corresponding to the closed position of the panel or door;
figure 3 shows a schematic perspective view of the same device in the position corresponding to the open position of the panel or door;
figures 4 and 5 show a schematic front view of the device of this invention combined and cooperating with a conventional carriage fixed to the panels;
figure 6 shows a schematic perspective view of the shock absorbing stopping device of this invention in the configuration referred to the specific use thereof on sliding doors;
figures 7 to 9 shows schematic side views of as many operating steps of the shock absorbing stopping device of figure 6.

**[0015]** With initial reference to figures 1 to 6, the shock absorbing stopping device for sliding panels and doors of this invention, globally indicated with 10 at figure 2, comprises a plate shaped support or footing 12, made of metal, plastic or other suitable material and of substantially rectangular shape, whereon a tubular container 14 for a shock absorbing means is arranged; the said latter is advantageously composed of a silicone or air piston 16. The tubular container 14 is arranged in the central-rear part of the footing 12 and surmounts a shaped centring base 18 made integral with the footing itself. The base 18 comprises one or more holes 20 for as many screws 22 and relevant nuts 22' for fixing the

device 10 in a cavity of a metal section bar (not shown) wherealong conventional carriages fixed to the panels slide. The container 14 defines an opening 14' of a longitudinally extended seat wherein the piston 16 is arranged, fixed in the seat itself in a known manner. The stem 16' of the piston 16 develops, when it is exposed, in the direction of the front side of the footing 12 and the free end thereof is connected to a guiding cursor 24. The cursor 24 is preferably composed of a plate substantially shaped as an "L" and comprises a pin 26 suitable for sliding in a linear slot 28; said slot 28 is obtained along a kerb 30 that makes up the extension of the centring base 18 of the footing 12 and develops parallel to the footing itself. The kerb 30 is made integral with said footing, relative whereto it develops orthogonally, reaching the front end thereof; in such position, the kerb 30 defines a rounded profile.

**[0016]** The cursor 24 is connected to a side of the kerb 30 with interposition of a cam 32; said cam has a basically "T" shaped inclined profile and is provided with opposite top 34 and bottom 36 recesses. A plate 38 is arranged on the opposite side of the kerb 30 provided with a plurality of holes 40, 42, 44 aligned in horizontal direction; the hole 40, made at the back end facing the shaped base 18, seats a pin 46 that crosses the plate 38, the slot 28, the cam 32 and the cursor 24. To this end, the cam 32 is provided with a hole 48 and the cursor 24 with a hole 50. The pin 46 protrudes by a limited extent both from the plate 38 and from the cursor 24 and constitutes the hooking means of a helical spring 52.

**[0017]** The opposite ends of pin 46 are provided with a groove 54 for said spring, which advantageously is bent on itself as a "U" about the rear end of the shaped base 18.

**[0018]** In order to keep the spring 52 into position relative to the footing 12, it is envisaged that the tubular container 14 comprises two integral and opposite sleeves 56 of suitable length, wherein the spring is inserted before coupling the ends thereof to the pin 46.

**[0019]** A pair of rivets 58, inserted in the holes 42 and 44 of the plate 38, crosses the slot 28 and the bottom recess 36 of the cam 32 to engage into corresponding holes 60, 62 of the cursor 24; the rivets 58 thus compact the plate 38, the cam 32 and the cursor 24 to each other, while leaving freedom of movement to said cam that can pivot, as schematised at figures 4 and 5. Said cam comprises a rivet 64, inserted in a cross hole 66, suitable for sliding along the top edge 30' of the kerb 30.

**[0020]** The device 10 as a whole is suitable for being inserted and fixed, through the screws 22 and the nuts 22', inside a known section bar wherein the conventional carriages for example fixed to the furniture panels (not shown) slide. At figures 4 and 5, said carriages are schematised with 68 and comprise a support 70 suitable for cooperating with the cam 32. The function of the device 10 in fact is to hook the carriage 68 fixed to the panel and gradually lead the latter to the end of travel.

**[0021]** The progressive approach effect of the panel to the travel end thereof is determined by the synergy between the spring 52 and the piston 16.

**[0022]** Figure 4 shows device 10 in the position corresponding to the open position of the panel. The stem 22 of the piston 16 is totally exposed and the spring 52 is tensioned, since the assembly composed of the plate 38, the cam 32 and the cursor 24 is arranged at the front end of the kerb 30; the rivet 64 of the cam 32 has passed over the bottom end with rounded profile and the cam itself is lowered in the front side.

**[0023]** When the carriage 68 of the panel abuts with the support 70 the cam 32, the latter pivots by the effect of the thrust received which leads the rivet 62 to rise along the top edge 30' of the kerb 30. The cam 32 engages with the support 70 through a front tooth 32' of the cam itself and at that point, the shock absorbed towing step carried out by device 10 towards carriage 68, and thus the panel connected thereto, begins. The spring 52 retracts and pulls backward the set composed of the plate 38, the cam 32, engaged with the carriage 68, and the cursor 24 and in this step, it meets the resistance of the piston 16 whose stem 22 abutted by the cursor 24 retracts progressively. The spring 52 is sized so as to produce a suitable towing force and in parallel, the piston 16 is sized to oppose the spring 52 and gradually approach the carriage 68 to the end of travel.

**[0024]** On the other hand, when the panel opens the spring 52 becomes tensioned and extends, the stem 22 of piston 16 exposes and the cam 32 moves at the front end of the kerb 30; the rivet 64 passes over the rounded end of the kerb itself and causes the disengagement between the cam 32 and the support 70 of carriage 68.

**[0025]** Figures 6 to 9 illustrate the device of this invention in an operating condition especially suitable for sliding doors for the partition of rooms.

**[0026]** According to this configuration, the device 10 is upturned relative to the previous solution and is combined with a carriage 72, substantially known per se, fixed with a shaped plate 74 to the top side of the sliding door, not shown. The device 10 and the carriage 72 are inserted in a metal section bar 76 of substantially known type that defines two opposite seats 78, 80; the seat 78 located at the top receives the device 10 that is fixed therein in suitable position with screws or equivalent retaining members, whereas the seat 80 located at the bottom constitutes the rectilinear extended cavity wherein the carriage 72 slides and wherefrom the same protrudes at the bottom through a longitudinally extended slit 84 of said section bar. Said latter is constrained in a known manner to the support frame of the sliding door. The cam 32 of the device 10 protrudes downwards in the direction of the carriage 72, which is provided with a shaped projection 86 suitable for abutting and pivoting the cam 32; such pivoting leads the front tooth of the cam 32, indicated with 32', to insert in a recess 34' obtained on the carriage 72, so that the latter as a whole is hooked and subject to the shock absorbed towing of device 10, with the same methods described before with reference to wardrobe doors. Figure 7, in particular, shows the cam 32 in

two positions; in the front side of said figure, the cam 32 is shown in the moment it is abutted by the carriage 72 that causes the pivoting thereof and leads the tooth 32' to insert in the recess 34'. In the back side of the same figure, wherein for simplicity the representation of the carriage 72 has been omitted, the cam 32 is illustrated in the position it reaches subsequent to the retraction imposed by the spring 52, a retraction that also determines the return of the stem 22 of the shock absorbing piston 16. The horizontal position of the cam 32 is such since the tooth 32' thereof is engaged in the recess 34' of the carriage 72, which has reached the end of travel in the opening step of the sliding door.

**[0027]** The two different conditions indicated above, of hooking the carriage 72 and of the complete retraction thereof with reaching of the travel end, are respectively illustrated at figures 8 and 9.

**[0028]** As can be noticed from the above, the advantages achieved by the invention are clear.

**[0029]** The shock absorbing stopping device for sliding panels and doors of this invention allows moving both the furniture panels and room partition doors, even very heavy, in a gradual manner, avoiding violent shocks or abutments with the travel end. The provision of using a single helical spring 52 bent as a "U" which realised a calibrated towing force along the opposite sides of the kerb 30 is especially advantageous.

**[0030]** Moreover, said device is very compact, easy to seat in the section bar seats, and inexpensive to make considering the limited number of components thereof.

**[0031]** Even if the invention has been described with particular reference to an embodiment thereof, made by way of a non-limiting example, several changes and variations will appear clear to a man skilled in the art in the light of the above description.

**[0032]** This invention therefore is intended to include any changes and variations thereof falling within the spirit and the scope of protection of the following claims.

## Claims

1. A shock absorbing stopping device (10) for sliding panels and doors, combined with metal section bars wherein carriages (68-72) fixed to said panels and doors slide, comprising a footing or plate-shaped support (12) made of metal or other suitable material and with substantially rectangular shape, wherealong a shock absorbing piston (16) of the silicone, air or equivalent type is arranged in longitudinal direction, cooperating with a spring (52) which develops about said piston along two opposite sides and a head of the same and engages, at the opposite ends, with a pin (46) arranged transversally in a linear slot (28) obtained along a kerb (30) obtained in the central/front side of the support (12), orthogonally to the footing (12).

2. The shock absorbing stopping device according to claim 1, wherein the shock absorbing piston (16) is arranged in a tubular container (14) constrained to the central-back side of the footing (12) along a shaped base (18) provided with opposite and integral sleeves (56) for receiving and stabilising the spring (52), said base (18) comprising at least one hole (20) for a screw (22) with nut (22') suitable for fixing the footing (12) in a metal section bar wherealong a support (70) fixed to a furniture panel is moved.

3. The shock absorbing stopping device according to claims 1 and 2, wherein the piston (16) is provided with a mobile stem (16') that protrudes in the direction of the central-front side of the footing (12) and abuts a cursor (24) carrying a pin (26), oriented in the direction of the kerb (30) and sliding in the slot (28) of said kerb (30).

4. The shock absorbing stopping device according to claim 3, wherein the cursor (24) is coupled to a cam (32), consisting of a shaped plate provided with opposite top (34) and bottom (36) recesses, as well as a front tooth (32').

5. The shock absorbing stopping device according to claims 3 and 4, wherein the cam (32) abuts a side of the kerb (30) and engages through a pin (46) with said slot (28) of the kerb (30).

6. The shock absorbing stopping device according to claim 5, wherein said pin (46) engages in a hole (50) of the cursor (24), in a hole (48) of the cam (32) and in a hole (40) of a plate (38) that abuts the kerb (30) on the opposite side relative to said cam (32).

7. The shock absorbing stopping device according to claim 6, wherein the pin (46) protrudes, on the opposite sides, from the plate (38) and from the cursor (24) and along said protruding walls, it has a groove (54) for hooking the ends of the spring (52).

8. The shock absorbing stopping device according to one or more of the previous claims, wherein one or more rivets (58), transversally inserted in holes (42) and/or (44) of the plate (38), that engage in corresponding holes (60) and/or (62) of the cursor (24).

9. The shock absorbing stopping device according to one or more of the previous claims, wherein the cam (32) comprises a rivet (64), arranged in a cross hole (66), which slides along the top edge (30') of the kerb (30) and passes over the front end thereof with rounded profile.

10. The shock absorbing stopping device according to one or more of the previous claims, wherein said device is fixed in upturned position in the top seat

(78) of a section bar (76), constrained to the support frame of a sliding door and provided with an adjacent bottom seat (80) wherein the carriage (72) is moved.

**11.** The shock absorbing stopping device according to claim 10, wherein the carriage (72) comprises as shaped plate (74), fixed to the top side of the sliding door, and a recess (34') wherein the front tooth (32') of the cam (32) engages, abutted by a shaped projection (86) of the same carriage.

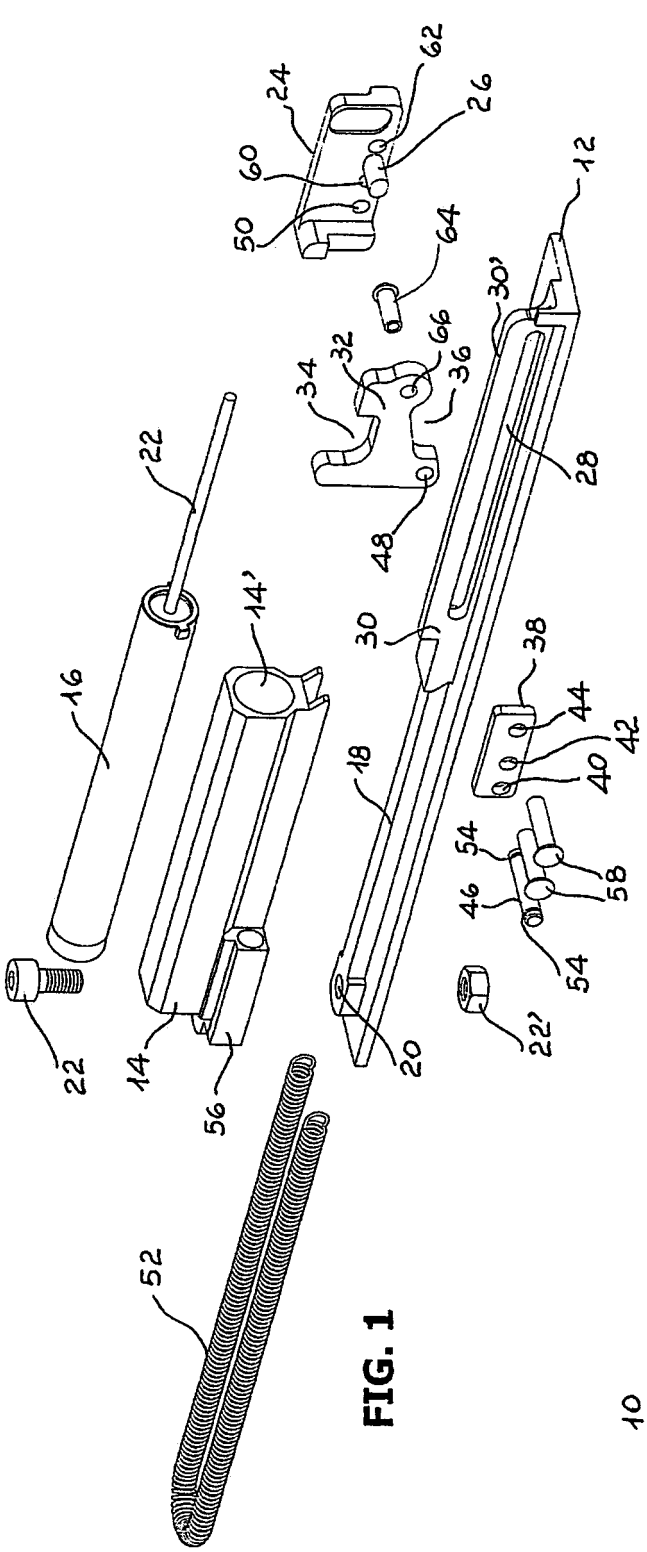



FIG. 1




FIG. 2

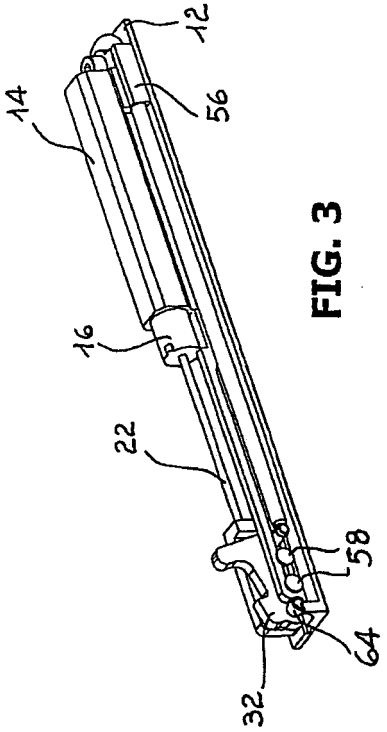



FIG. 3

FIG. 4

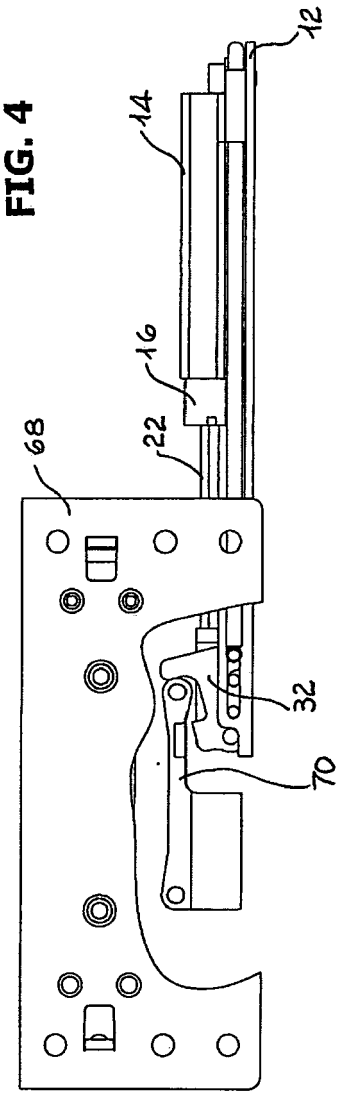



FIG. 5

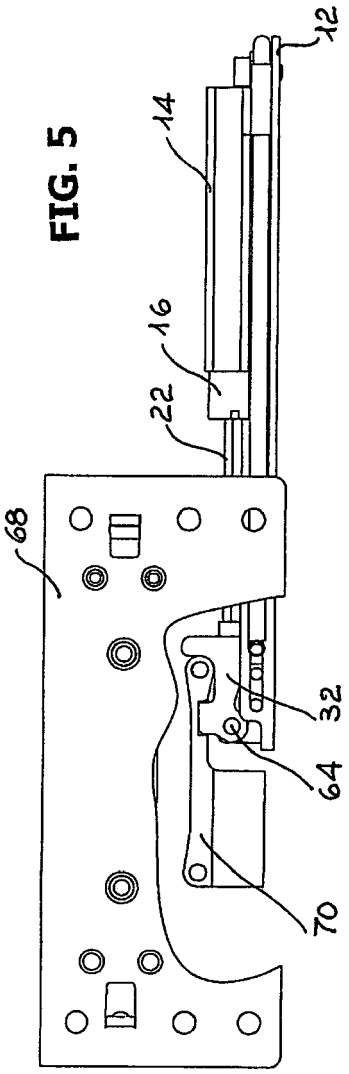


FIG. 6

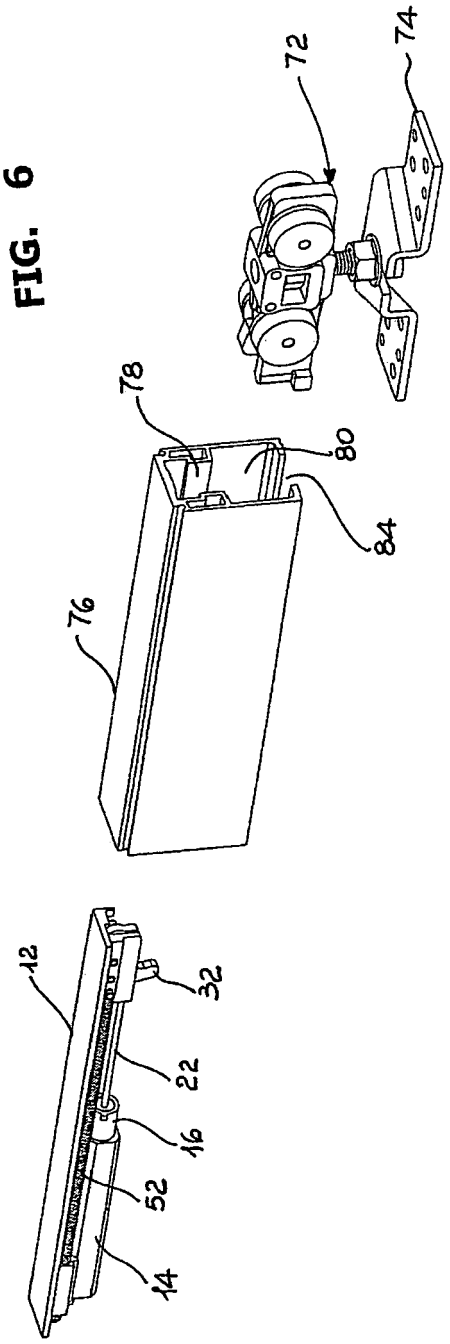
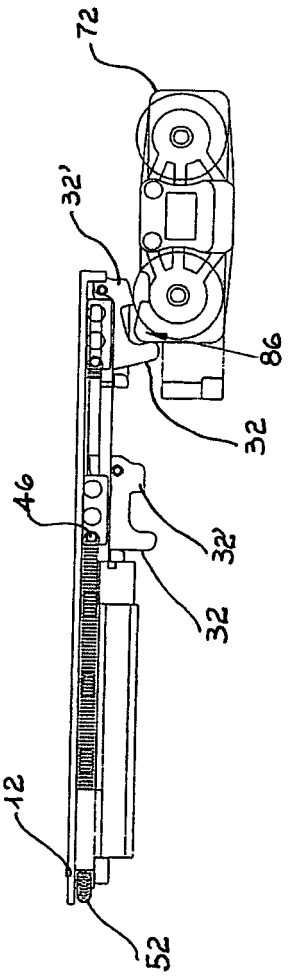



FIG. 7



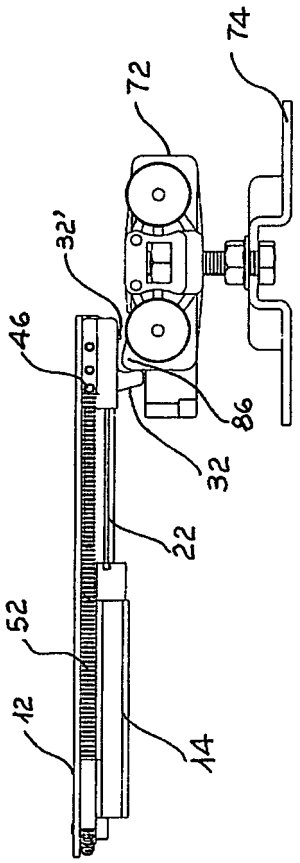



FIG. 8

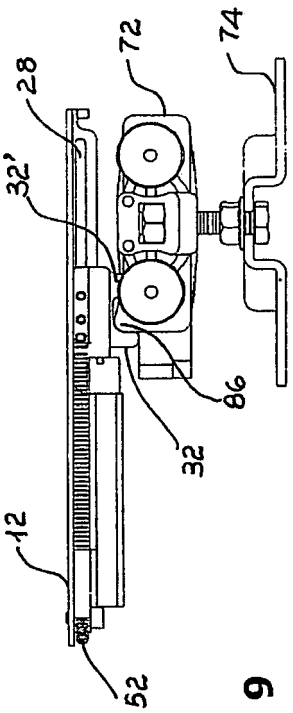



FIG. 9