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(54) **Servo-lifting device**

Servohebevorrichtung

Dispositif de levage servo-assisté

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(73) Proprietor: **VKR Holding A/S
2970 Hørsholm (DK)**

(72) Inventors:
• **Kristensen, Lars
8752 Ostbirk (DK)**

- **Sørensen, Henning Villiam
2950 Vedbæk (DK)**
- **Kornerup, Klaus
3460 Birkerød (DK)**
- **Jakobsen, Peter Dirch
4000 Roskilde (DK)**

(74) Representative: **Carlsson, Eva
Awapatent A/S
Rigensgade 11
1316 Copenhagen K (DK)**

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Description

FIELD OF INVENTION

[0001] The invention relates to a servo-lifting device. It is used for a window or a door, in particular for a roof window. When a roof window is opened upwardly, the servo-lifting device can provide an auxiliary force so as to overcome the gravity of the sash and thus keep the sash at a certain open angle without falling down or bounce up. This type of servo-lifting device can be used in other devices needing the servo-lifting other than doors and windows.

BACKGROUND OF THE INVENTION

[0002] WO95/16097 discloses a servo-lifting device according to the pre-ample of claim 1 used for a roof window. The servo-lifting device comprises a lifting arm with one end connected to a gliding element; the gliding element is fitted into a rail along which it can slide and it connects to a rod through a connecting part. The end of the rail connects to a spring sheath inside which an auxiliary spring is fitted. The rod goes through the spring and at the end where it extends out of the sheath configures a lifting spring. A moving base is located at the end of the sheath where the rod is inside spring and a fixed base fixed relative to the rod is located at the end where the sheath approaches the lifting spring.

[0003] The servo-lifting device can keep the window staying at any of the stationary position throughout the entire open angle range. It can also provide a servo-lifting force during the opening of the window. Due to the servo spring, the preserved stress can be adjusted according to the slope of the roof so that within the predetermined range of window open angle, the lifting spring will apply a parallel spring force to reinforce the spring force of the lifting spring. However, this lifting device structure is complex and it has many parts. Not only the cost is high, but also troubles tend to appear since there are many parts. Also the assembling process is complex and it needs the skilled people to operate.

[0004] US5291634 discloses a servo lifting device according to the pre-ample of claim 1 for the constraining of a hatch or door from a support structure.

SUMMARY OF THE INVENTION

[0005] The purpose of the invention is to provide a simple-structured, low cost servo-lifting device. It is in particular suitable for a roof window and it can provide an auxiliary force so that it ensures the window remaining stationary at any position in the open range.

[0006] In order to achieve the purpose, the servo-lifting system for a window comprises a lifting arm with a free end and another opposite end hinged to a gliding element, wherein the gliding element is mounted slidingly to a rail; and a rod is connected at one end with the gliding

element and cooperating with a lifting spring, with one end fixed relative to the rod and the other end fixed relative to the rail, wherein the spring is a compression spring whose end near the gliding element is connected to a base mounted on the rod; the other end which is far away from the gliding element abuts a fixed base fixed in said rail wherein the rail is groove-shaped and the fixed base is a right-angle plate whose board matches the inner side of the groove-shaped rail; an opening is constructed in the board on the corresponding rail surface; the other board of the right-angle plate is perpendicular to the rail and embedded into a recess on the rail surface.

[0007] The bouncing force of the spring produces a tension on the lifting arm through the rod and the gliding element. During the window opening process, the tension makes the lifting arm provide a lifting force to the sash of the window so as to overcome partially the window's gravity. The moments of the gravity of the sash, friction of the gliding element relative to the rail and the spring force over the sash balance so that the sash can stay in any open angle.

[0008] The fixing of the rod and the lifting spring can use such adjustable movable connection as the lifting spring base. The lifting spring base can be blocked by a nut and then positioned on the rod. Since the rod and the relative fixed end of the lifting spring are adjustably fixed relative to each other, the predetermined pressure or stretch of the spring can be conveniently adjusted by adjusting their relative position so as to apply to the spring different predetermined stress and make it suitable for different sloping angles of the roof.

[0009] The structure of the servo-lifting device is that the lifting spring is a compression spring, one end of which near the gliding element is connected to a base which is mounted on the rod; a fixed base, which is fixed at the rail, is placed at the other end of the lifting spring away from the gliding element.

[0010] The lifting spring can be placed around or beside and parallel to the rod that goes through the base. The rod can slide relative to the fixed base and the lifting arm so that it ensures the lifting arm is operated steadily.

[0011] The fixed base is a right-angle plate and the rail is groove-shaped. The board of the right-angle plate matches the inner side of the groove-shaped rail and an open hole is constructed in the board and on the corresponding rail surface. Another board of the right-angle plate is vertical to the rail and it can be embedded into a concave opening on the rail surface. A tab protruding inward can be configured at one end of the rail that blocks the fixed base from sliding out of the rail. By this type of structure, the end of the lifting spring can be fixed at the rail and it can also be separated from the rail to facilitate the transporting. The concave opening configuration helps the fixed base embedded into the rail conveniently, ensuring that the open hole on the rail lines up with the hole in the fixed base so that by a screw the fixed base can be fixed to the rail.

[0012] Of course, the lifting spring can be an air spring.

The rod connects to the gliding element by way of a screw thread. The other end of the rod connects to the piston of the air spring, preferably using relatively rotatable connection. The air spring is fixed on the rail. For example, the air spring is mounted inside the rail and the other end of the air spring is fixed at the end of the rail.

[0013] A sliding sleeve surrounds the rod in the lifting spring. Take a plastic sleeve for example. The sliding sleeve holds the lifting spring and prevents noise produced by the shaking from the pressing of the spring. A longitudinal groove can also be configured on the sliding sleeve.

[0014] The free end of the lifting arm can also be hinged to a fixed arm. The other end of the fixed arm is hinged with the rail. An open hole can be configured on the fixed arm to fix it to the frame or sash conveniently. By the fixed arm, the servo-lifting device can be fixed at one side of the sash or the frame. A pin axis can be configured at the fixed arm, by which the fixed arm can be conveniently hang on such sash hanging installation parts fixed to the frame as sash locking and unlocking device.

[0015] The rail can be a groove-shaped part formed by several surfaces. The lifting spring and other parts are inside the rail. This type of structure operates steadily and is compact.

[0016] Inside the rail there is an angular restricting tab that limits the maximum open angle of the window. For example, the rail plate can be pressed to form an upward protruding convex part inside the rail. When the window opens to its maximum angle, the restricting tab functions against the gliding element so that the window won't open beyond the maximum open angle. This restriction is necessary sometimes.

[0017] A flange protruding inward inside the rail is located above the gliding element so that the gliding element can be sliding inside the rail steadily and won't fall off the rail. At the same time it prevents the window from over-opening.

[0018] An open hole is configured on the side surface of the groove-shaped rail for fixing. Also an outward protruding pin can be configured on the exterior surface. The rail can be fixed to the frame or the sash by a screw and the pin through the open hole.

[0019] A preferred connection configuration for the rod and the gliding element is the connection through the screw thread and the gliding element. By rotating the rod, the insert depth of the rod into the gliding element can be adjusted. In a certain range it has the function of adjusting the maximum angle between the lifting arm and the rail, i.e. the maximum open angle of the window.

[0020] The servo-lifting device according to the invention, compared with the known servo-lifting device, ensures the prior function, i.e. to ensure that the window keep stationary at any position in the open range; and through the adjustable connection of the lifting arm relative to the rod, by adjusting the predetermined stress of the lifting spring, the servo-lifting device of the invention is suitable for different sloping roof; what's more, its struc-

ture is simpler and the installation is more convenient by the open holes on the groove and the fixed arm, also the cost is low. Other than used in a roof window, the servo-lifting device can be used in other types of window, door or other field.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

Fig.1 shows a structure view of a preferred embodiment of the servo-lifting device according to the invention;

Fig.2 is the top view of fig.1;

Fig.3 is the bottom view of fig.1;

Fig.4 is the cross section of the groove-shaped rail in fig.1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0022] The servo-lifting device of the invention will be further described in detail with reference to the drawings and preferred embodiment as following.

First Embodiment

[0023] As shown in fig.1-3, the servo-lifting device of the invention comprises a groove-shaped rail 1, inside which there is a gliding element 2. As shown in the cross section of the rail 1 in fig.4, the groove-shaped rail is formed by two side surfaces and three bottom surfaces. One of the side surfaces is wider so as to facilitate the fixing to the sash side. The structure ensures a better friction between the gliding element 2 and the rail 1, so that when the window opens to a certain angle, there is enough friction to keep the window stationary. The window won't be closed by the gravity of itself, nor opened automatically by the servo-lifting device.

[0024] Two open holes 10 are located on the higher side surface of the groove-shaped rail 1. Also at the exterior surface, there are two pins 20 protruding outward. By the screws (not shown) through the open holes 10 and the two pins 20, the rail 1 is conveniently fixed on the side surface of the sash. A lifting arm 3 is hinged to the gliding element 2. The top end of the lifting arm is hinged to a fixed arm 9. One end of the fixed arm 9 is hinged to the end of the rail 1 by an axis 7. A hole 21 and a pin axis 6 are located on the fixed arm 9. The hole 21 is used to fix the fixed arm 9 to the frame by way of a screw. The pin axis can cooperate with a sash locking and unlocking device 8. The sash locking and unlocking device 8 can be mounted at the interior surface of the frame, so that the sash with a servo-lifting device can be conveniently mounted on the frame or conveniently dismantled from the frame. Without the fixed arm 9, directly installing the lifting arm 3 onto the frame through a pin axis is also feasible.

[0025] A screw hole is configured on the gliding element 2 and the rod 17 has outer thread. The rod 17 is screwed into the hole of the gliding element 2, thus the inserting depth of the rod 17 into the gliding element 2 can be conveniently adjusted. In a certain degree, it can also change the maximum open angle of the window. Of course, the rod 17 can be connected to the gliding element by other ways. A pressing spring 12 surrounding the rod 17 acts as the lifting spring. A base 19 and an elastic adjusting nut 18 are configured at the end of the pressing spring 12 near the gliding element and a fixed base 16 made by right-angle plate is at the other end. The rod 17 goes through a hole in the fixed base 16. A tab 22 protruding inward and an open hole 23 are at one end of the groove-shaped rail and a concave 24 is located at the other side. The board of the fixed base 16 vertical to the rail can be embedded into the concave 24. At this time another board sticks to the side surface of the rail and the tab 22 on the rail is against the side edge of the front end of the fixed base 16, fixing the fixed base 16 at the end of the rail 1. In this status, the open hole 23 in the fixed base 16 lines up with the open hole in the rail side surface and by screwing a screw in the holes the fixed base 16 can be fixed tightly on the rail. When taking off the fixed base 16 from the end of the rail 1, the rod 17 and the pressing spring 12 are exposed and protrude forward. Also the gliding element 2 slides forward so that the lifting arm 3 and the fixed arm 9 can be stretched straight relative to each other, thus facilitates the transportation. It must be pointed out that, the fixed base 16 can be fixed to the rail by other common means.

[0026] Since noise may be produced due to the shaking of the spring 12 when being pressed, a noise-reduction means is applied in the embodiment, i.e. to add a plastic or rubber pat 15 and 11 between the spring 12 and the fixed base 16 and the base 19. Also a plastic sleeve 13 is around the rod 17. The sleeve 13 holds the pressing spring 12, so that the spring won't shake relative to the rod 17 when being pressed, thus prevents the noise being produced due to the shaking of the spring. A plurality of longitudinal grooves (not shown) is configured on the exterior surface of the sleeve 13, so that the sleeve effectively supports the spring 12 and won't produce bigger friction with the spring 12.

[0027] When installing the servo-lifting device of the invention into the window, close the window and then the fixed arm 9 will make the gliding element slide forward in the rail 1 by way of the lifting arm 3 and press the pressing spring 12 by way of the base 19 fixed on the rod 17 by the screw nut 18. Also the front end of the rod 17 extends forward through the hole in the fixed base 16. Stop the closing operation, the moment produced by the sash gravity balances with the moment produced by the result force of the stationary friction between the gliding element and the rail 1 and the stress of the spring 12. Therefore, the sash stays at the open position. On the contrary, open the window and the pressed spring 12 stretches automatically. Also through rod 17 and gliding

element 2, the lifting arm pushes the fixed arm upward. When the user's action stops, the moments of the gravity, the stationary friction between the gliding element and the rail 1 and the force of the spring 12 balance again, thus the sash also stays at the position. What's more, the force of the spring offsets part of the sash gravity, so it is laborsaving when the window is opened or closed.

[0028] By adjusting the screw nut 18 of the rod 17, it changes the predetermined stress of the spring 12, so that the elasticity of the spring 12 changes. The servo-lifting device thus is suitable for different slopes of the roofwindows.

[0029] The pressing spring 12 of the embodiment can use air spring (not shown). It only needs to directly fix the piston of the air spring with the gliding element 2 together or fix them together through the rod 17. By rotatably connecting the piston screwed in the gliding element by thread with the piston of the air spring, the predetermined air spring stress can be adjusted.

[0030] To prevent the window being opened to an undesired degree, a tab 5 facing upward is configured at the bottom of the rail 1. When the window opens to the designed open angle, the tab comes into contact with the gliding element to stop the further moving. There are three flanges 4 on the side surface of the rail 1, so that the gliding element 2 only slides inside the rail and won't fall off.

[0031] A possible situation is that the lifting arm 3 in the figure will tilt backward. Only by fixing the spring base 19 which abuts the gliding element to the rail 1 thus make the other end of the spring 12 free without being fixed to the rail 1, the effect will be the same. Only the pressing direction of the spring is opposite. If a screw nut (not shown) is configured at the end of rod 17', the predetermined stress of the spring can also be adjusted to fit different roof slopes.

Second Embodiment

[0032] Referring to fig.1 and 2, in the embodiment, the structure of the servo-lifting device is substantially the same with that of the first embodiment. Only the fixing means is slightly different. So it will be described with reference to the same drawings as that of the first embodiment. The lifting spring 12 uses a stretch spring. The end of the spring near the gliding element is fixed with the rail through the fixed base 19. The other end of the spring 12 is a free end and is fixed to the end of the rod 17'. A sleeve 13 surrounds the rod 17 to support spring thus prevents the noise being produced due to the shaking of the spring. Grooves are configured on the exterior surface of the sleeve 13. When the window closes, the frame or the sash presses the lifting arm 3 through the fixed arm 9, which makes the gliding element 2 slide forward in the rail 1 and then the rod 17 stretches the spring 12. When the window closing stops, the window will stay at the open position. On the contrary, open the window, and the stretched spring will retract, thus provides a servo

force.

[0033] If the lifting arm 3 tilts to another direction, it needs to fix the end of the spring 12 near the gliding element 2 relative to the rod 17 and fix the other end relative to the rail 1. The end of the rod 17 away from the gliding element i.e. the end of the rod 17' is free relative to the spring 12, so it can rotate relative to the spring 12. This embodiment is also feasible.

Claims

1. A servo-lifting device for a window, comprising a lifting arm (3) with a free end and another opposite end hinged to a gliding element (2), wherein the gliding element (2) is mounted slidably to a rail (1); and a rod (17) is connected at one end with the gliding element (2) and cooperating with a lifting spring (12), with one end fixed relative to the rod (17) and the other end fixed relative to the rail (1), **characterized in that** the lifting spring (12) is a compression spring whose end near the gliding element (2) is connected to a base (19) mounted on the rod; the other end which is far away from the gliding element abuts a fixed base (16) fixed in said rail (1), the rail is groove-shaped and the fixed base (16) is a right-angle plate whose one board matches the inner side of the groove-shaped rail (1); an opening (23) is constructed in the one board and on the corresponding rail surface; the other board of the right-angle plate is perpendicular to the rail (1) and embedded into a recess (24) on the rail surface opposite the opening (23).
2. A servo-lifting device according to claim 1, **characterized in that** the lifting spring (12) is placed around or parallel to the rod (17), which goes through the base (19) and can slide relative to the fixed base (16) and the lifting arm (3).
3. A servo-lifting device according to any of the preceding claims, **characterized in that** said base (19) surrounds the rod (17) and an elastic adjusting screw nut is screwed on the rod (17) at the side of the base (19) facing the gliding element (2).
4. A servo-lifting device according to any of the preceding claims, **characterized in that** a tab (22) protruding inward, which is pushed against the side edge of the right-angle plate, is constructed at the end of the groove-shaped rail (1).
5. A servo-lifting device according to any of the preceding claims, **characterized in that** the compression spring is an air spring which is fixed on the rail (1); the rod (17) is connected to the gliding element (2) by means of threads and the other end of the rod is connected to the piston of the air spring.

6. A servo-lifting device according to any of the preceding claims, **characterized in that** the free end of the lifting arm (3) also is hinged to a fixed arm (9) and the other end is hinged to the rail (1) at the other end.
7. A servo-lifting device according to any of the preceding claims, **characterized in that** a pin or/and opening is/are configured in the fixed arm (9).
8. A servo-lifting device according to any of the preceding claims, **characterized in that** a sleeve (13) for damping the compression spring (12) is located surrounding the rod (17) inside the compression spring (12) and the exterior surface of the sleeve supports the compression spring (12).
9. A servo-lifting device according to any of the preceding claims, **characterized in that** a plurality of longitudinal grooves are configured on the exterior surface of the sleeve.
10. A servo-lifting device according to any of the preceding claims, **characterized in that** the rail (1) is a groove-shaped rail formed by a plurality of surfaces.
11. A servo-lifting device according to any of the preceding claims, **characterized in that** inside the rail (1) there is a tab (5) which limits the maximum angle of opening the window; when the window is opened to its maximum angle, the tab abuts the gliding element (2).
12. A servo-lifting device according to any of the preceding claims, **characterized in that** a flange (4) protruding inward is located above the gliding element so that the gliding element can slide in the rail.
13. A servo-lifting device according to any of the preceding claims, **characterized in that** an opening (10) is configured on the side surface of the groove-shaped rail (1) for fixing.
14. A servo-lifting device according to any of the preceding claims, **characterized in that** a pin (20) which protrudes outward and is inserted into the hole in the sash is configured on the side surface of the groove-shaped rail (1).
15. A servo-lifting device according to any of the preceding claims, **characterized in that** the rod (17) is connected with the gliding element (2) by means of threads.

Patentansprüche

1. Servohebevorrichtung für ein Fenster mit einem Hebearm (3) mit einem freien Ende und einem anderen

- gegenüberliegenden Ende, das an einem Gleitelement (2) angelenkt ist, wobei das Gleitelement (2) verschiebbar an einer Schiene (1) angebracht ist, und wobei eine Stange (17) an einem Ende mit dem Gleitelement (2) verbunden ist und mit einer Hebefeder (12) zusammenwirkt, wobei ein Ende relativ zu der Stange (17) fixiert ist und das andere Ende relativ zu der Schiene (1) fixiert ist, **dadurch gekennzeichnet, dass** die Hebefeder (12) eine Druckfeder ist, deren Ende nahe dem Gleitelement (2) mit einer Basis (19) verbunden ist, die an der Stange angebracht ist, wobei das andere Ende, das weit entfernt von dem Gleitelement ist, an einer fixierten Basis (16) anliegt, die in der Schiene (1) fixiert ist, wobei die Schiene nutzförmig ist und die fixierte Basis (16) eine rechtwinklige Platte ist, deren eine Fläche zu der Innenseite der nutzförmigen Schiene (1) passt, wobei eine Öffnung (23) in der einen Fläche und an der entsprechenden Schienenoberfläche ausgebildet ist, wobei die andere Fläche der rechtwinkligen Platte senkrecht zu der Schiene (1) und in einer Aussparung (24) an der Schienenoberfläche gegenüber der Öffnung (23) eingebettet ist.
2. Servohebevorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Hebefeder (12) um die oder parallel zu der Stange (17) angeordnet ist, die durch die Basis (19) verläuft und relativ zu der fixierten Basis (16) und dem Hebearm (3) gleiten kann.
 3. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Basis (19) die Stange (17) umgibt und eine elastische Einstellschraubenmutter auf die Stange (17) an der Seite der Basis (19) aufgeschraubt ist, die dem Gleitelement (2) gegenüberliegt.
 4. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein sich nach innen erstreckender Vorsprung (22), der gegen die Seitenkante der rechtwinkligen Platte gedrückt wird, an dem Ende der nutzförmigen Schiene (1) ausgebildet ist.
 5. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Druckfeder eine Luftfeder ist, die an der Schiene (1) fixiert ist, wobei die Stange (17) mit dem Gleitelement (2) mittels Gewinden verbunden ist und das andere Ende der Stange mit dem Kolben der Luftfeder verbunden ist.
 6. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das freie Ende des Hebearms (3) auch an einem festen Arm (9) angelenkt ist und das andere Ende an der Schiene (1) an dem anderen Ende angelenkt ist.
 7. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein Stift und/oder eine Öffnung in dem festen Arm (9) ausgebildet ist/sind.
 8. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Hülse (13) zum Dämpfen der Druckfeder (12) angeordnet ist, die die Stange (17) in der Druckfeder (12) umgibt, wobei die äußere Oberfläche der Hülse die Druckfeder (12) stützt.
 9. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Vielzahl von in Längsrichtung verlaufenden Nuten an der äußeren Oberfläche der Hülse ausgebildet sind.
 10. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Schiene (1) eine nutzförmige Schiene ist, die durch eine Vielzahl von Oberflächen gebildet ist.
 11. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** innerhalb der Schiene (1) ein Vorsprung (5) ist, der den maximalen Öffnungswinkel des Fensters begrenzt, wobei, wenn das Fenster bis zu seinem Maximalwinkel geöffnet ist, der Vorsprung an dem Gleitelement (2) anliegt.
 12. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein Flansch (4), der sich nach innen erstreckt, über dem Gleitelement angeordnet ist, so dass das Gleitelement in der Schiene gleiten kann.
 13. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Öffnung (10) an der Seitenfläche der nutzförmigen Schiene (1) zur Befestigung ausgebildet ist.
 14. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein Stift (20), der sich nach außen erstreckt und in das Loch in dem Flügel eingesetzt wird, an der Seitenfläche der nutzförmigen Schiene (1) ausgebildet ist.
 15. Servohebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Stange (17) mit dem Gleitelement (2) mittels Gewinden verbunden ist.

Revendications

1. Dispositif de servo-levage pour une fenêtre, comportant un bras de levage (3) doté d'une extrémité libre et d'une autre extrémité opposée articulée à un élément coulissant (2), dans lequel l'élément coulissant (2) est monté coulissant sur un rail (1) ; et une tige (17) est raccordée en une première extrémité à l'élément coulissant (2) et coopère avec un ressort de levage (12), la première extrémité étant fixe par rapport à la tige (17) et l'autre extrémité étant fixe par rapport au rail (1), **caractérisé en ce que** le ressort de levage (17) est un ressort de compression dont l'extrémité proche de l'élément coulissant (2) est raccordée à une base (19) montée sur la tige ; l'autre extrémité qui est éloignée de l'élément coulissant vient buter contre une base fixe (16) fixée dans ledit rail (1), le rail est configuré en forme de gorge et la base fixe (16) est une plaque à angle droit dont une première aile coïncide avec le côté intérieur du rail en forme de gorge (1) ; une ouverture (23) est formée dans la première aile et sur la surface correspondante du rail ; l'autre aile de la plaque à angle droit est perpendiculaire au rail (1) et encastree dans un évidement (24) formé sur la surface du rail opposée à l'ouverture (23).
2. Dispositif de servo-levage selon l'une quelconque des revendications 1, **caractérisé en ce que** le ressort de levage (17) est placé autour de, ou parallèlement à, la tige (17), laquelle traverse la base (19) et peut coulisser par rapport à la base fixe (16) et au bras de levage (3).
3. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite base (19) entoure la tige (17) et **en ce que** un écrou de vis de réglage élastique est vissé sur la tige (17) du côté de la base (19) faisant face à l'élément coulissant (2).
4. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** une patte (22) faisant saillie vers l'intérieur, laquelle est poussée contre le bord latéral de la plaque à angle droit, est formée à l'extrémité du rail configuré en forme de gorge (1).
5. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le ressort de compression (2) est un ressort pneumatique qui est fixé sur le rail (1) ; la tige (17) est raccordée à l'élément coulissant (2) au moyen de filetages et l'autre extrémité de la tige est raccordée au piston du ressort pneumatique.
6. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'extrémité libre du bras de levage (3) est également articulée à un bras fixe (9) et **en ce que** l'autre extrémité est articulée au rail (1) à l'autre extrémité.
7. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** un ergot et/ou une ouverture est/sont configuré(s) dans le bras fixe (9).
8. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** un manchon (13) permettant d'amortir le ressort de compression (2) est placé autour de la tige (17) à l'intérieur du ressort de compression (5) et **en ce que** la surface extérieure du manchon supporte le ressort de compression (5).
9. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** plusieurs gorges longitudinales sont configurées sur la surface extérieure du manchon.
10. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le rail (1) est un rail configuré en forme de gorge formé par plusieurs surfaces.
11. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que**, à l'intérieur du rail (1), il y a une patte (5) qui limite l'angle maximal d'ouverture de la fenêtre ; lorsque la fenêtre est ouverte suivant son angle maximal, la patte vient en butée contre l'élément coulissant (2).
12. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** une cornière (4) s'avancant vers l'intérieur est placée au-dessus de l'élément coulissant de sorte que l'élément coulissant peut coulisser dans le rail.
13. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** une ouverture (10) est configurée sur la surface latérale du rail en forme de gorge (1) dans un suet de fixation.
14. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** un ergot (20) qui fait saillie vers l'extérieur et est inséré dans le trou formé dans le châssis mobile est configuré sur la surface latérale du rail configuré en forme de gorge (1).
15. Dispositif de servo-levage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la tige (17) est raccordée à l'élément coulissant (2) au moyen de filetages.

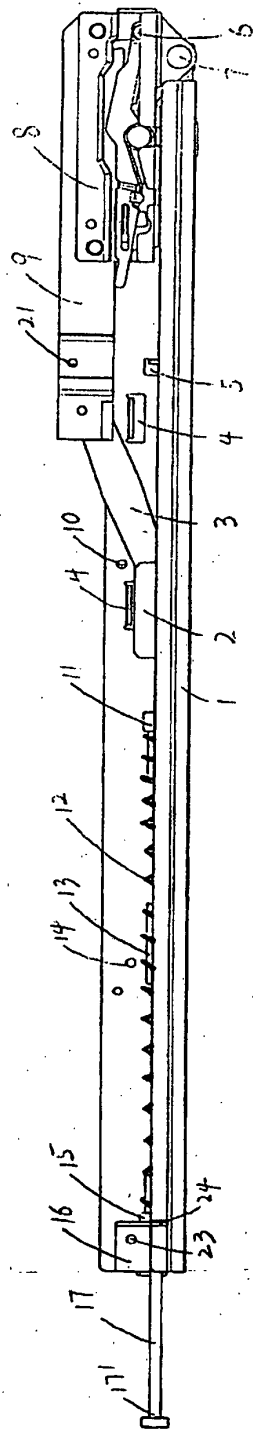


Fig. 1

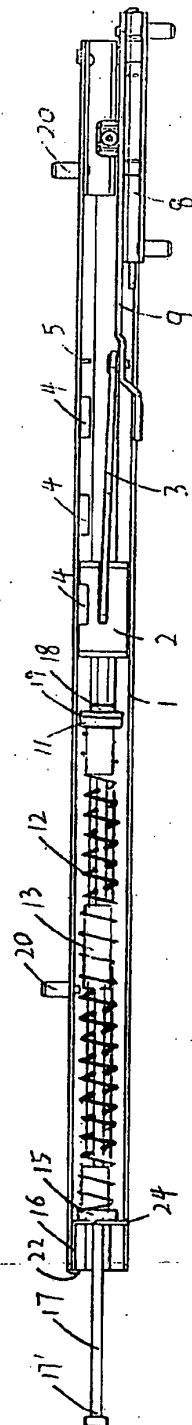


Fig. 2

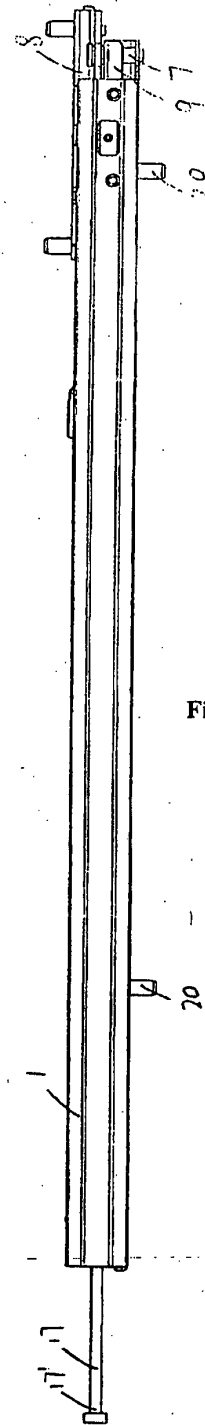


Fig. 3

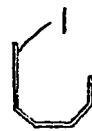


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- US 5291634 A [0004]