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SLIDING PANEL ACTUATORS

Filed March 27, 1967

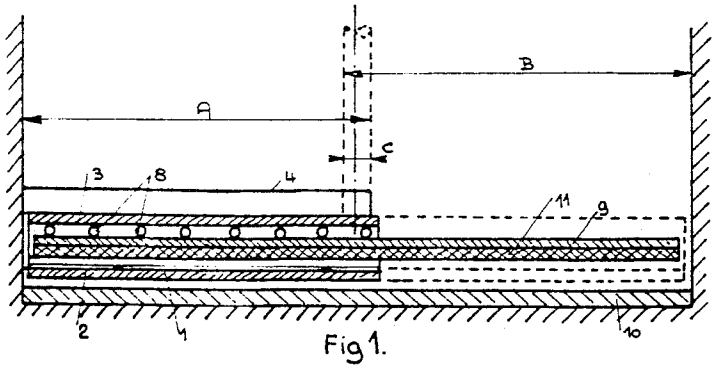

Fig 1.

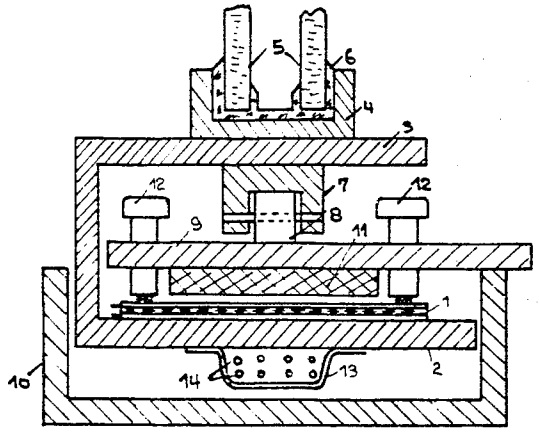

Fig 2.

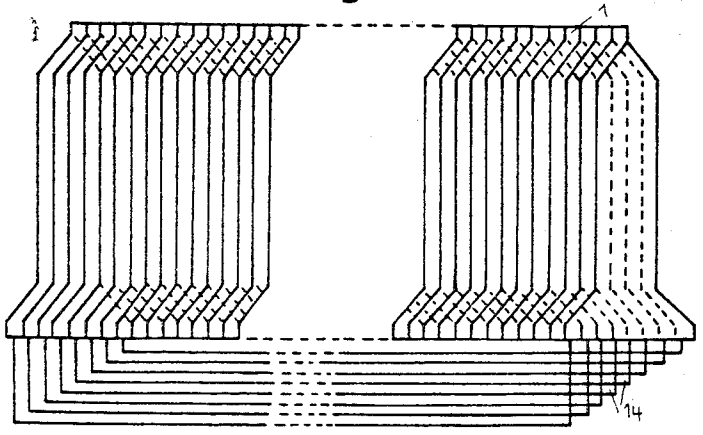

Fig 3.

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SLIDING PANEL ACTUATORS

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ABSTRACT OF THE DISCLOSURE

An apparatus for releasing the weight of heavy sliding door or window panels which may be laterally moved for instance by rolling along horizontal tracks. An elongated linear winding armature of partial length with respect to the length of the track is affixed to the panel and moves with it within a magnetic field airgap arranged along the track. Said winding is energized from pairs of brushes arranged along said track.

The present invention concerns improvements in or relating to sliding panel actuators for easing the manual control of sliding heavy panels such as those of windows and doors.

SUMMARY

A linear motor armature is attached to an horizontal side of the panel frame. A magnetic field linear airgap is created along the useful run of the track from linear elongated members cooperating with said track on which, for instance, the panel may slide for instance by rolling along said track. When said armature is fed with an electrical current, the weight of the panel is substantially compensated for from the magnetic attraction between the armature and field members of such a linear actuator.

DRAWINGS

FIG. 1 shows a front view in partial cross-section of an illustrative embodiment of a device according to the invention and associated to the lower framework of a sliding panel;

FIG. 2 shows a transversal cross-section view of said embodiment; and,

FIG. 3 shows a top partial view of an illustrative embodiment of the armature in said embodiment.

From the description of said embodiment may be directly deduced any technological alternative thereof, such as, for instance, the association of such a device to the upper framework of the sliding panel structure.

DETAILED DESCRIPTION

Referring to FIG. 1, A denotes the width or span of the sliding panel proper, the lower bar of the framework of which is shown at **4**. This panel can be controlled for occupying the position B, with a small overlap between the shut A position and the open B position thereof (a fixed panel, not shown, normally occupies the span B behind the panel A).

The frame **4** is secured, through any suitable known means, not shown as conventional per se, to and on an elongated plate **3** which substantially spans over the distance A and makes part, see FIG. 2, of an elongated stirrup-member the other branch of which **2** at least is made of soft magnetic iron or alloy. Said other branch plate **2** spans over the same length as the plate **3**. Beneath the plate **3** are affixed through any conventional securing means not shown a plurality of carriers **7** for rollers **8**. These rollers bear on the upper side of a roller-path **9** spanning substantially over the distance $(A+B-C)$. Said roller-path **9** is a plate supported from a gully **10**, also extending over such a span $(A+B-C)$ and resting on the hardware of the wall wherein the concerned window is mounted. Under the plate **9** is secured by any conventional means a plate **11** of a coercive hard magnetic material such as a ferrite wherein a series of alternate magnetic polarity poles have been magnetized along the length thereof. Said plate **11** consequently constitutes the field member of an actuator the magnetic airgap is defined between said field plate **11** and the facing soft magnetic plate **2**. Within said linear airgap, of small width, is arranged an armature winding **1** applied over the airgap face of the plate **2** and having the same length as said plate. Pairs of brushes such as **12** are provided for the supply of said armature with electrical current, direct or rectified current for instance. The brushes pass through the plate **9** and in each pair (several paralleled pairs can be provided along the arrangement) the two paralleled brushes are arranged near the lateral edges of the armature.

The armature winding may be such as shown in FIG. 3, that is to say it may comprise a flat series wound winding of two layers of half-turn conductors of lamellar form. In such an embodiment, relating to the printed-circuit winding technique, each of the half-turn conductor presents a mid-portion which is substantially transverse to the lateral width of the winding, extended on both sides by slanted extensions (they may be evolvents if required) up to the edges so that the shift between the ends of said conductor defines the progression pitch of the winding. The orientation of the slanted portions is reversed from one layer to the other one and the facing ends are electrically interconnected for defining the electrical circuit of the winding. However, at each of its ends, the winding presents half-turn conductors only on one face, reverse from one end to the other; in the FIG. 3 as shown, such conductors, spanning over two polar spans, are in the upper layer at the left-hand end and in the lower layer at the right-hand end. In order to complete the electrical winding or, otherwise said, in order to close said winding circuit, it is necessary to establish connections between the free ends of the half-turn conductors as shown at **14** in FIG. 3. Such connections could be made with lamellar conductors in the plane of the winding. However, not to unduly broaden the width of the armature in the device, it is preferred to make such end to end connections **14** with conventional insulated wires soldered at both their ends to the corresponding ends of the half-turn lamellar conductors, and to locate such wires **14** within a gutter **13** secured under the plate **2** over which is secured the armature.

In the illustrated embodiment, the sliding panel comprises, for instance, two insulating plates **5**, glass for instance, spaced and maintained by a plastic joint **6** within a gutter member **4** comprising the bar of the carrier framework of said panel.

The operation and use of such a device may be explained as follows: starting from the closed position indicated on FIG. 1, it may be assumed that the armature winding is not fed (it may be with a polarity aiding the application of the panel in abutment on the left, but this of course would not be economical). For opening the panel, the operator then presses a push-button switch (not shown) for applying to the armature an electrical D.C. or rectified current of such a polarity that the magnetic attraction between the winding and the fixed field structure either produces a drive of the armature towards the right-hand direction up to the complete opening of the panel, or at least so reduces the strain to apply by hand to the panel that the operator can move easily and with a very slight effort indeed the said sliding panel. When the panel is open, even to the degree desired by the operator, said operator cuts off the electrical current. The same process is used for closing the panel or moving it in the other direction. If wanted, automatic cut-off

may be provided from contacts mechanically actuated when the panel is brought to either one of its end positions.

The device which has been described in relation to linearly displaced panels of flat shape is directly adaptable to arcuate panels which must be moved along correspondingly arcuate paths, from an obvious modification of the linear shapes of members such as **9–11–2–13** into corresponding arcuate shapes of such members.

Instead of magnetic poles permanently magnetized within a plate of hard ferrite, one may use separate magnet poles of either permanent or wound character.

What is claimed is:

1. An actuator device for at least substantially reducing the apparent weight of a sliding panel in its displacement along a substantially horizontal track comprising the combination of an elongated multi-polar field structure extending substantially over the span of said track and defining a correspondingly extending magnetic airgap, a flat elongated winding armature secured to a side of the framework of said panel parallel to said track and located within said magnetic airgap, and electrical current transducer means associated to said field structure for the supply of said winding armature with an electrical current the polarity of which defines the direction of the magnetic attraction between said armature and said field structure in the direction of said track.

2. Device according to claim **1**, wherein said winding armature is secured to one branch of a stirrup member the other branch of which supports one side of the framework of said panel, at least the branch of said stirrup member supporting said armature being of a soft magnetic material, and said field multi-polar structure is secured to a side of an elongated plate facing said armature, said plate constituting the track on which moves said panel through a plurality of rollers carried on the said other branch of the stirrup member on the side opposite to that supporting said framework side of the panel.

3. Device according to claim **2**, wherein said armature winding is of the series-wound kind with at least two layers of half-turn conductors each extending substantially transversely to the length of the winding, and wherein return conductors for closing the electrical circuit of said winding from end to end are located within a gutter-like member secured under the branch of said stirrup member carrying said armature.

4. Device according to claim **2**, wherein the length of said armature winding is substantially equal to the length of said side of the framework of said panel.

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