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Boyriven

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[54] **ELECTRICAL WINDOW REGULATOR MECHANISM**

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July 6, 1970 France.....7024906

[52] **U.S. Cl.** **74/89.15,** 310/114, 49/351

[51] **Int. Cl.**.....**F16h 27/02**

[58] **Field of Search** 74/89.15; 310/244, 310/112, 114, 126; 49/351, 227

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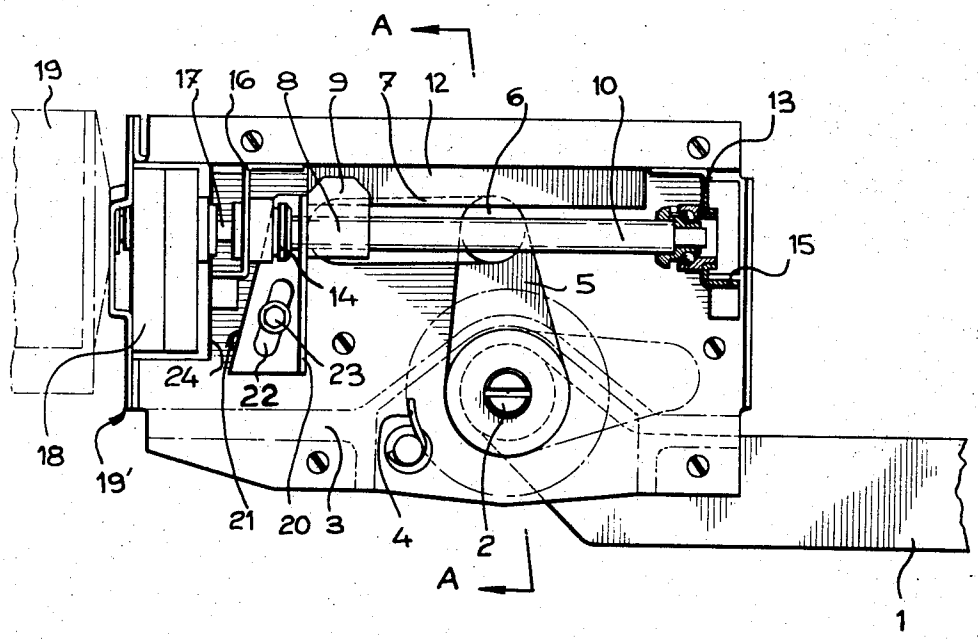
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Assistant Examiner—Wesley S. Ratliff, Jr.
Attorney—Raymond A. Robic

[57] **ABSTRACT**

A device for moving an actuating arm comprising a plate upon which the actuating arm is mounted for rotation through a predetermined angle and a threaded shaft also rotatably mounted on such plate. Means are provided for connecting the output shaft of an electric motor to the thread shaft. A slide is mounted parallel to the threaded shaft and a nut is immobilized in rotation by the slide and adapted to move longitudinally of the threaded shaft upon rotation of the threaded shaft. A first lever is secured to the axis of the operating arm and a second lever is pivotally connected at one end to the first lever and at its other end to the nut, whereby movement of the nut due to rotation of the threaded shaft will cause the first lever to rotate the second lever and thus the operating arm.

7 Claims, 10 Drawing Figures



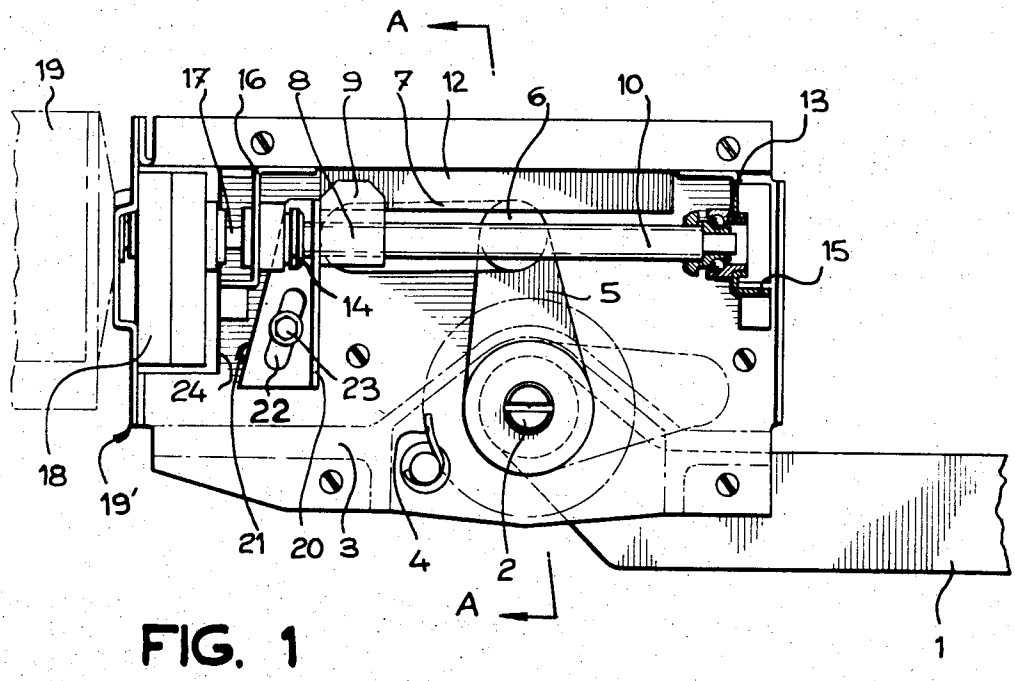

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FIG. 1

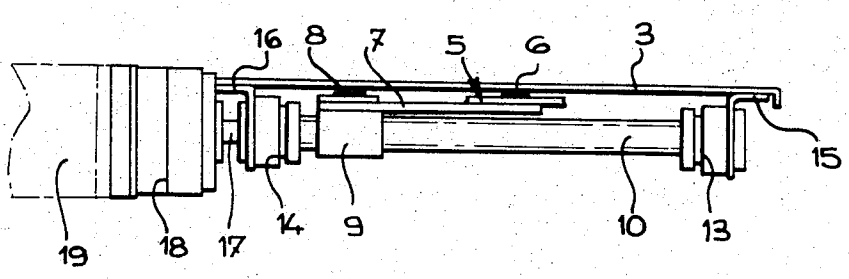

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FIG. 2

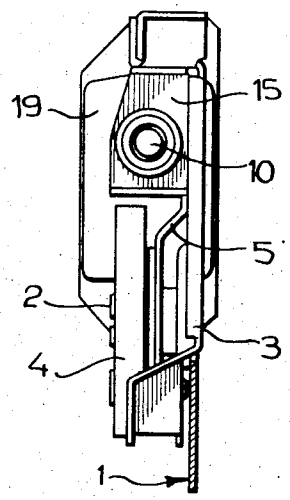


FIG. 4

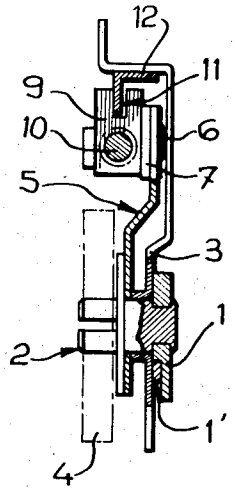


FIG. 3

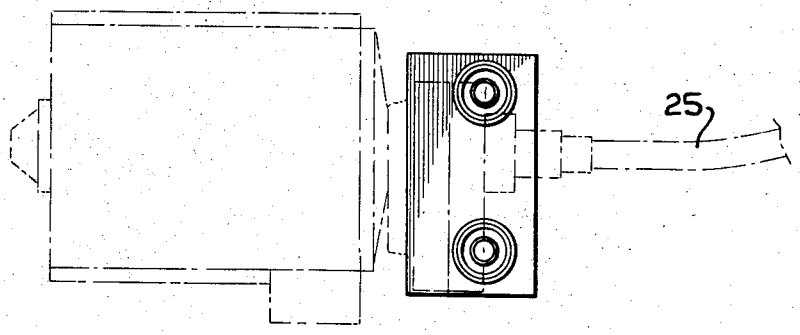


FIG. 5

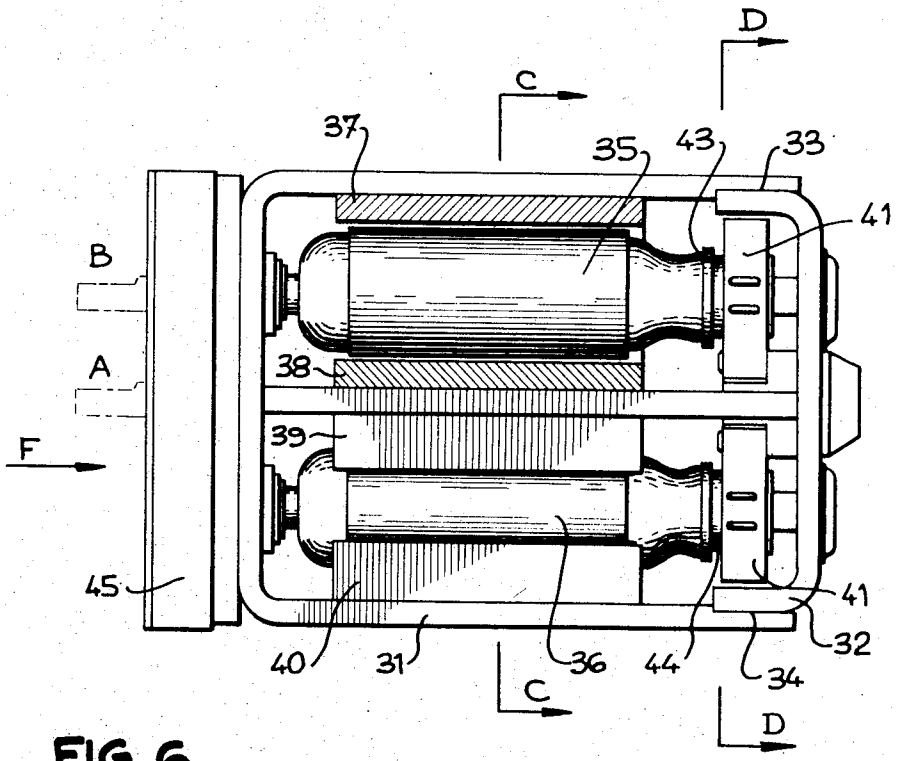


FIG. 6

FIG. 7

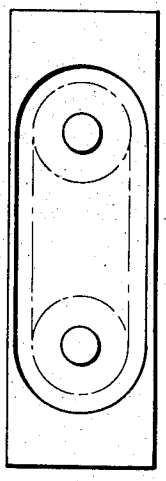


FIG. 8

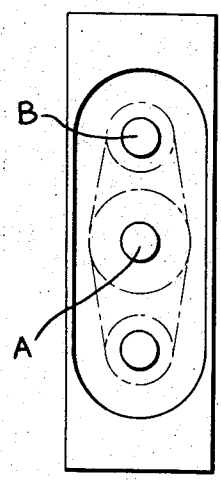


FIG. 9

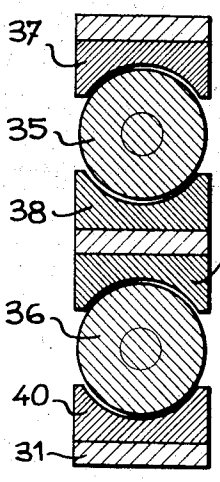
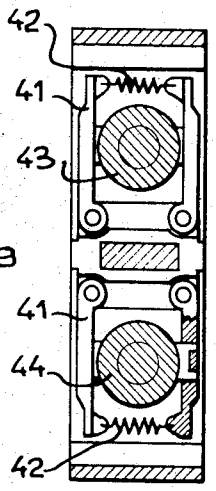


FIG. 10



ELECTRICAL WINDOW REGULATOR MECHANISM

The invention relates to the control of actuating mechanisms for car window regulators and the like.

An object of the invention is to replace known actuating mechanisms for the arms of car window regulators including for example, a single arm, diverging arms, or arms arranged in a parallelogram, the drive of which is commonly obtained through the action of a pinion meshing with a toothed segment, by a mechanism better suited to allow the operation thereof by an electric motor.

According to the invention there is provided a device for moving the actuating arm of a window regulator comprising means for connecting the output shaft of an electric motor through a reducer unit to a threaded shaft which carries a nut which can move longitudinally of the threaded shaft but immobilized in rotation by a slide mounted parallel to the threaded shaft. A first lever is secured to the axis of the actuating arm and a second lever is pivotally connected at one end to the first lever and at its other end to the nut, whereby movement of the nut will cause the first lever to rotate the second lever and thereby the actuating arm.

The invention will be better understood by referring to the following description and to the accompanying drawings, which give one advantageous embodiment by way of example only of the invention, with regard to which, and to its variants:

FIG. 1 is an elevation of an actuating mechanism for a window regulator arm, in accordance with the invention, shown in the position of complete closure of the window;

FIG. 2 is a diagrammatic profile view of the same mechanism, but limited to a motor-reduction gear unit thereof and to a nut and screw mechanism and to a set of levers which it entrains;

FIG. 3 is a diagrammatic partial section in plan, along the line A—A of FIG. 1, from which a motor-reduction gear unit and an adjustable stop are presumed to be withdrawn;

FIG. 4 is a plan view of the whole of the mechanism shown in elevation in FIG. 1;

FIG. 5 is a view of a variant embodiment, characterized by the use of a motor-reduction gear unit which is separate and connected to the actuating mechanism of the window regulator arm by a flexible transmission;

FIG. 6 is an elevational view partially in section of an electric motor having a double rotor, in accordance with the invention;

FIG. 7 is a profile view of the same motor, in the direction of the arrow F of FIG. 6, but with a housing variant of a coupler of reduced dimensions;

FIG. 8 is a view of another variant of housing for a coupling device;

FIG. 9 is a diagrammatic profile section, along the line C—C of FIG. 6 and in the direction of the arrows; and

FIG. 10 is a diagrammatic profile section, along the line D—D of FIG. 6 and also in the direction of the arrows.

In FIGS. 1 to 4 there is shown an actuating mechanism for a single arm 1 or of a "false" arm, to operate a car door window in the customary manner — which will therefore not be described — by simple rotation on an axle 2, which is connected to it, in a corresponding bearing of a plate 3 entraining a spiral balance spring 4.

In accordance with the invention, for electrical operation, this window regulator arm 1 is connected by its axle 2 to a lever 5 which is coaxial with it and the free end 6 of which forms a knee joint, with a second lever 7 pivoting at its other end at 8, on one of the lateral faces of a nut 9 rising on the screw 10 and immobilized in rotation by its groove 11 which slides on a slide 12, which is bent in the form of an angle-iron, so as to be fixed on the plate 3.

The aforementioned threaded shaft forming the screw 10 is centered between stop bearings 13 and 14 which are preferably ball bearings and are respectively fixed on the plate 3, by counter-bent supports 15 and 16, so as to be entrained in rotation by a slow shaft 17 of a reduction gear 18, which is itself driven by electric motor 19 also mounted through the support 19' on the same plate 3. An auxiliary adjustable stop 20 made of bent sheet-metal having an oblique edge 21 limits the tilting upwards of the arm 1 and thus defines the final closure position of the window, which is not shown.

This adjustment is obtained, through the sliding of the stop 20 in a slot 22, which has the same orientation as the aforesaid oblique edge 21 and which slides against slots such as 24 of the plate 3, so as thus to provide an inclination of the order of 75° in relation to the axis of the screw 10 upon its displacement, which can be blocked by the nut 23, in a suitable position in which the bent edge of the stop 20 limits the displacement downwards of the threaded nut 9, and thus the tilting upwards of the lever 1.

FIG. 5 shows a variant of embodiment according to which the electric motor 19 as well as its support and its geared speed reducer 18 can be placed at any location of the door panel thanks to the fact that the rotary movement, at the output of the low speed reducer shaft 18 is transferred to the threaded axis 10, of the tilting mechanism of the arm 1, by a flexible transmission 25 for this rotary movement, as is already known.

It has been found that, for the execution of certain operations and more especially in the case of window regulators in accordance with the invention or of other types, or for the operation of car hoods, by virtue of quite large and often very variable frictions in the guiding slides whereas the space available for housing the electric motor is generally very limited, the above described embodiment often proves insufficient. In order to have the necessary power to ensure such operations, in all circumstances and at all times, the object of the invention is also to provide a device capable of overcoming the above disadvantages.

This is achieved, by providing an original electric motor in accordance with FIGS. 6 to 10, thanks to the new combination of two armatures or rotors, arranged one beside the other and parallel in the same "carcass" or stator, comprising therefore a double couple of polar pieces, which allows one to double the available power available from a motor accommodatable in a given space for example that which is available in a door panel.

The invention furthermore relates to the combination of such electric motors having double rotors as well as speed reducing gears of known types, and with transmissions, for example by flexible wires.

In FIGS. 6 to 10 there is shown an electric motor with a double rotor in accordance with the invention, comprising a belt or "carcass" formed by two stirrups 31, 32 of soft iron, into a U-shape, fitting mutually and being permanently interconnected at 33 and 34, so as to be held in position and to center two armatures or rotors 35 and 36 in corresponding bearings, as well as pole-pieces 37, 38, 39 and 40 which are advantageously made of ferrite, while four holders 41 for metal or carbon brushes oscillating about suitable axes and biased by springs 42 achieve by means of the said brushes the successive movement of each of the blades of the respective collectors 43 and 44.

A housing made of sheet metal which is not shown ensures the protection and the shielding of the whole, while a second housing 45 covers the coupling device of the two rotors 35 and 36, which can be of any known type, for example belts or gears and constitute at the same time a speed reducing or amplifying mechanism, between the said rotors and the output shaft A, while the shaft B turns at the speed of the rotors.

Generally the electrical feed of such motors will be effected by direct current under a tension of 6 to 10 volts, according to the battery of accumulators with which the car is equipped, and the two rotors are fed preferably in "parallel" if the battery is one of 6 volts and in series if it is one of 12 volts, as is customary for the so-called "bi-tension" motors.

It is easy to understand that in all the cases, owing to the general interaction of the means thus described above and considering first the mechanism of FIGS. 1 to 4 in the position corresponding to the complete closure of the window as determined by the abutment of the nut 9 on the stop 20 when locked in an appropriate position by the nut 25, the rotation of the electric motor 19 will be blocked and there will result therefrom a current surge in the windings of the motor which will bring about the cutting of the electrical feed through the action of any suitable thermal circuit-breaker.

If, on the contrary, the motor is fed in the opposite direction, in known manner by an inverter, this inverse rotation of shaft 17 reduced by the reducer 18 is then again decreased by the screw pitch of the threaded axis 10 which is integral therewith, and brings about the raising of the nut 9, through the action of the sliding of its slot 11 on the slide 12, while by joining of this nut 9 to the pair of levers 5, and 7 hinged at 6 and 8 tilting of the false arm 1 about its axis 2 is achieved. Thus in known manner, any type whatsoever of window regulator ensures the appropriate displacement of the window, at least until one stops to press the switch or until the complete opening of the window, which can also be stopped by a stop symmetrically opposed to the stop 20 described above, or else by the action of an electrical contact forming an end-of-travel switch. A fresh inversion of the electrical feed will ensure once more the closing of the window and so forth.

The operation remains of course absolutely identical, if in accordance with the variant of FIG. 5, the transmission of movement between the output of the slow shaft of the motor-reducer unit and the threaded axis 10 is achieved by the flexible rotatable wire 25, and equally if as in FIGS. 6 to 10 the electric motor has a double rotor.

Finally, it is clear that the invention is not limited to the sole new application of means and methods described by way of example, and not to the sole combinations of means and methods thus implemented to materialize the invention, but that on the contrary its scope extends explicitly to all the variants of execution, using equivalent or simply comparable means, for the purposes of realizing the new industrial products characteristic of the invention, or even simply a fraction of these new products.

By way of example, it is to be understood that the invention is not limited to the applications of motors thus improved, to the operations of window regulators for cars, but that, on the contrary, its scope extends explicitly to all the variants of application and for example to the operation of car hoods, using equivalents or simply comparable means or methods, such as so-called simplified "squirrel-cage" rotors when multiphase alternating current supplies are used, even by the mere effect of a condenser.

I claim:

1. A device for moving an actuating arm comprising a plate upon which the actuating arm is mounted for rotation through a predetermined angle, a threaded shaft also rotatably mounted on the said plate, means for connecting the output shaft of an electric motor to said threaded shaft, a slide mounted parallel to said threaded shaft, a nut immobilized in rotation by said slide and adapted to move longitudinally of said threaded shaft upon rotation of the threaded shaft, a first lever secured to the axis of the operating arm, and a second lever pivotally connected at one end to said first lever and at its other end to said nut, whereby movement of said nut due to rotation of said threaded shaft will cause said first lever to rotate said second lever and thus said operating arm.

2. A device as claimed in claim 1 further including at least one adjustable stop having an inclined edge which slides on a slot in the plate, the inclination of the slot being at a predetermined angle with regard to the threaded shaft to permit adjustment of the movement of the nut and thereby of the angle of rotation of the actuating arm.

3. A device as claimed in claim 1, wherein the electric motor comprises two coupled armatures or rotors with corresponding pairs of polar pieces and brushes placed in a single carcass or stator, said rotors and polar pieces being placed side by side in the same plane so as to increase the power of the motor without increasing its thickness.

4. A device as claimed in claim 3, wherein the two rotors have blade collectors and are fed by the battery of a vehicle into which the device is mounted.

5. A device as claimed in claim 3, wherein the mutual coupling of the two rotors is combined with a speed reducer or multiplier device.

6. A device as claimed in claim 1, wherein the means connecting the output shaft to the threaded shaft comprises a rotary flexible transmission.

7. A device as claimed in claim 1, wherein the actuating arm is connected to a vehicle window regulator.

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