

April 21, 1959

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2,883,183

VEHICLE WINDOW ACTUATORS

Filed April 21, 1958

2 Sheets-Sheet 1

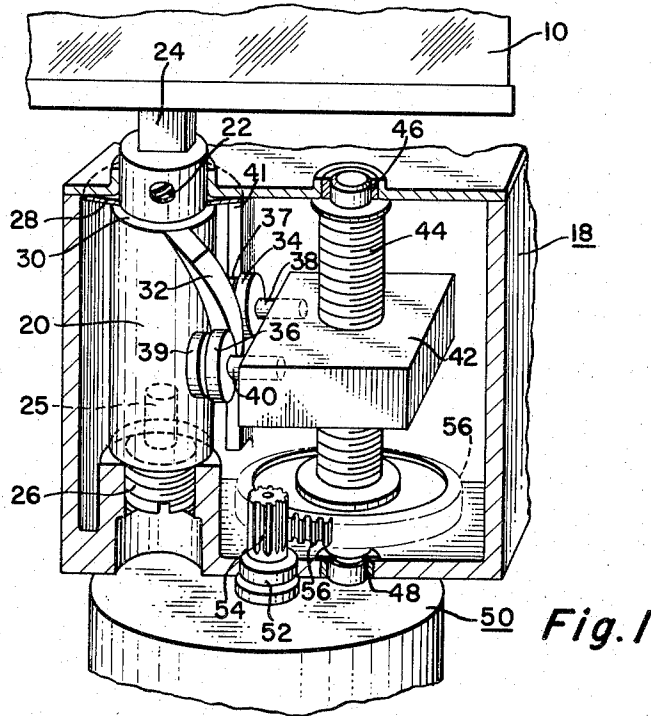


Fig. 1

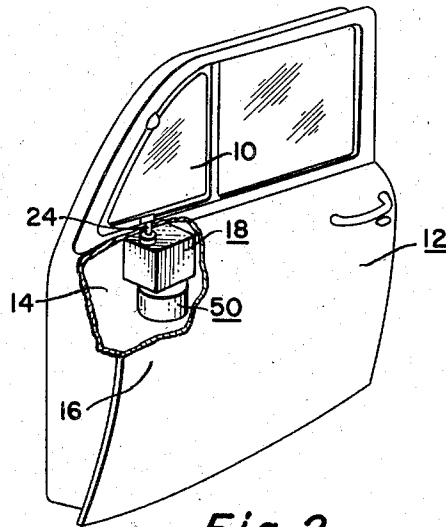


Fig. 2

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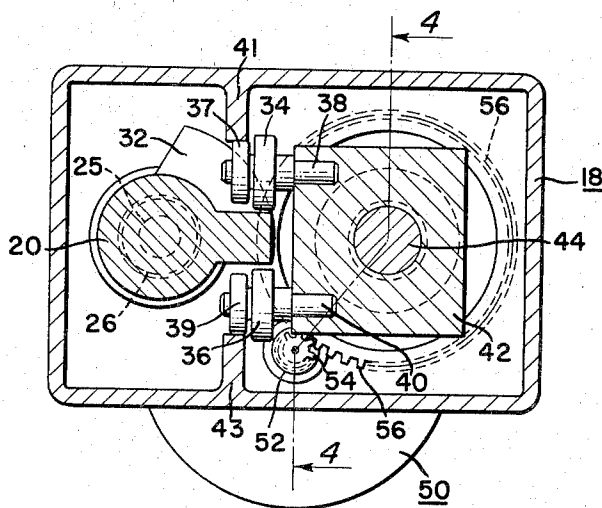


Fig. 3

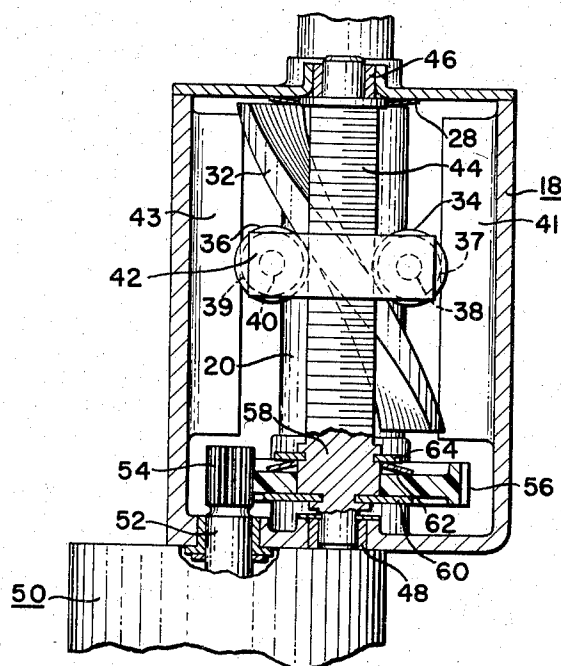


Fig. 4

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## VEHICLE WINDOW ACTUATORS

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Application April 21, 1958, Serial No. 729,845

8 Claims. (Cl. 268—121)

This invention pertains to actuating mechanism for operating a pivotally mounted device, and particularly to an electric motor driven actuator for operating a pivotally mounted window.

Heretofore, numerous actuators have been designed for operating pivotally mounted ventilator windows in automobiles. However, prior actuators have been unduly complex and bulky. The present invention relates to a compact window actuator of simple design which is powered by a reversible electric motor. Accordingly, among our objects are the provision of a compact actuator for operating a pivotally mounted device; the further provision of an electric motor driven actuator for operating a pivotally movable device including a friction overload clutch; and the still further provision of a power unit for a pivotally mounted vehicle window including a screw and nut type actuator and means for converting reciprocation of a nut into angular movement of a pivot shaft.

The aforementioned and other objects are accomplished in the present invention by interconnecting a reciprocable nut and a pivot shaft by straddling type helical cam and cam follower parts. Specifically, the window actuator is disposed between the inner and outer panels of a vehicle door and comprises a housing attached to the door. A reversible electric motor is supported by the housing, and has a drive pinion disposed within the housing which meshes with a spur gear. The spur gear is rotatably supported on a screw shaft which is rotatably mounted in the housing. The spur gear is drivingly connected to the screw shaft through an overload friction clutch which prevents jamming of the nut and screw shaft and the window is moved to the closed position.

A nonrotatable nut threadedly engages the screw shaft whereby rotation of the screw shaft effects reciprocation of the nut. The pivot shaft to which the ventilator window is attached is rotatably supported in the housing, the axis of the pivot shaft being parallel to but spaced from the axis of the screw shaft. The pivot shaft has a radially projecting helical cam thereon, and the nut has a pair of pins attached thereto which extend towards the pivot shaft. A pair of rollers are journaled on the pins adjacent their outer ends, the rollers straddling the helical cam on the pivot shaft whereby reciprocation of the nut will effect angular movement of the pivot shaft.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Figure 1 is a fragmentary view, partly in section and partly in elevation of a window unit actuator constructed according to this invention.

Figure 2 is a perspective view of a vehicle door, with certain parts broken away, showing the installation of a window actuator constructed according to this invention.

Figure 3 is a sectional view of a window actuator.

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Figure 4 is a fragmentary view, partly in section and partly in elevation, taken along line 4—4 of Figure 3.

With particular reference to Figures 1 and 2, the actuator of the present invention is designed for operating a ventilator window 10 which is pivotally mounted in a vehicle door 12. The vehicle door includes inner and outer panels 14 and 16 respectively, and the window frame may be provided with conventional resilient weather stripping material, not shown, so that portions of the inner and outer edges of the window 10 sealingly engage the weather stripping material, which weather stripping material constitutes a stop for the ventilator window in the closed position thereof.

As seen in Figure 2, the actuator includes a housing 18 which is suitably attached to the door and disposed between the inner and outer panels 14 and 16 thereof. A pivot shaft 20 is rotatably mounted on a vertical axis within the housing 18. The pivot shaft 20 is connected by means of a set screw 22 to the post assembly 24 of the ventilator window 10. The pivot shaft 20 is rotatably supported within the housing 18 at its lower end on a pin 25 disposed within a cylindrical recess of the shaft, the pin being integral with a screw 26 which threadedly engages the housing 18. A spring washer 28 is disposed between the top of the housing 18 and a shoulder 30 on the shaft, the spring washer 28 resiliently maintaining the lower end of the shaft 20 in engagement with the pin 25. The screw 26 is utilized to adjust the vertical position of the shaft 20 so as to compensate for dimensional variations in the parts, and to collapse the spring washer 28. The spring washer 28 frictionally engages the housing 18 and the shaft 20 to prevent fluttering of the ventilator window.

The pivot shaft 20 has a radially projecting helical cam 32 thereon. The cam 32 is straddled by a pair of roller type followers 34 and 36 journaled on pins 38 and 40 respectively, which extend laterally from and are attached to a reciprocable nut 42. As seen in Figure 3, the pins 38 and 40 also carry rollers 37 and 39, respectively which engage ribs 41 and 43, respectively of the housing 18 so as to preclude rotation of the nut 42. The nut 42 threadedly engages a screw shaft 44 journaled by bearings 46 and 48 in the top and bottom walls of the housing, respectively. Since the nut 42 is restrained against rotation and threadedly engages the screw shaft 44, rotation of the screw shaft will effect reciprocation of the nut 42, and reciprocation of the nut 42 will effect angular movement of the pivot shaft 20 by reason of the cam followers 34 and 36 straddling the helical cam 32.

A reversible electric motor 50 has its frame attached to the housing 18 by any suitable means, not shown. The motor 50 includes an armature shaft 52 having an integral pinion gear which extends into the housing 18. The pinion gear 54, as seen in Figure 4, meshes with a spur gear 56 which is rotatably journaled on a hub portion 58 of the screw shaft 44. A collar 60 is securely attached to the screw shaft 44, and the spur gear 56 is maintained in frictional engagement with the collar 60 by a Belleville type spring washer 62. The Belleville spring washer 62 reacts between the spur gear 56 and a thrust washer 64 carried by the screw shaft 44.

The Belleville spring washer 62 normally maintains a frictional driving connection between the spur gear 56 and the collar 60 so that rotation of the motor 50 in either direction will impart rotation to the screw shaft 44. However, in order to prevent jamming of the window 10 in the closed position, the spur gear 56 will slip relative to the collar 60 if the motor is energized so as to impart closing movement to the window 10 when the window 10 is in the closed position, wherein movement of the window 10 is arrested by the resilient weather stripping, not shown.

Thus, the Belleville spring washer 62, the gear 56 and the collar 60 constitute an over-load type friction clutch which permits rotation of the spur gear 56 relative to the screw shaft 44 when pivotal movement of the window 10 is precluded for any reason.

The reversible electric motor 50 can be controlled by any suitable means, not shown, which are easily assessible to the driver. When the motor 50 is energized for rotation in one direction, the nut 42 will move upwardly, as viewed in Figure 4, thereby effecting counterclockwise angular movement of the pivot shaft 20 as viewed in Figures 1 and 3 so as to open the ventilator window 10. Conversely, when the motor 50 is energized for rotation in the opposite direction, the nut 42 will move downwardly, as viewed in Figures 1 and 4 so as to impart clockwise angular movement to the pivot shaft 20 thereby moving the window 10 towards the closed position.

From the foregoing it is readily apparent that the present invention provides a simple and compact electric motor driven actuator for operating ventilator windows. Moreover, the actuator mechanism includes overload clutch means for preventing stalling of the motor or jamming of the window.

While the embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. An actuator for operating a pivotally mounted closure including, a rotatable member, a nonrotatable element operatively connected with said rotatable member whereby rotation of said member effects reciprocation of said element, a pivot shaft rotatable about an axis parallel to but spaced from the axis of said member and having a helical cam projection thereon, a pair of cam followers attached to said nonrotatable element and straddling said helical cam whereby reciprocation of said element effects angular movement of said pivot shaft, means connecting said pivot shaft and said pivotally mounted closure, and reversible power means for rotating said rotatable member.

2. An actuator for operating a pivotally mounted closure including, a rotatable member, a nonrotatable element operatively connected with said rotatable member whereby rotation of said member effects reciprocation of said element, a pivot shaft attached to said closure and rotatable about an axis parallel to but spaced from the axis of said rotatable member, said pivot shaft having a radially projecting helical cam thereon, a pair of cam followers attached to said nonrotatable element and straddling said cam whereby reciprocation of said element effects angular movement of said pivot shaft, reversible power means for rotating said member, and an overload clutch operatively interconnecting said power means and said member.

3. An actuator for operating a pivotally mounted closure including, a rotatable screw shaft, a non-rotatable nut threadedly engaging said screw shaft whereby rotation of said screw shaft effects reciprocation of said nut, a pivot shaft attached to said closure and rotatable about an axis parallel to but spaced from the axis of said screw shaft, said pivot shaft having a radially projecting helical cam thereon, a pair of cam followers attached to said nut and straddling said cam whereby reciprocation of said nut effects angular movement of said pivot shaft, and a reversible electric motor drivingly connected to said screw shaft effecting rotation thereof.

4. An actuator for operating a pivotally mounted closure including, a rotatable screw shaft, a nonrotatable nut threadedly engaging said screw shaft whereby rotation of said screw shaft will effect reciprocation of said nut, a pivot shaft rotatable about an axis parallel to but spaced from the axis of said screw shaft and attached to said

closure, coengaging cam and cam follower parts on said pivot shaft and said nut whereby reciprocation of said nut effects angular movement of said pivot shaft, and a reversible electric motor drivingly connected to said screw shaft for effecting rotation thereof.

5. An actuator for operating a pivotally movable ventilator window mounted in a door, including, a housing attached to said door, a pivot shaft rotatably supported in said housing and attached to said window, a screw shaft supported for rotation in said housing about an axis parallel to but spaced from the axis of said pivot shaft, a nonrotatable nut threadedly engaging said screw shaft whereby rotation of said screw shaft effects reciprocation of said nut, coengaging cam and cam follower parts on said pivot shaft and said nut whereby reciprocation of said nut effects angular movement of said pivot shaft, and a reversible electric motor attached to said housing and having an output shaft drivingly connected with said screw shaft for imparting rotation thereto.

6. An actuator for operating a pivotally movable ventilator window mounted in a door, including, a housing attached to said door, a pivot shaft rotatably supported in said housing and attached to said window, said pivot shaft having a laterally extending helical cam thereon, a screw shaft supported for rotation in said housing about an axis parallel to but spaced from the axis of said pivot shaft, a nonrotatable nut threadedly engaging said screw shaft so as to reciprocate upon rotation of said screw shaft, a pair of cam followers attached to said nut and straddling said helical cam whereby reciprocation of said nut effects angular movement of said pivot shaft, and a reversible electric motor attached to said housing and having an output shaft drivingly connected with said screw shaft.

7. An actuator for operating a pivotally movable ventilator window mounted in a door, including, a housing attached to said door, a pivot shaft rotatably supported in said housing and attached to said window, said pivot shaft having a radially extending helical cam thereon, a screw shaft supported for rotation in said housing about an axis parallel to but spaced from the axis of said pivot shaft, a nut slidably engaging said housing so as to be restrained against rotation and threadedly engaging said screw shaft so as to reciprocate upon rotation of said screw shaft, a pair of spaced pins attached to said nut and extending towards said pivot shaft, a pair of rollers journaled on said pins and straddling said helical cam whereby reciprocation of said nut effects angular movement of said pivot shaft, and a reversible electric motor attached to said housing and having an output shaft drivingly connected with said screw shaft.

8. An actuator for operating a pivotally movable ventilator window mounted in a door, including, a housing attached to said door, a pivot shaft rotatably supported in said housing and attached to said window, said pivot shaft having a radially extending helical cam thereon, a screw shaft supported for rotation in said housing about an axis parallel to but spaced from the axis of said pivot shaft, a nut slidably engaging said housing so as to be restrained against rotation and threadedly engaging said screw shaft so as to reciprocate upon rotation of said screw shaft, a pair of spaced pins attached to said nut and extending towards said pivot shaft, a pair of rollers journaled on said pins and straddling said helical cam whereby reciprocation of said nut effects angular movement of said pivot shaft, a reversible electric motor attached to said housing and having an output shaft disposed therein, and means including an overload friction clutch interconnecting said motor shaft and said screw shaft.

No references cited.