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VEHICLE WINDOW REGULATOR

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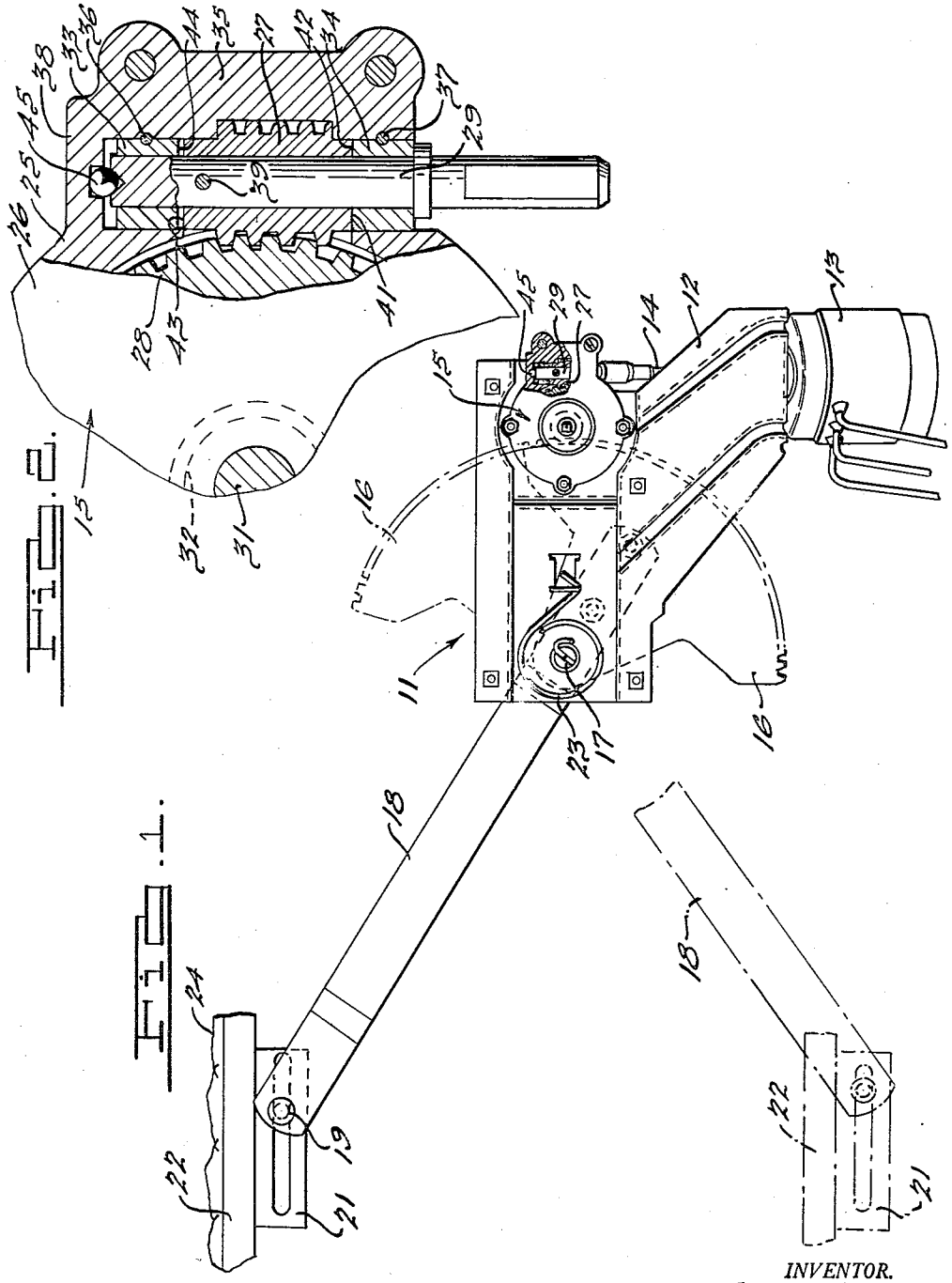


Fig. 2.

Fig. 1.

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VEHICLE WINDOW REGULATOR

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6 Claims. (Cl. 268—124)

This invention relates to vehicle window regulators, and more particularly to electric motor driven regulators of the type having a gear or gear sector connected to the regulator linkage and driven through a power transmission unit.

It is an object of the present invention to provide an improved window regulator of the above nature, which includes means by which the window can be lifted by grasping it manually in case of power failure, but is prevented from being lowered by manual pressure at all times.

It is another object to provide an improved window regulator having these characteristics, in which the above described functions are accomplished utilizing the standard power transmission unit and other conventional regulator parts.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description, taken in conjunction with the accompanying drawings.

In the drawings:

Figure 1 is a side elevational view of a typical electric window regulator embodying the invention; and

Figure 2 is a detailed elevational view, partly in cross-section and showing the thrust bearing arrangement for the worm.

Referring to Figure 1, a typical electric window regulator 11 is shown of the type, for example, described and claimed in application Serial No. 224,945 of Earl M. Barden for Vehicle Window Regulator, filed May 7, 1951, and assigned to the assignee of the present application. This regulator comprises a unitary mounting plate 12 from which is suspended an electric motor 13, the motor being connected by a flexible shaft 14 with a power transmission unit 15. This unit includes worm reduction gearing, the output of which is connected with gear sector 16 pivotally mounted at 17 on the mounting plate 12. A window regulator arm 18 is secured at one end to gear sector 16 and is connected at its other end by a pin 19 with a slotted bracket 21 secured to window frame 22. A counterbalance spring 23 is provided for counteracting the weight of the window, and it will be seen that by driving motor 13 is opposite directions gear sector 16 will be rotated counterclockwise to lower window 24 or clockwise to raise the window.

Since the window 24 is not provided with regulating means other than electric motor 13, it is desirable that means be provided for closing the window in cases where the motor 13 is inoperative, for example in cases of power failure, so that the car may be locked against entrance from the outside. The novel means of this invention provides for manual lifting of the window if even a small part thereof is exposed and can be manually grasped. At the same time, the invention prevents any possibility of lowering the window by manual force on the window or a connected part. The invention is incorporated in the power transmission unit 15 of the window regulator, which is shown in the enlarged view of Figure 2. This unit has an enclosing housing 25 and a cover plate 26, these parts enclosing a worm 27 and a worm gear 28. Worm 27 is mounted on a worm shaft 29 which is connected to motor 13 by flexible coupling 14, and the worm meshes with worm gear 28 which is mounted on a shaft 31. Output pinion 32 shown in dotted lines in Figure 2 is secured to one end of shaft 31 and meshes with gear sector 16.

Worm shaft 29 is rotatably supported by bearing means comprising a pair of bushings 33 and 34, preferably of bronze or similar material, which are held within rectangular portion 35 of housing 25. Bushings 33 and 34 are held against movement by pins 36 and 37 respectively, and the housing adjacent bushing 33 has an end wall enclosure 38 so that the parts may be assembled through the opposite end of housing portion 35.

The helix angle and pitch of worm 27 and worm gear 28 are such that disregarding outside frictional forces, worm 27 can be either the driving member or the driven member. In other words, assuming there are no outside retarding forces other than in motor 13, worm 27 can be driven by rotating worm gear 28, for example by a force exerted to lower or raise window 24. The invention provides means by which this reversibility of the worm and worm gear can be made effective only in one direction, that is, when raising the window, but is made ineffective when it is attempted to lower the window.

The means for accomplishing this purpose comprises the thrust bearing supports for worm 27, which is secured to the worm shaft by means of pin 39. The arrangement is such that the end face 41 of the worm 27 is engageable with the end face 42 of bushing 34, whereas the opposite end face 43 of the worm 27 is held from engagement with end face 44 of bushing 33. An anti-friction ball thrust member 45 is disposed between the end of shaft 29 adjacent bushing 33 and wall 38 of the housing. In this manner, it will be seen that due to the inherent play in the worm shaft supports, the engagement of surfaces 41 and 42 when worm gear 28 is urged clockwise will result in sufficient frictional contact to prevent rotation of worm 27. However, when worm gear 28 is urged in a counterclockwise direction, surfaces 41 and 42 will no longer be forced into contact, and the thrust load will be taken by ball thrust bearing 45 which acts as an anti-friction member. The worm gear 28 can therefore be readily rotated in a counterclockwise direction, turning worm 27, worm shaft 29 and electric motor 13.

In actual practice, the parts used in constructing the device of this invention can for the most part be those ordinarily used in the manufacture of a power transmission unit of the type shown. It is merely necessary to shorten the length of bushing 33 so that it will no longer be engageable with end face 43 of the worm 27. At the same time, a ball thrust member 45 is disposed in appropriate facing recesses in end wall 38 of the housing and in the end of shaft 29.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A window regulator comprising a reversible electric motor, a worm driven by said motor, a worm gear operatively meshing with said worm, the shape of said worm and worm gear teeth being such as to normally permit said worm gear to drive said worm in either direction, linkage means connected to said worm gear for moving

a window to either a closed or open position, an anti-friction thrust support at one end of said worm, and a frictional thrust support at the opposite end of said worm, said frictional thrust support preventing said worm gear from driving said worm when the worm gear is urged in a window-opening direction.

2. In a window regulator, a reversible electric motor, a worm driven by said motor, a worm gear operatively connected to said worm, the shape of said worm and worm gear teeth being such as to permit said worm gear to normally drive said worm in either direction, linkage means for connecting said worm gear to a movable window, said worm gear being rotated in one direction when said window is closed and in the opposite direction when said window is opened, a pair of bushings supporting the opposite ends of said worm, one of said bushings being engageable by the adjacent end of said worm when said worm gear is urged in one direction, and antifriction means for preventing the other end of said worm from engaging its corresponding bushing when the worm gear is urged in the opposite direction.

3. In a window regulator, a reversible electric motor, a worm driven by said motor, a worm gear operatively connected to said worm, the shape of said worm and worm gear teeth being such as to permit said worm gear to normally drive said worm in either direction, linkage means for connecting said worm gear to a movable window, said worm gear being rotated in one direction when said window is closed and in the opposite direction when said window is opened, a pair of bushings supporting the opposite ends of said worm, one of said bushings being engageable by the adjacent end of said worm when said worm gear is urged in one direction, and ball thrust bearing means operable when said worm gear is urged in the opposite direction to take the thrust load on said worm, whereby the opposite end of said worm is prevented from engagement with its corresponding bushing.

4. In combination, a shaft, means for connecting a driver to said shaft, a worm on said shaft having opposite end faces, a pair of bushings supporting said worm shaft on opposite sides of said worm, one of said bushings being frictionally engageable with its corresponding worm end face, the other of said bushings being spaced from its corresponding worm end face, an anti-friction thrust support for said worm shaft adjacent said last-mentioned bushing, the dimensions of said thrust support being such as to maintain the spaced relationship between said other bushing and worm end face, and a worm gear

operatively meshing with said worm, said worm being rotatable by said worm gear when the latter is urged in a direction so as to place a thrust load on said anti-friction thrust means, the frictional engagement between said first bushing and said worm preventing said worm gear from driving said worm in the opposite direction.

5. A window regulator comprising a mounting plate, a reversible electric motor supported by said mounting plate, a gear sector rotatably secured to said mounting plate, a window actuating linkage secured to said gear sector, a power transmission unit supported by said mounting plate, said unit having a worm driven by said electric motor, a worm gear meshing with said worm, the shape of said worm and worm gear teeth being such as to normally permit said worm gear to drive said worm in either direction, an output pinion directly connected to said worm gear and meshing with said gear sector, means for braking said power transmission unit when said linkage is urged in a window-opening direction by an outside force, said means comprising a frictional thrust support for said worm when urged in one direction by said worm gear, and means for preventing braking of said power transmission unit when said linkage is urged by an outside force in a window-closing direction, said last-mentioned means comprising an anti-friction thrust support for said worm when urged in the opposite direction.

6. In combination, a shaft, means for connecting a driver to said shaft, a worm on said shaft, a worm gear operatively meshing with said worm and adapted to be connected to a driven member, the shape of said worm and worm gear teeth being such as to normally permit said worm gear to drive said worm in either direction, a frictional thrust support for preventing movement of said worm shaft in one axial direction, and an anti-friction support for preventing movement of said worm shaft in the other axial direction, whereby said worm gear is capable of driving said worm in one direction only.

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