Feb. 17, 1959 E. A. SCHNEIDEWIND 2,873,612

WINDOW REGULATOR MECHANISM

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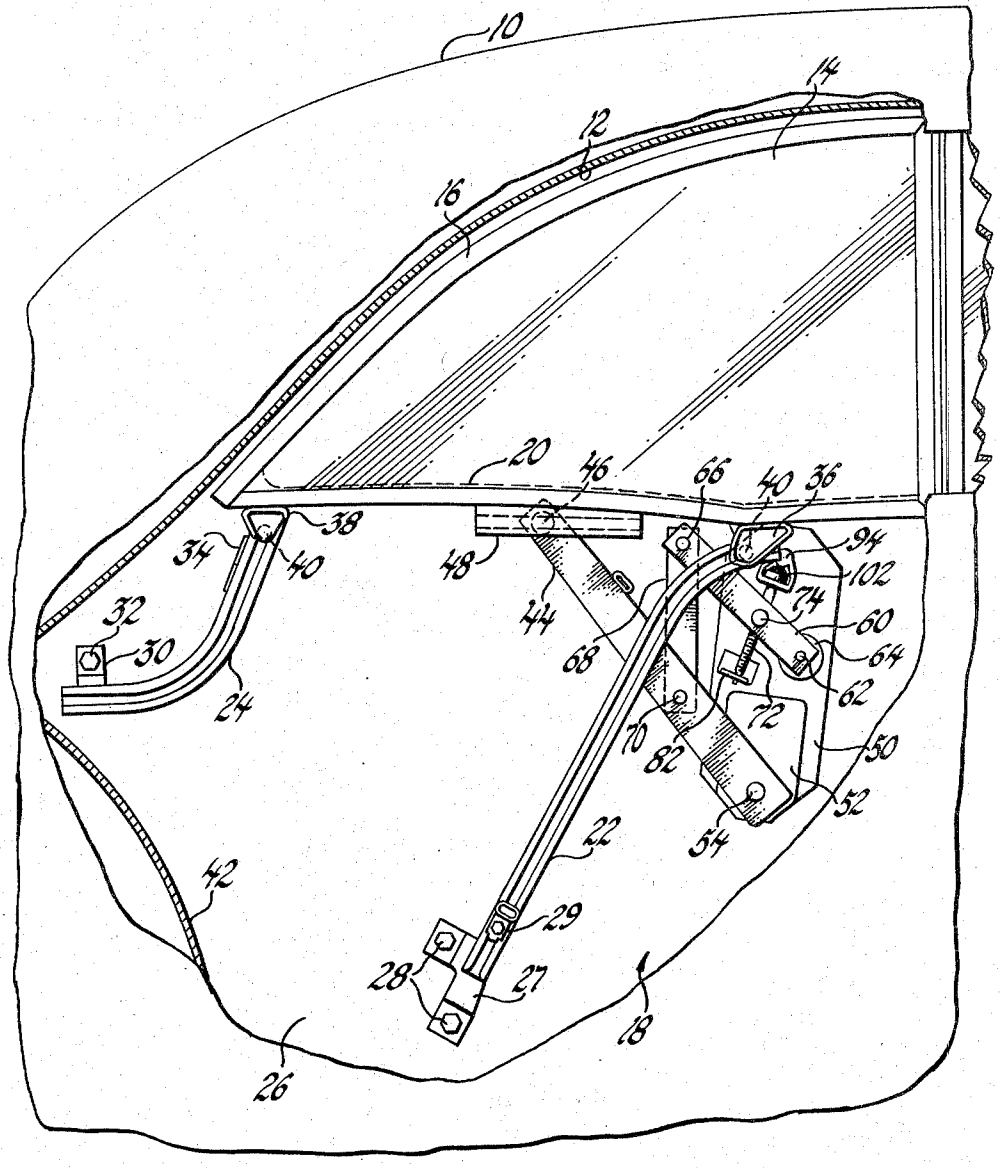

Fig. 1

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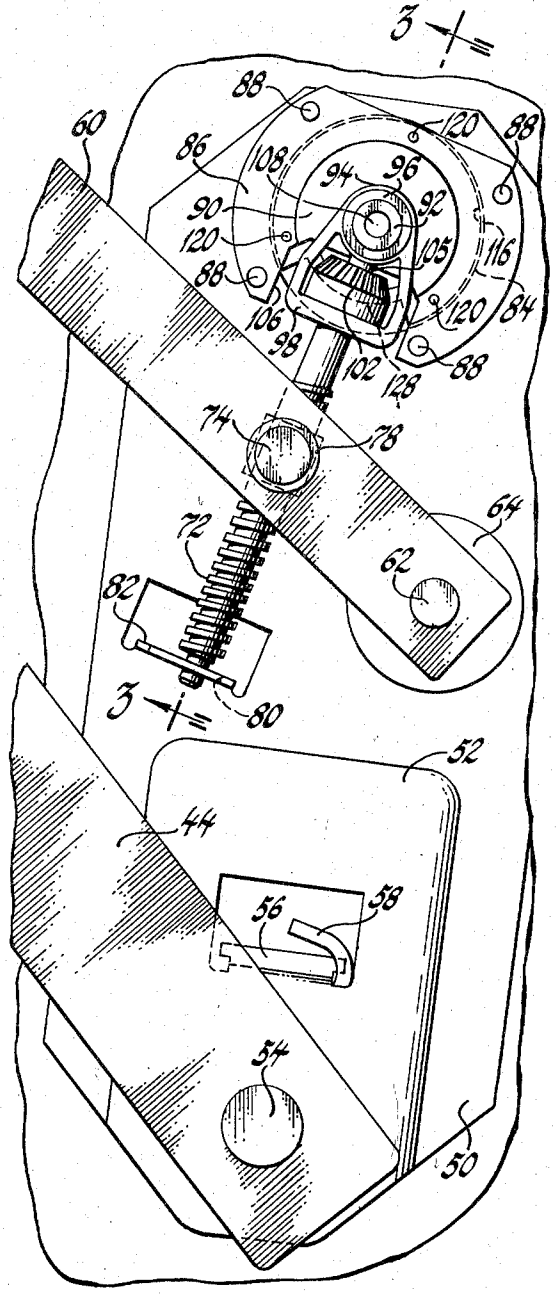

Fig. 2

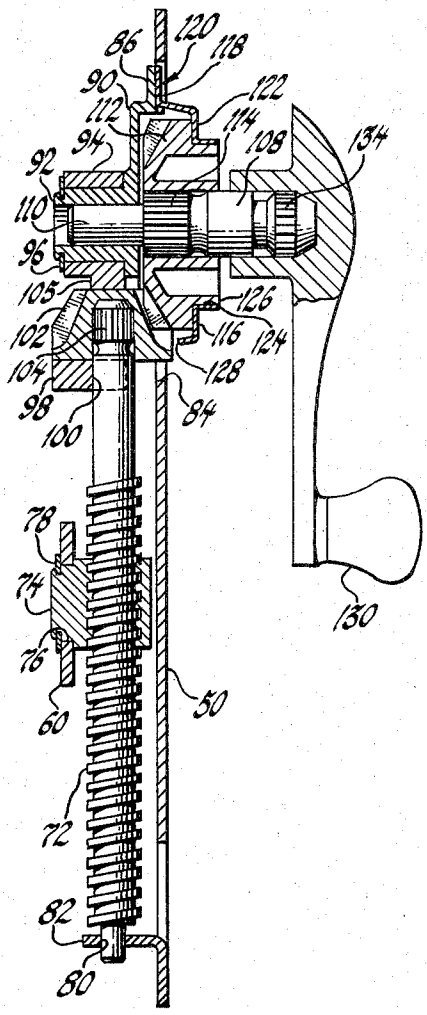

Fig. 3

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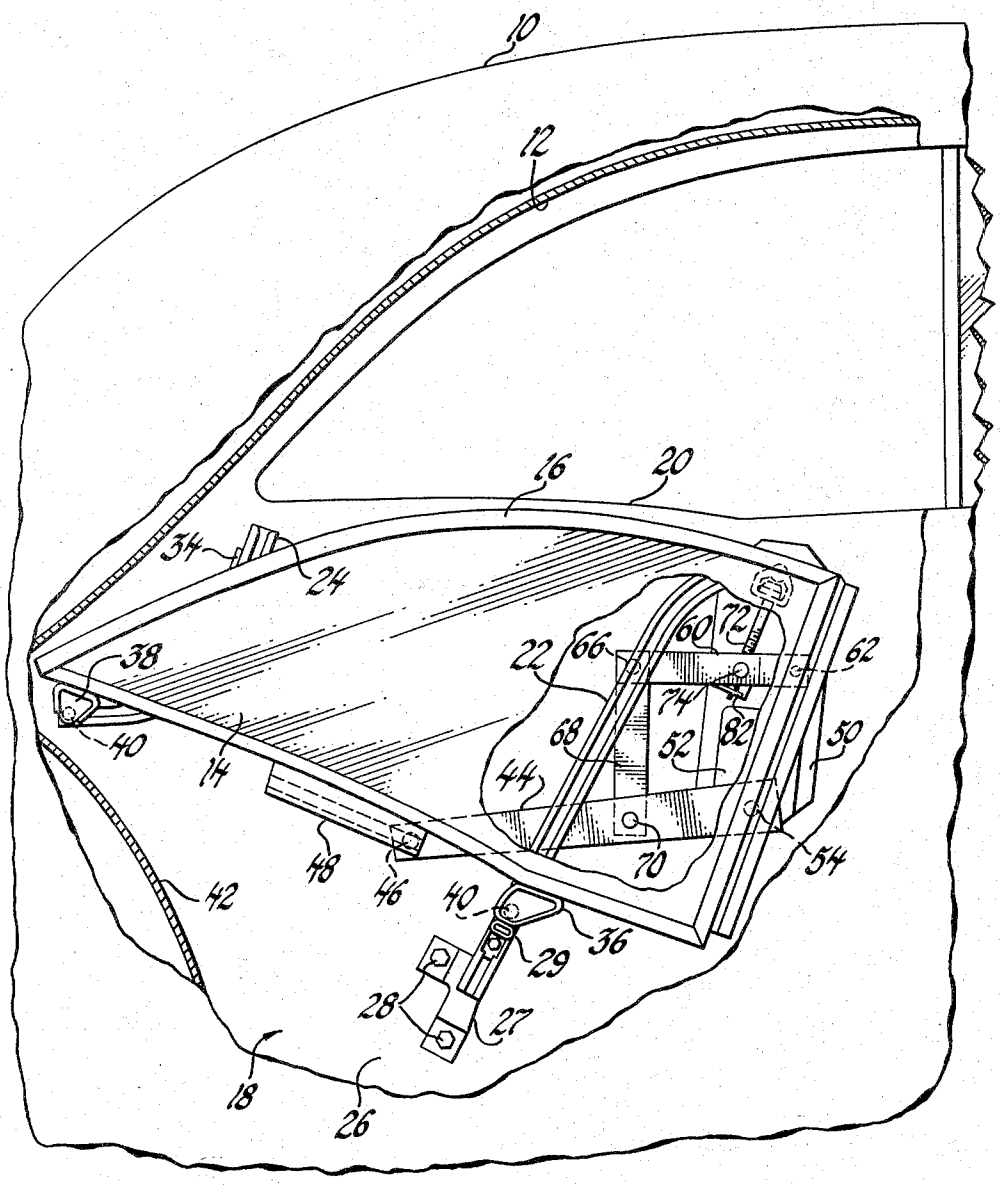

Fig. 4

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WINDOW REGULATOR MECHANISM

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Application June 7, 1956, Serial No. 590,031

5 Claims. (Cl. 74—89)

This invention relates to window regulator mechanisms and more particularly to window regulator mechanisms adapted for use in vehicle bodies.

An object of this invention is to provide a new and improved window regulator mechanism adapted for use in vehicle bodies. Another object of this invention is to provide a new and improved window regulator mechanism adapted for use in vehicle bodies and operative to move the window to a plurality of positions and hold the window in any position thereof without shifting movement of the window.

These and other objects of this invention will be readily apparent from the following specification and drawings, in which:

Figure 1 is a partial view of a vehicle body embodying a window regulator mechanism according to this invention, with parts broken away for clarity of illustration and the window being shown in closed position;

Figure 2 is an enlarged view of a portion of the window regulator mechanism of Figure 1;

Figure 3 is a sectional view taken on the plane indicated by line 3—3 of Figure 2; and

Figure 4 is a view similar to Figure 1 showing the window in open position.

Referring now to Figure 1 of the drawings, a vehicle body **10** is provided with a rear window opening **12**. A window **14** mounted within a window frame **16** is adapted to open and close the window opening **12** and is movable between a closed position, as shown in Figure 1, and an open position, as shown in Figure 4, wherein the window is positioned obliquely within the window well **18** below the lower edge portion **20** of the window opening. Front and rear arcuately shaped guide channels **22** and **24**, respectively, are provided within window well **18** to guide the window in its movement between open and closed positions. The front guide channel **22** is located in spaced relationship to the vehicle body inner panel **26** and has its base adjacent the lower end thereof secured to a bracket **27** mounted on the vehicle body inner panel at **28**. The upper end of the front guide channel is also secured in a suitable manner to the vehicle body inner panel. An adjustable stop **29** adjacent the lower end of the front guide channel locates the forward portion of window **14** in open position. The rear guide channel **24** is supported at its lower end on the vehicle body inner panel **26** by a bracket **30** secured thereto at **32**. The upper end of this guide channel is supported on the vehicle body inner panel **26** by an angular bracket **34** which is secured to the rear side of the guide channel and secured to the body inner panel beneath the guide channel.

Front and rear brackets **36** and **38**, respectively, are secured to the lower window frame member of window frame **16** and mount studs **40** which are adapted to interlock within the front and rear guide channels so as to pivotally and slidably interconnect the window with the guide channels. As previously mentioned, the guide channels guide the movement of the window between

open and closed positions. Since the rear wheel housing **42** projects into the window well **18**, window **14** cannot be moved between closed and open positions along a vertical path but must be rotated in its vertical path of movement in order to be disposed within the window well. This rotational movement of window **14** is imparted to the window by the front and rear guide channels so that the window is disposed in an oblique position within window well **18** in the open position thereof, as shown in Figure 4.

A window lift arm **44** pivotally supported by the body inner panel **26**, as will be described, imparts translational movement to the window. The upper end of the lift arm mounts a laterally outwardly extending stud **46** which is pivotally and slidably received within an inwardly opening channel **48** secured to the lower window frame member of window frame **16** intermediate brackets **36** and **38**. The window lift arm **44** swings between the front guide channel **22** and the body inner panel.

Referring now particularly to Figures 1, 2, and 3 of the drawings, the operating mechanism for lift arm **44** will be described. A back plate **50** is detachably secured in a suitable manner to the vehicle body inner panel **26**. The lower portion of the back plate includes an outwardly embossed portion **52**, and the lower end of lift arm **44** is pivotally secured to embossed portion **52** at **54**. A tab **56** lanced out of the embossed portion extends laterally inwardly thereto to provide a stop for the outer end **58** of the coil counterbalance spring which counterbalances the lift arm. The inner end of the coil counterbalance spring is secured to pivot **54** in a suitable manner as is well known.

A toggle linkage includes link **60** pivoted at **62** on an outwardly embossed circular portion **64** of the back plate and pivoted at **66** to one end of link **68**. The other end of link **68** is pivoted at **70** on lift arm **44** intermediate the pivot **54** of the lift arm on the back plate and the stud **46** which is pivotally secured to the upper end of the lift arm. When the window **14** is in closed position, as shown in Figure 1, the toggle linkage is disposed in a substantially folded position to the upper side of lift arm **44** and defines an angle of less than 90 degrees. When the window is moved to open position, as shown in Figure 4, by downward swinging movement of the lift arm **44** about pivot **54**, the toggle linkage is partially unfolded to define an angle of approximately 90 degrees but still remains to the upper side of the lift arm. Thus, it can be seen that the toggle linkage does not cross over the lift arm in any position thereof and moves between a folded and partially unfolded position upon movement of the lift arm between window closed and window open positions. The toggle linkage also moves between the front guide channel **22** and the vehicle body inner panel **26** as can be seen in Figure 1.

In order to fold and unfold the toggle linkage to swing the lift arm, a manually operable mechanism is provided as shown particularly in Figures 2 and 3. A threaded shaft **72** is threadedly receive by a nut **74** which is pivotally secured to link **60** by having a shouldered end of the nut extend through an aperture **76** in the link and being peened over a washer **78** which bears against link **60**. The lower end of shaft **72** is received within a slot **80** provided in a laterally outwardly extending tab **82** lanced out of back plate **50**. A circular opening **84** is provided in back plate **50** adjacent the upper end thereof and a gear housing **86** secured to the back plate at **88** covers the outer side of the opening. Housing **86** includes an annular outwardly extending embossed portion **90**, and a sleeve **92** which extends laterally outwardly from the center of the embossed portion. A swivel bearing **94** is swingably mounted on the sleeve **92** of hous-

ing 86 and retained in place by peening the end of sleeve 92 over a washer 96. The U-shaped support portion 98 of the swivel bearing has a slot 100 in its base web which provides a bearing for the upper end of shaft 72. A bevel gear 102 fits within support portion 98 and is splined at 104 to the upper end of the shaft to axially locate the shaft within slot 100. A downwardly extending projection 105 of bearing 94 bears against the upper face of bevel gear 102 to hold the lower face thereof in bearing engagement with the upper face of the base web of support portion 98 to locate the bevel gear and prevent axial shifting movement thereof and of shaft 72. Housing 86 is cut out at 106 to provide space for bevel gear 102 and to also allow a certain amount of swinging movement of the swivel bearing and bevel gear as a unit relative to the housing as will be described.

A shaft 108 has one shouldered end 110 thereof slidably and rotatably received by the sleeve 92 of housing 86. A bevel gear 112 splined at 114 to shaft 108 drivingly meshes with the bevel gear 102 splined to shaft 72. A gear casing 116 includes an annular flange 118 which is secured at 120 to the flange of gear housing 86 to mount the gear casing on the back plate. The gear casing includes a central annular embossed portion 122 which extends laterally inwardly with respect to the back plate and is provided with a flanged opening 124. The gear casing surrounds bevel gear 112, as shown in Figure 3, with the rear face of the bevel gear bearing against the base of the central annular portion 122 of the gear casing and a sleeve portion 126 of the bevel gear fitting within the flanged opening 124 of the casing to provide a bearing support for the bevel gear and to also locate the end 110 of shaft 108 within sleeve 92. The bevel gear 112 also radially locates the upper end of shaft 72 within slot 100 since the bevel gear meshes with bevel gear 102 and is located by gear casing 116. A portion of the gear casing 116 is cut away at 128 to provide both rotary and swinging clearance for bevel gear 102.

A handle 130 is provided with a splined bore which receives the splined end 134 of shaft 108 to mount the handle on the shaft. It will be noted that upon rotation of handle 130 in either direction, shaft 108 and bevel gear 112 will be rotated in the same direction to drive bevel gear 102 and shaft 72.

As previously mentioned, when window 14 is in closed position, as shown in Figure 1, the toggle linkage is disposed to the upper side of lift arm 44 and is in a substantially folded position wherein links 60 and 68 define an angle less than 90 degrees. When it is desired to move the window 14 from its closed position, as shown in Figure 1, to its open position within the window well 18, as shown in Figure 4, handle 130 is manually rotated to drive shaft 108 and bevel gear 112 in the approriate direction. Upon rotation of bevel gear 112, bevel gear 102 and shaft 72 will also be rotated. Since nut 74 is held against rotation by being pivotally secured to link 60, rotation of shaft 72 will cause the nut to travel axially and downwardly along the shaft as the shaft is rotated. As the nut moves axially and downwardly along shaft 72, it will swing link 60 counterclockwise about its pivot 62 as viewed in Figures 1, 2, and 4 to thereby shift link 68 downwardly and swing lift arm 44 counterclockwise about its pivot 54 on the back plate.

As previously mentioned, the toggle linkage remains to the upper side of lift arm 44 in all positions thereof and does not cross over the lift arm in any manner. Thus, as the lift arm 44 swings counterclockwise about its pivot 54 or downwardly within window well 18, links 60 and 66 will be partially unfolded from their position shown in Figure 1 and will define an angle of approximately 90 degrees when the window is in open position.

During the movement of nut 74 axially and downwardly along shaft 72, the nut must also move in an arc having its center at the pivot 62 of link 60 on the back

plate. In order to allow for this movement of nut 74, the swivel bearing 94 is employed to swingably support the upper end of shaft 72 and the lower end of the shaft is slidably mounted in the slot 80 of tab 82. Thus, as link 60 swings counterclockwise about pivot 62 to move the window to open position upon axial and downward movement of nut 74 along shaft 72, the shaft and swivel bearing 94 will swing slightly clockwise about an axis defined by the axis of rotation of shaft 108 as the lower end of the shaft shifts toward the left side of slot 80 as viewed in Figures 2 and 4. As previously mentioned, the gear housing 86 is cut away at 106 to allow for this swinging and rotary movement of bevel gear 102, and the gear casing 116 is similarly cut away at 128 for the same purpose. If it is desired to move window 14 to closed position as shown in Figure 1 from an open position within window well 18, the reverse procedure takes place.

Thus, the window regulator mechanism of this invention is of relatively simple construction and yet provides for easy operation of a vehicle window. The window is held in any position thereof without shifting movement due to the threaded interaction of nut 74 and shaft 72. The pitch of the threads on the shaft and on the nut are so dimensioned that the nut will not move axially of the shaft regardless of the load on link 60 without rotary movement of the shaft. The window regulator mechanism is therefore operative to move the window to a plurality of positions and to also hold the window in any position thereof without shifting movement of the window.

Although the window regulator mechanism of this invention has been shown and described in conjunction with the rear window of a vehicle body, it will be appreciated that the mechanism may be used with equal success on other windows of vehicle bodies and in other installations.

I claim:

1. A window regulator mechanism comprising, a support, a driving arm swingably mounted on said support, articulated linkage means having one link thereof pivotally mounted on said support and another link thereof pivotally secured to said driving arm, rotatable operating means mounted on said support for swinging movement relative thereto, and means movable axially of said operating means upon rotation thereof and operatively secured to one of said links intermediate the ends thereof to swing said one link about its pivot and thereby fold and unfold said linkage means to swing said driving arm relative to said support, said operating means swinging relative to said support upon axial movement of said means to allow said means to move in an arc defined by said pivot of said one of said links.

2. A window regulator mechanism comprising, a support, a driving arm swingably mounted on said support, articulated linkage means having one link thereof pivotally mounted on said support and the other link thereof pivotally secured to said driving arm, rotatable operating means swingably mounted on said support, and means movable axially of said operating means upon rotation thereof and pivotally secured to said one link intermediate the ends thereof to swing said one link relative to said support and thereby fold and unfold said linkage means to swing said driving arm relative to said support, said operating means swinging relative to said support upon axial movement of said means to allow said means to move in an arc defined by the pivot of said one of said links on said support.

3. A window regulator mechanism comprising, a support, a driving arm swingably mounted on said support, articulated linkage means having one link thereof pivotally mounted on said support and another link thereof pivotally secured to said driving arm, shaft means rotatably mounted on said support, rotatable operating means swingably mounted on said shaft means, means movable axially of said operating means upon rotation thereof

and operatively connected to said one of said links to swing said one link about its pivot on the support and thereby fold and unfold said linkage means to swing said driving arm relative to said support, said rotatable operating means and said axially movable means cooperating to hold said driving arm in any adjusted position thereof, driving means on said shaft means, means on said operating means operatively connected to said driving means to rotate said operating means upon rotation of said driving means, and means limiting the swinging movement of said rotatable operating means about said shaft means.

4. A window regulator mechanism comprising, a support, a driving arm swingably mounted on said support, an articulated linkage having one link thereof pivotally secured to said support and the other link thereof secured to said driving arm, a shaft rotatably mounted on said support, a lead screw swingably mounted on said shaft, a nut movable axially of said lead screw upon rotation thereof and pivotally connected to said one of said links intermediate the ends thereof to swing said one link about its pivot on the support and thereby fold and unfold said linkage to swing said driving arm relative to said support, said lead screw and said nut cooperating to hold said driving arm in any adjusted position thereof, gear drive means operatively interconnecting said shaft and said lead screw, means for rotating said shaft to thereby rotate said lead screw, and means limiting the swinging movement of said lead screw relative to said support.

5. A window regulator mechanism comprising, a support, a driving arm swingably mounted on said support,

an articulated linkage having one link thereof pivotally secured to said support and the other link thereof pivotally secured to said driving arm, a housing member secured to said support and having an apertured boss therein, a shaft rotatably mounted on said support at one end thereof and having the other end thereof slidably and rotatably received within said boss, a yoke member swingably mounted on said boss, a lead screw member, a bevel gear secured to one end of said lead screw member and rotatably received within said yoke member, a nut movable axially of said lead screw and pivotally connected to said one of said links intermediate the ends thereof to swing said one link about its pivot on the support and thereby fold and unfold said linkage to swing said driving arm relative to said support, said nut and lead screw cooperating to hold said driving arm in any adjusted position thereof, a bevel gear secured to said shaft and meshing with said first-mentioned bevel gear to thereby rotate said lead screw upon rotation of said shaft, and means limiting the swinging movement of said lead screw about said housing member.

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