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J. D. LESLIE ET AL

2,848,218

WINDOW REGULATOR

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3 Sheets--Sheet 1

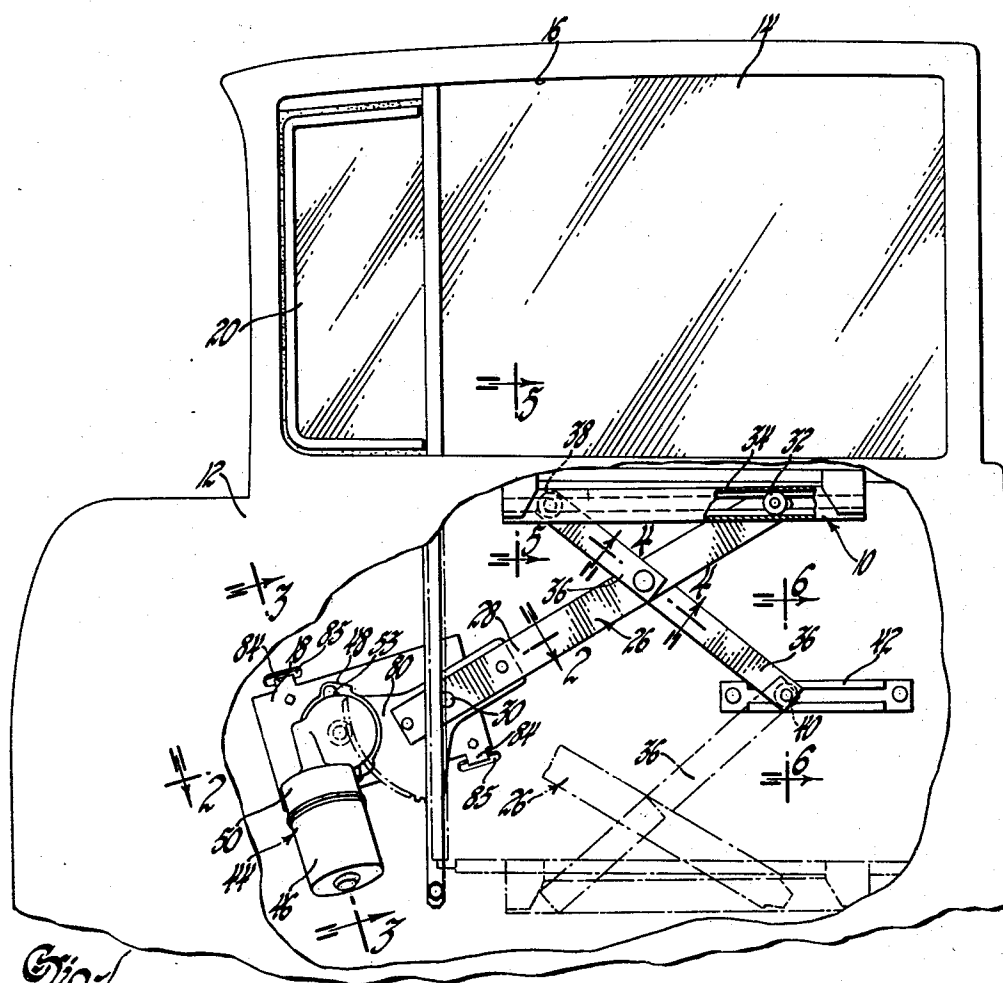
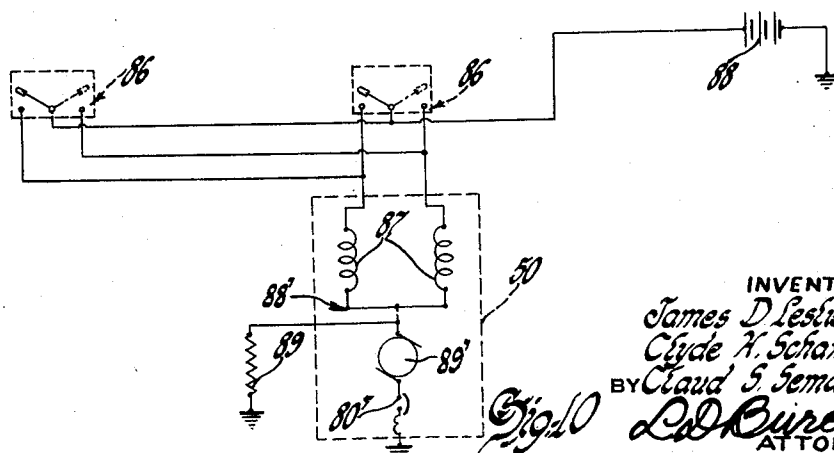


Fig. 2



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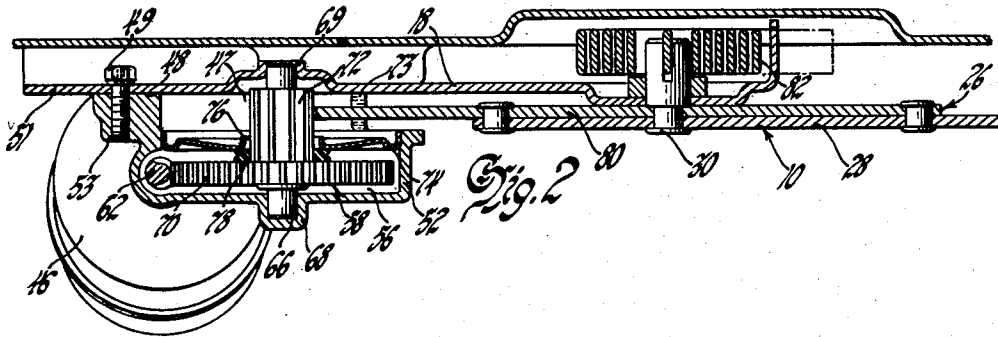
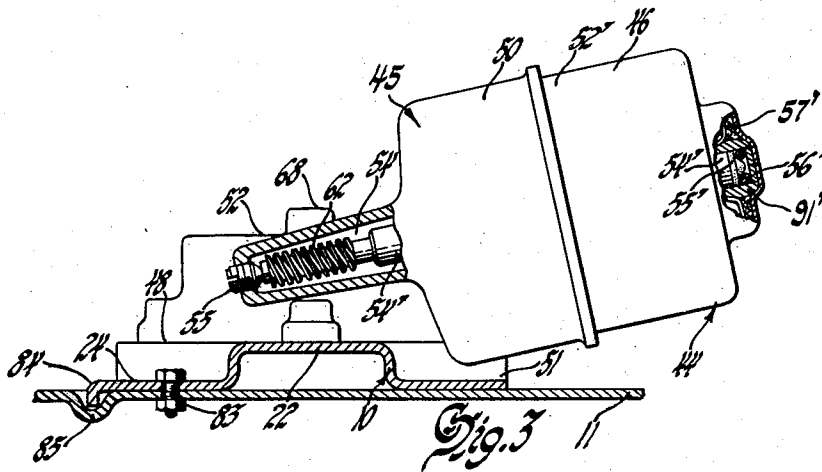
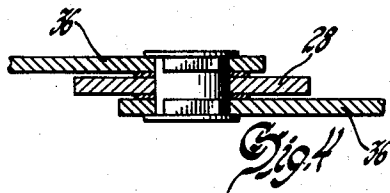
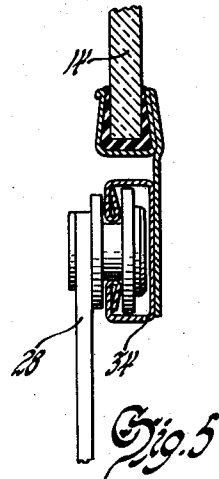
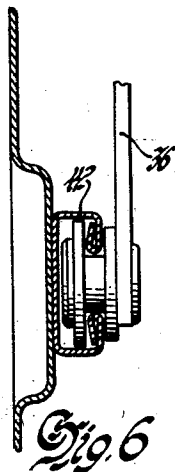
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3 Sheets-Sheet 2



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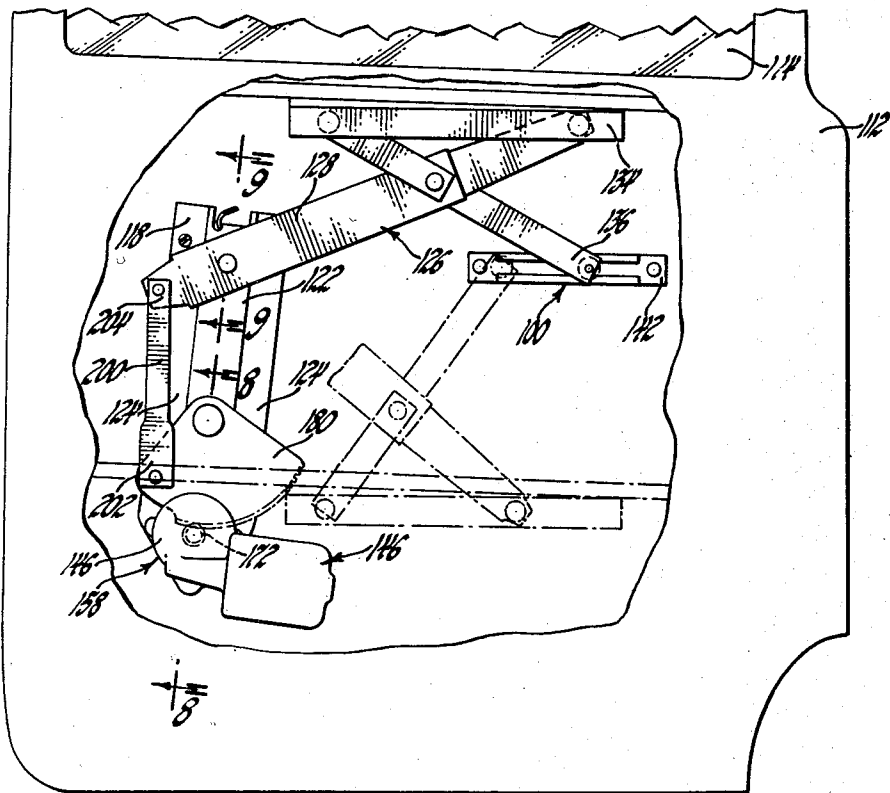


Fig. 7

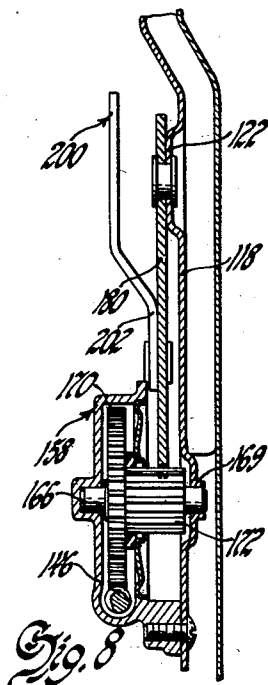


Fig. 8

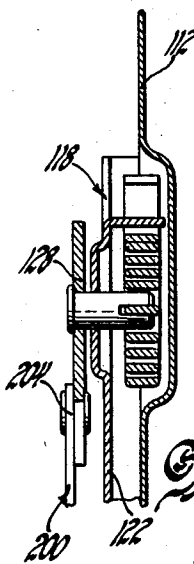


Fig. 9
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2,848,218

WINDOW REGULATOR

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Application November 24, 1953, Serial No. 393,986

4 Claims. (Cl. 268—124)

The present invention relates to window regulators and more particularly to power means for opening and closing the windows of a vehicle.

In order to facilitate the opening of the window in a vehicle, it is desirable to employ remotely controlled power means for moving the windows between the opened and closed positions. This permits the driver, even while operating the vehicle, to safely control the positions of all of the windows from a common point. Although there have been numerous power operated window regulators devised for this purpose, they have been subject to numerous objections. The power operated window regulators presently available are generally very complicated. This results in a window regulator which is not practical from a commercial standpoint because it is too expensive and unreliable to be generally accepted by the public.

It is proposed to provide a simple power operated window regulator that will be economical to manufacture. The regulator is a self-contained assembly which is supported on a single frame. This permits the regulator to be installed on a vehicle as a factory installed accessory or to be sold as an accessory for installation on fully assembled car. The power means and actuating linkage for the regulator are constructed so as to be very reliable in operation and require the minimum amount of controls and related equipment.

When an electric motor is employed for driving a window regulator it is necessary to employ a speed reducing gear train. In the past it has been the practice to place the gear train in a gear box that may be secured to the motor housing. It is now proposed to employ a single housing having a gear portion and a motor portion formed therein. These produce an integral unit which not only contains both the gear train and motor but is also very economical to manufacture.

Due to its torque characteristics and simplicity of control a series electric motor is a highly desirable power source for a window regulator. However, since there will be large variations in the amount of friction present in various windows and regulators, it is desirable to employ a motor which has a substantially constant speed regardless of load. Accordingly, it is now proposed to employ a window regulator having a series motor in which the motor may be provided with means that will produce a more constant speed regulation. This will cause the windows to be actuated at a more uniform speed.

It is also proposed to employ a window regulator having friction means disposed to provide a frictional drag on the armature of the motor. Thus when it is desired to stop the window in a certain position, the momentum of the high speed electric motor will be dissipated as soon as the motor is shut off. Therefore the tendency for the window to overrun its position will be greatly reduced.

In the drawings:

Fig. 1 is a side elevational view of a door partially

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broken away so as to more clearly show a window regulator mechanism embodying the present invention.

Fig. 2 is a cross-sectional view of the power means in the regulator mechanism taken substantially along the plane of line 2—2 in Fig. 1.

Fig. 3 is a view of the motor taken substantially along the plane of line 3—3 in Fig. 1.

Fig. 4 is a view taken substantially along the plane of line 4—4 in Fig. 1.

Fig. 5 is a view taken substantially along the plane of line 5—5 in Fig. 1.

Fig. 6 is a view taken substantially along the plane of line 6—6 in Fig. 1.

Fig. 7 is a side elevational view of a door partially broken away to show a modification of the present invention.

Fig. 8 is a cross-sectional view of the modified power means taken substantially along the plane of line 8—8 in Fig. 7.

Fig. 9 is a view taken substantially along the plane of line 9—9 in Fig. 7.

Fig. 10 is a schematic representation of the wire circuit for the motor and control therefor.

Referring to the drawings in more detail, the present invention may be embodied in any suitable window regulator 10. The present regulator is adapted to be mounted in a structure such as an automobile door 12 having a window 14 adapted to slide into and out of a window opening 16 in the door 12. Although the regulator 10 may be mounted on the door 12 in any desired position, in the preferred embodiment the regulator 10 is secured between the panels enclosing the lower portion of the door 12.

The regulator includes a frame 18 which is secured to the inner panel 11 of door 12 below a pivotally mounted ventilator 20. Although the frame 18 may be fabricated in any suitable manner, it has been found to be economical to employ a stamped sheet metal frame. The frame 18 may be provided with a raised center portion that forms a rib 22 extending longitudinally the length of the frame 18. The edge portions of the frame 18 may be laterally offset from the center portion 22 so as to form a pair of flanges 24. The flanges 24 extend longitudinally of the frame substantially parallel to the center portion 22 to form mounting means adapted to be secured to the inner panel 11 of the door 12 for supporting the frame 18 and window regulator 10. It has been found that when stopping the window, the momentum of the moving parts may cause sufficient twisting of the frame to cause the bolts 83 to work in their holes. Accordingly, the frame may be provided with tabs 84 that are bent over along the edges of flanges 24 so as to seat in the dimples 85. Thus tightening bolts 83 will compress the tabs 84 into the dimples 85 so as to absorb any torque tending to twist the frame 18.

The regulator 10 may include any linkage 26 which is suitable to be pivotally mounted on the frame 18 and to be attached to the window 14. The linkage 26 may include an elongated lever 28 which is secured to a pin 30 that extends through the frame 18. One end of the lever 28 may be provided with a roller 32 that travels in a track 34 secured to the bottom of the window 14. In order to prevent the window 14 becoming misaligned and interfering with the operation of the regulator 10, a second lever 36 may be pivotally mounted on the center of the first lever 28. The opposite ends of the lever 36 may have rollers 38 and 40 that are adapted to travel in the tracks 34 and 42, respectively. The levers 28 and 36 and track 42 are preferably positioned to maintain the track 34 level at all times. Thus as the regulator 10 moves the window 14 up or down, the two levers 28

and 36 in the linkage 26 will tend to maintain the window 14 in alignment at all times.

The linkage 26 may be actuated by any suitable means, such as the power means 44. In the present instance the power means includes a housing 46 which may have a planular face 48 formed thereon. A pair of tabs 51 may be struck up adjacent one end of the frame 18 so as to cooperate with the rib 22 and form a surface adapted to receive the posts 53 on the housing 46. The housing 46 is secured to the frame 18 by any suitable means such as a plurality of screws 49. It is preferable that the housing 46 be secured on the same side of the frame 18 as said linkage 26.

Although the housing 46 may be fabricated in any suitable manner, it preferably has a cast body 45 that includes a motor portion 50 and a gear portion 52 that is formed integral with the motor portion 50. The motor portion 50 may have a chamber 54 that is formed inside of the cast body 45 and an end cap 52' that is secured to the cast body 45. The motor 88' may be disposed in this chamber 54 and the cap 52' may be made removable to allow access to the motor 88'. The armature 89' may have a worm gear 62 formed thereon so that it will extend into the gear portion 52 for driving the gear train 58. A screw 55 may be threaded into the housing so as to apply an adjustable axial force against the armature shaft 54'. The cap 52' may have a suitable bearing such as a spherical self-aligned bearing 91' mounted therein for rotatably receiving the end of the armature or drive shaft 54'. In order to dissipate the momentum of the rotating motor 88' and prevent the window 14 coasting or overrunning after the motor 88' is shut off, a frictional drag may be applied to the armature shaft 54'. In the present instance a friction washer 55' of any suitable material such as nylon may be positioned to engage the end of the shaft 54'. Any resilient member 56' such as a rubber O-ring may be seated on the flat surface of a metallic washer 57' so as to bias the friction member 55' against the end of the shaft 54'. By adjusting the screw 55 the shaft 54' may be forced against this friction member 55' with any desired force. Thus the frictional drag on the shaft 54' may be easily controlled. This drag is preferably adjusted so that it is not sufficient to materially interfere with the operation of the motor and/or the window. However, it is preferably large enough to prevent the momentum of the motor 88' causing the window 14 to move after the motor is shut off. The gear portion 52 may have a chamber 56 formed therein for receiving the gear train 58. This chamber may be substantially cylindrical and extend through one side of the face of the housing 46 to form an opening 47. In addition this frictional drag will prevent forcing the window open by making it impossible for the gear train to turn the armature shaft 54' through the worm gear 62.

A shaft 66 may be mounted in the gear chamber 56 with one end thereof journaled in a hollow hub 68 formed in the side of the gear portion 52. The other end of the shaft 66 is rotatably supported in a bearing 69 which may be stamped or inserted into the frame 18. A worm wheel 70 may be secured to one end of the shaft 66 so as to engage the worm gear 62 and be driven thereby. Although the axis of the motor may be either parallel or oblique to the plane of the worm wheel 70, it has been found that if the axis is properly inclined to the plane, the teeth on the worm wheel 70 may be cut normal thereto. A pinion gear 72 may be secured to the opposite end of the shaft 66 between the frame 18 and worm wheel 70. An opening 73 may be provided in the side of the housing 46 to allow access to the pinion gear 72.

A spring plate 74 may be pressed into the opening 47 formed in the gear portion 52 so as to form a cover 74. An aperture 76 may be provided in the center of the cover 74 so as to permit the shaft 66 and pinion gear 72 to extend therethrough. In order to seal the interior

of the housing 46 from dust, etc., a gasket 78 may be provided between the cover 74 and the worm wheel 70. In addition to sealing the housing the cover will tend to retain the shaft 66 and gears 70 and 72 in position even when the housing 46 is not secured to the frame 18.

A sector gear 80 may be secured onto the end of the lever 28 by any suitable means such as rivets. The sector gear 80 is positioned to pivot on the pin 30 with the lever 28 and to extend through the opening 73 in the side of the gear portion 52 and engage the pinion gear 72. A spring 82 may be keyed into the pin 30 so as to bias the linkage 26 against the weight of the window 14, etc. This will keep the window 14 and regulator 10 substantially balanced at all times and cause the same amount of force to be exerted when raising or lowering the window 14.

In order to actuate the window regulator 10, the operator moves either of the switches 86 to the desired position. This will energize one of the field coils 87 from the battery 88 and cause the motor to run and turn the worm gear 62 formed on the armature shaft 54'. It should be noted that since the speed of a series motor varies considerably with load, it may be desired to provide means for improving the speed regulation. Accordingly, a resistor 89 may be provided for grounding one side of the field coils 87. Thus even during no-load conditions there will be sufficient current drawn through the field coils to prevent excessive motor speeds. The worm gear 62 will rotate the worm wheel 70 and shaft 66 so as to cause the pinion gear 72 to turn the sector gear 80. As the sector gear 80 turns, the lever 28 will pivot on pin 30 and cause the roller 32 to travel along the track 34 and move the window 14. As this movement progresses the second lever 36 will pivot on the first lever 28 and the rollers 38 and 40 traveling in the tracks 34 and 42 will maintain the track 34 horizontal and thus prevent the window 14 becoming cocked. In order to prevent damage to the window regulator 10, a circuit breaker 80' may be provided in series with the motor. Thus if the motor is energized when the window cannot move, the circuit breaker will open as a result of the overload and prevent any damage to the regulator 10.

The modification 100 is particularly adapted for use in door 112 where the window 114 extends the full width of the door 112, or in other installations where it is desirable to place the power means near the bottom of the door 112 to prevent interference with the fully lowered window 114. A frame 118 may be secured to the door 112 with the upper end in approximately the same relationship as in the preferred embodiment 10. The lower end of the frame 118 extends downwardly towards the bottom of the door 112. The frame 118 is similar to the frame 18 since it includes a raised center forming a rib 122 that extends longitudinally of the frame 118. The edge portions are offset from the center portion to form mounting flanges 124 for mounting the frame 118 on the door 112.

The regulator 100 includes a linkage 126 having levers 128 and 136. The lever 128 is pivoted on the rib 122 formed in the center of the frame 118 with one end thereof engaging the track 134. The lever 136 is pivoted on the lever 128 and is connected to tracks 134 and 142 the same as in the regulator 10.

The power means includes a housing 146 similar to housing 46. The housing 146 contains a speed reducing gear train 158. The gear train 158 includes a worm wheel 170 and a pinion gear 172 mounted on a shaft 166. The shaft 166 has one end journaled in a bearing 169 formed in the rib 122 while the other end of the shaft 166 is supported in the housing 146. A sector gear 180 is mounted on the rib 122 so as to extend into the housing 146 and engage the pinion 172.

In order to permit the motor to be a greater distance below the linkage 126 and to transfer the motion from the sector gear to the linkage, a push rod 200 is employed. One end 202 of the push rod is pivotally connected to

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the sector gear 180 while the other end 204 is connected to the lever 128 in the linkage. Thus as the motor drives the sector gear 180, the push rod 200 will rotate the lever 128 and move the window 114 in the desired direction.

It is to be understood that, although the invention has been described with specific reference to particular embodiments thereof, it is not to be so limited since changes and alterations therein may be made which are within the full intended scope of this invention as defined by the appended claims.

What is claimed is:

1. A frame adapted to be secured to a vehicle structure for supporting a window regulator, said frame comprising an elongated member having a raised center portion extending longitudinally thereof and a pair of offset edge portions that extend along each side of said center portion substantially parallel thereto, said edge portions forming mounting means adapted to be secured to said vehicle structure, resilient fingers on said edge portions disposed at substantially right angles thereto and being positioned to engage depressed portions in said vehicle structure, said center portion having means formed thereon for supporting motor means, and additional means on said frame for supporting a linkage mechanism in driving relation to said motor means for connection to a movable window.

2. A window regulator adapted to be installed on a structure for moving a window into and out of an opening in said structure, said regulator including a frame comprising an elongated member with a raised center portion extending longitudinally thereof and a pair of offset edge portions that extend along each side of said

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center portion substantially parallel thereto, said edge portions forming mounting means adapted to be secured to said vehicle structure and having resilient fingers thereon engaging depressed portions in said structure, power means secured to said center portion adjacent one end thereof, a linkage mechanism having at least a portion thereof mounted on said center portion adjacent the opposite end thereof and in driving relation to said power means for connection to said window.

3. The combination of claim 2 wherein said linkage mechanism includes a sector gear operatively interconnected with a gear train on said power means.

4. The combination of claim 2 wherein said linkage mechanism includes a lever pivotally mounted on said center portion with one end thereof attached to said window and the other end thereof being interconnected with said power means by a push rod.

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