

May 22, 1956

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2,746,747

WINDOW REGULATOR

Filed Jan. 2, 1952

4 Sheets-Sheet 1

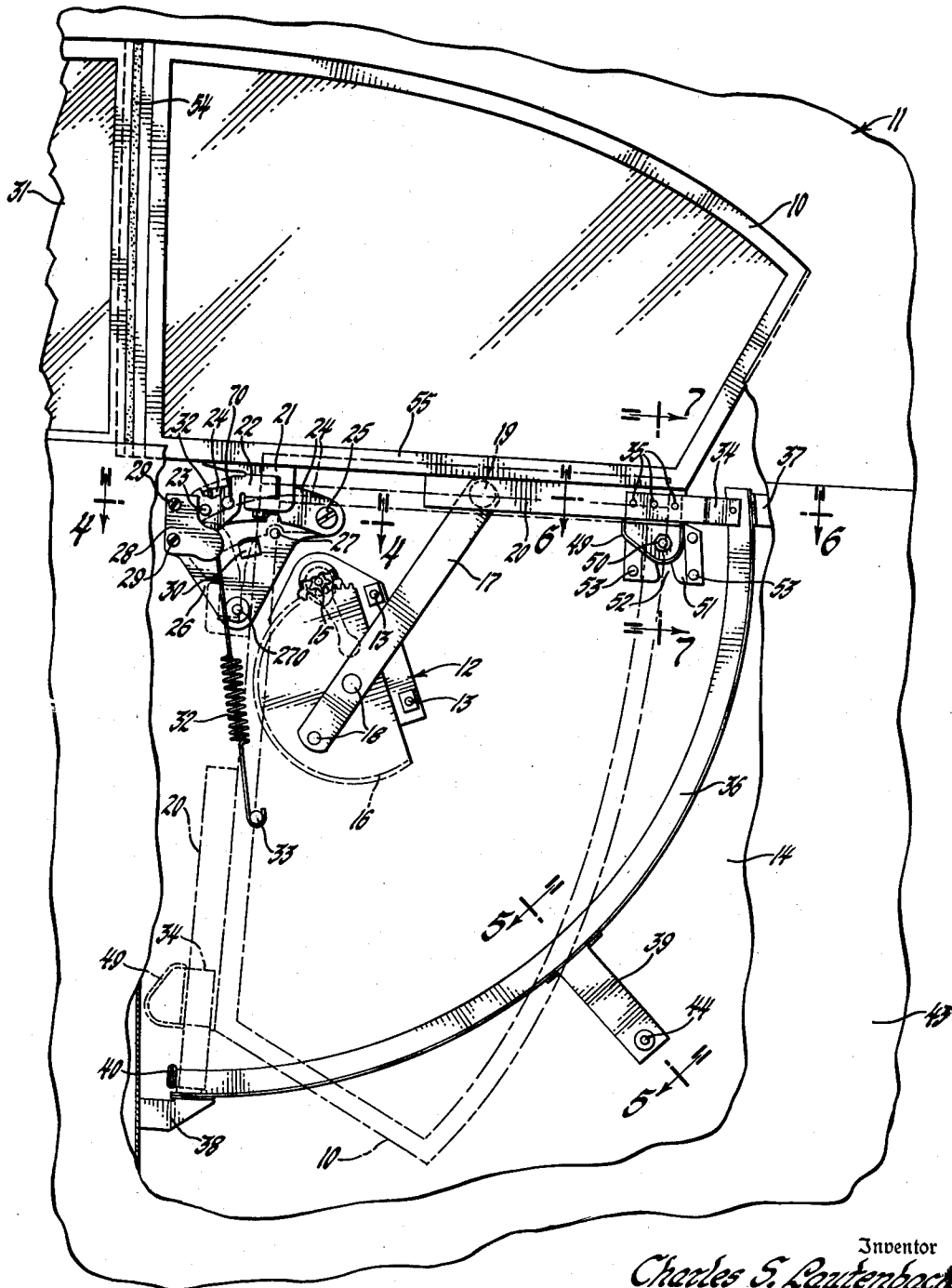


Fig. 1

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4 Sheets-Sheet 2

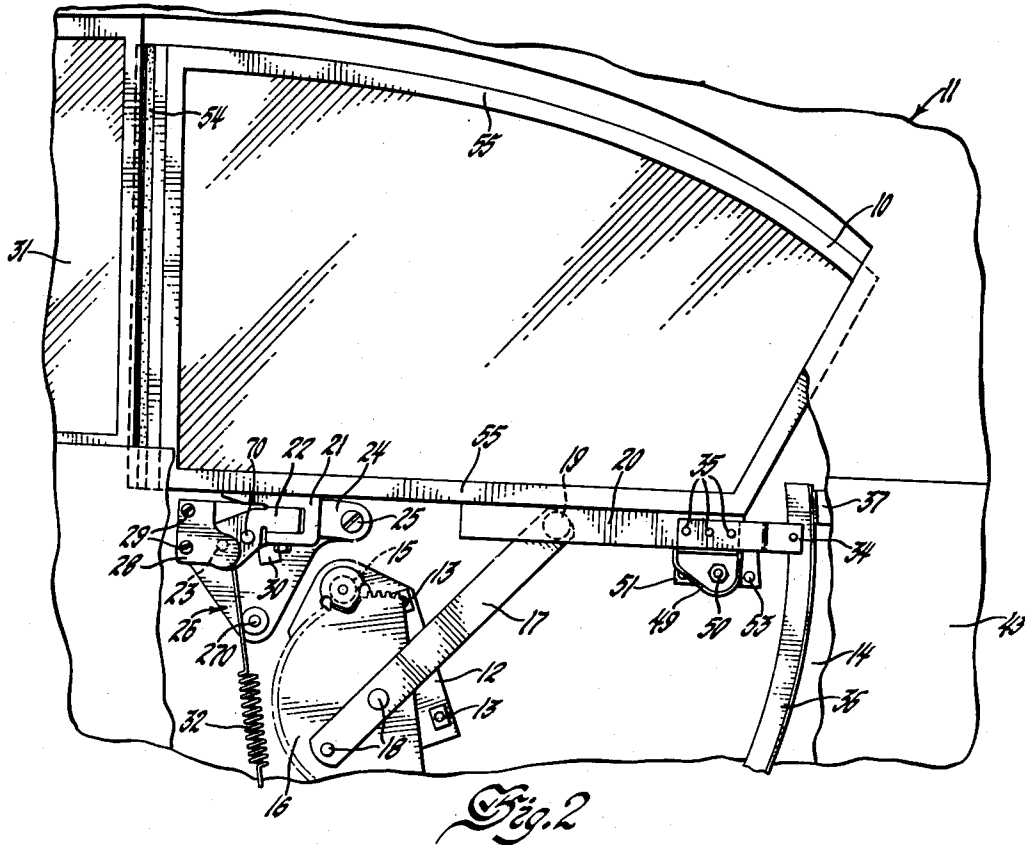


Fig. 2

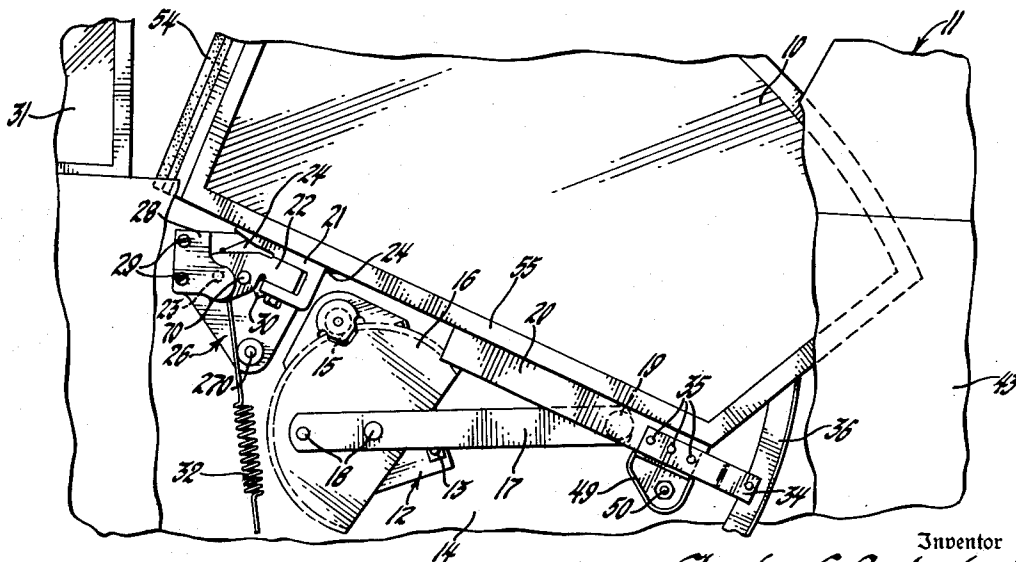


Fig. 3

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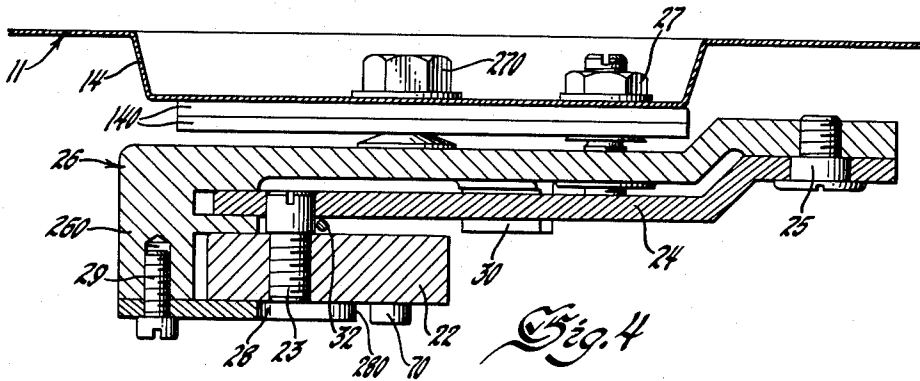
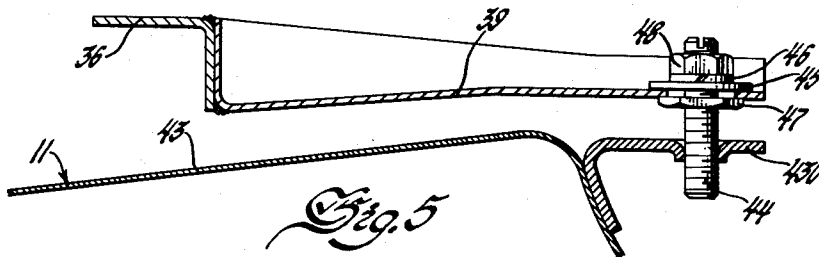
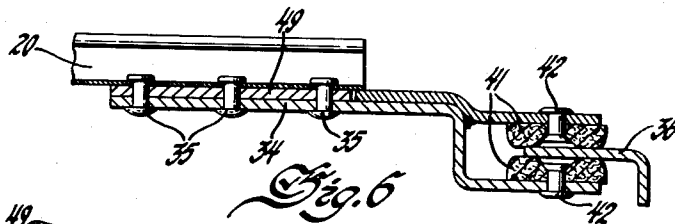
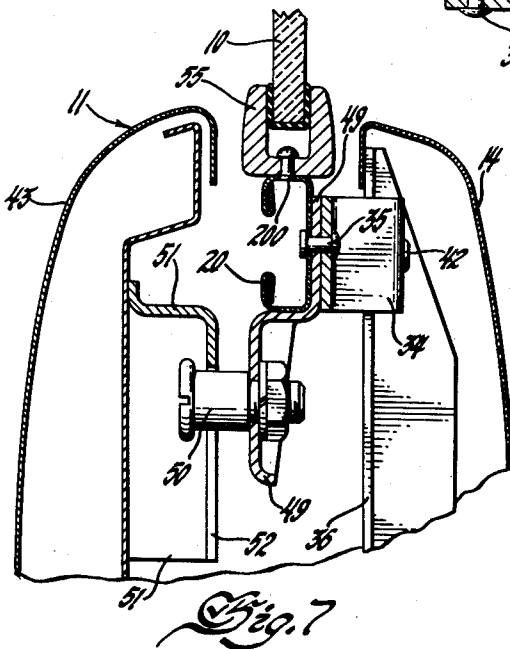
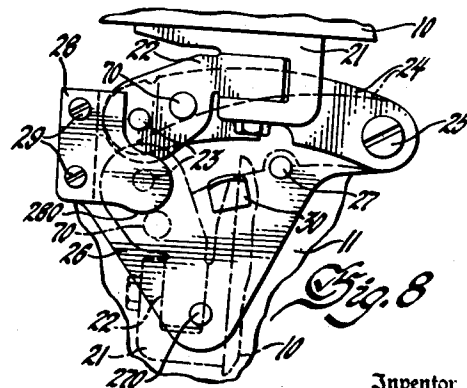
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

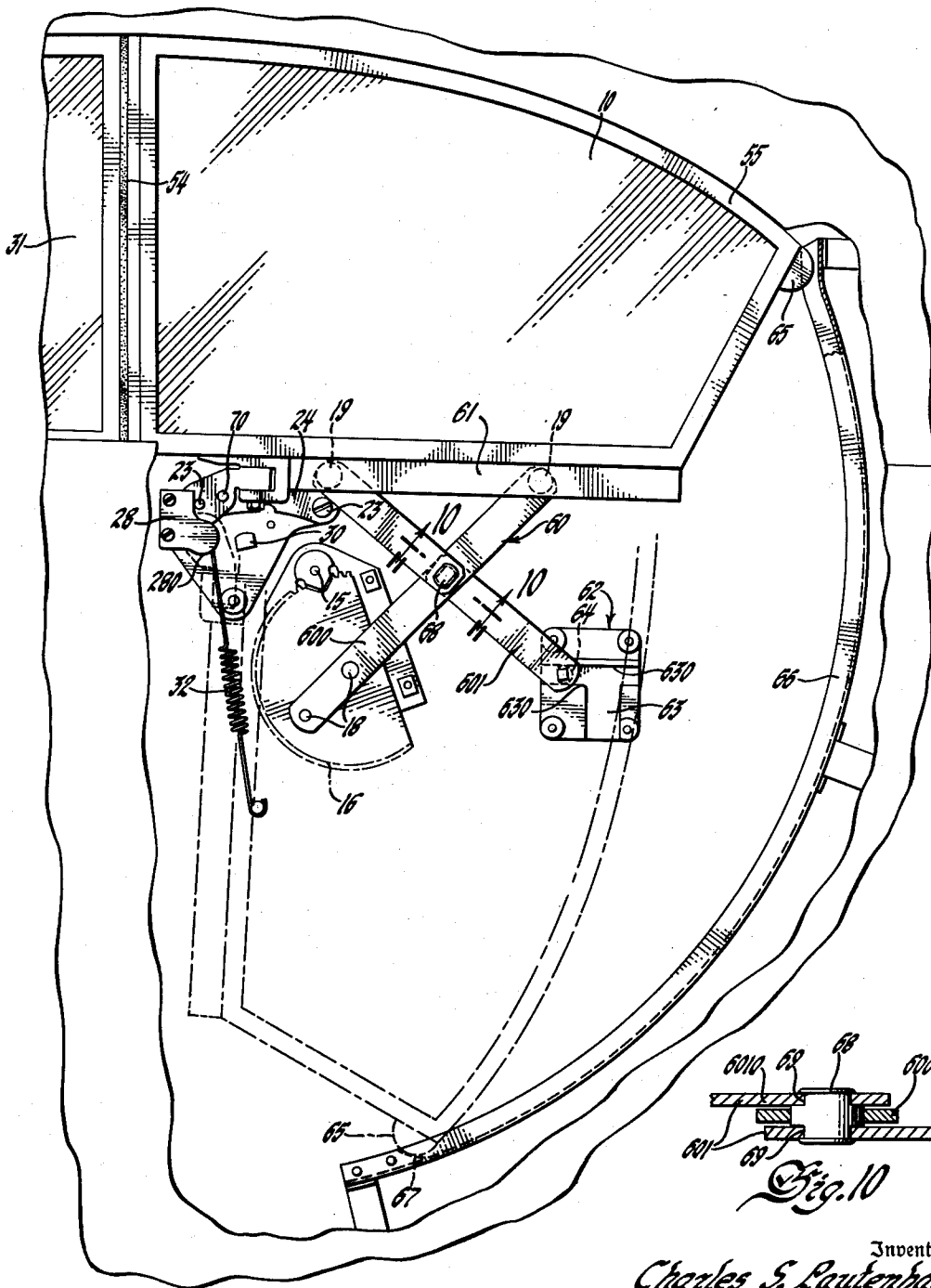


Fig. 9

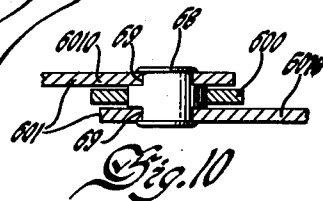


Fig. 10

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2,746,747

WINDOW REGULATOR

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Application January 2, 1952, Serial No. 264,528

14 Claims. (Cl. 268—104)

This invention relates to window regulators, and in general to window regulators of a type providing multi-directional window movement particularly advantageous in opening and closing the rear quarter window of automobiles.

The conventional rear quarter window of an automobile oftentimes is pivoted at its forward lower end on a fixed pivot about which the window is opened by window regulator means that causes the said rear quarter window to pivot downwardly about its fixed pivot. This construction has been found to be disadvantageous for several reasons, among which is the fact that the roof line design is limited by the space required for clearance for the upper front corner of the rear quarter window as the rear quarter window is pivoted open or closed about its fixed pivot. To provide the necessary clearance referred to above, it is generally necessary to construct a pocket in the roof rail above the rear quarter window which is not only expensive but necessitates special provisions for weatherstripping at the said pocket.

Furthermore, when a conventionally pivoted rear quarter window panel is pivoted to a partially open position to admit a small amount of ventilation to the rear seat space of the automobile, an unsightly or haphazard appearance results that detracts from the normal symmetry and smooth flowing body design lines of the modern motor vehicle.

With the foregoing in view, it is the primary object of the invention to provide a new and effective window regulator construction usable, among other places, in a pivoted rear quarter window mounting, which window regulator construction causes the window panel to move downwardly and upwardly at the initial opening and final closing thereof respectively.

Another object of the invention is to provide pivoted window regulator means which permits the window panel to be opened with a substantially direct downward movement to provide a limited uniform ventilator space along the top thereof prior to pivoting the said window panel to its full open position and to allow sufficient clearance at the roof rail for pivoting the said window panel to its full open position.

Another object of the invention is to provide a multi-directional movement window regulator which moves a window panel first downwardly and then pivots the same rearwardly to open, the said window regulator moving said window panel slightly out of abutment with its forwardly adjacent member during its initial downward opening movement and into abutment with said forwardly adjacent member during its final upward closing movement.

A further object of the invention is to provide an improved multi-directional movement window regulator for rear quarter automobile windows which is simple and economical to manufacture and install and which may employ any one of several well known window regulator actuating means.

Other objects of the invention will become apparent by

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reference to the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary elevational view of an automobile body with portions broken away showing a rear quarter window regulator embodying the invention with the rear quarter window panel in its closed position.

Fig. 2 is a fragmentary elevational view similar to Fig. 1 with the rear quarter window panel moved downwardly upon the initial opening thereof to a ventilation position leaving a neat uniform ventilation space along the top of the window panel.

Fig. 3 is a fragmentary elevational view similar to Figs. 1 and 2 except that the rear quarter window panel has been pivoted downwardly from its initial ventilation position toward its full open position.

Fig. 4 is an enlarged detailed horizontal sectional view of the swingable link-pivot mechanism taken on the line 4—4 of Fig. 1.

Fig. 5 is an enlarged detailed sectional view of the intermediate arcuate guide bracket taken on the line 5—5 of Fig. 1.

Fig. 6 is an enlarged detailed horizontal sectional view of the stabilizer shoe construction taken on the line 6—6 of Fig. 1.

Fig. 7 is an enlarged detailed vertical sectional view taken on the line 7—7 of Fig. 1 showing the horizontal guide, cam pin and cam guide construction.

Fig. 8 is an enlarged elevational view of the swingable link-pivot mechanism, the full lines showing the said mechanism in the position assumed when the window panel is fully closed, while the dot and dash lines show the said mechanism in the position assumed when the window panel is fully opened.

Fig. 9 is a fragmentary elevational view similar to Fig. 1 of an automobile body with portions broken away showing an alternative embodiment of the invention with the rear quarter panel in its closed position.

Fig. 10 is an enlarged sectional view taken on the line 10—10 of Fig. 9.

Referring now to the drawings wherein like numerals refer to like and corresponding views, the particular embodiment of the invention disclosed for the purpose of illustration is shown in connection with the rear quarter window panel 10 of a hard-top convertible style automobile body 11; however, it is obvious that multi-directional movement window regulators embodying the invention may be used advantageously in other window installations.

In the embodiment of the invention disclosed in Figs. 1—8 inclusive, the window regulator shown in the drawings comprises a sector type operating element 12 mounted by studs 13 on the inner body member 14 and preferably includes a window operating crank and clutch, not shown, a driving pinion 15 which meshes with a toothed sector 16 onto which a cantilever window lifting arm 17 is fixed by such means as rivets 18. The cantilever window lifting arm 17 is provided with a suitable guide pin or roller 19 at the outer end thereof which travels in a horizontal guideway 20 riveted by rivets 200 (Fig. 7) to the rear lower portion of the trim strip 55 of the rear quarter window panel 10. The front lower portion of the quarter window panel 10 is provided with a bracket 21 and mounting arm 22 which is pivotally connected by a window panel pivot 23 to the upwardly and downwardly swingable link 24 pivoted by a swingable link pivot 25 on a hinge mechanism mounting plate 26 secured to the inner body member 14 at reinforcing plates 140 by such means as the studs 27 and 270, the latter serving to align the said mounting plate 26. An outer face plate 28 secured by studs 29 to an outstanding lug 260 of the hinge mechanism mounting plate 26 maintains the swingable link 24 and window panel

mounting arm 22 in proper operating alignment in respect to each other and the hinge mechanism mounting plate 26.

A stop 30 is provided on the hinge mechanism mounting plate 26 to limit the downward swinging of the upwardly and downwardly swingable link 24 to which the forward lower end of the quarter window panel 10 is pivoted by the pivot 23. The location of this stop 30 establishes the limit of the downward movement of the quarter window panel 10 upon the initial opening thereof, the upward movement of the said quarter window panel 10 upon the final closing thereof being limited by the abutment of the said quarter window panel 10 against its glass channels or adjacent window element 31, as the case may be. A tension spring 32 anchored at one end to a pin 33 on the inner body member 14 and at the other end to the swingable link 24 constantly draws the swingable link toward the stop 30 when the window panel 10 is closed and during its initial downward and final upward movement by the operating element 12, the said spring 32 holding said swingable link 24 against the stop 30 during the pivotal movement of the window panel 10 by the operating element 12. Thusly, the tension spring 32 serves to remove "play" from the window regulator mechanism that otherwise would be present, thereby assuring smooth operation thereof.

As best shown in Figures 1, 2, 3, 6 and 7, a stabilizer shoe generally designated by the numeral 34 is riveted by rivets 35 to the horizontal guideway 20, extends rearwardly therefrom and rides an arcuate guide 36 secured at its upper and lower ends and intermediate said ends to a body member by brackets 37, 38 and 39 respectively, the said guide means serving to maintain the window panel 10 in proper alignment at all times during the opening and closing of the same, when fully or partially open, and when closed. A stop 40 at the lower end of the arcuate guide 36 prevents movement of the window panel 10 beyond its proper fully open position. The said stabilizer shoe 34 consists of a V-shaped element to which inwardly facing preferably felt contact pads 41 are riveted by countersunk rivets 42, the said contact pads 41 being located to frictionally engage and ride on the arcuate guide 36. The end guide brackets 37 and 38 for the arcuate guide 36 are shown secured to the inner body member 14. The intermediate guide bracket 39 for the arcuate guide 36 may be of any necessary construction, and is welded to the said arcuate guide 36 at one end and has the other end thereof adjustably connected to an outer body member 43 by such means as a bracket 430, a stud 44, suitable washers 45 and 46 and nuts 47 and 48. If desired, the intermediate guide bracket 39 may be secured to the inner body member 14.

At the lower rear end of the window panel and connected thereto through the medium of a cam pin bracket 49 riveted to the horizontal guide member 20 by the same rivets that secure the stabilizer shoe to the said guide member 20 is a cam pin 50 which engages cam guide element 51 secured by rivets 53 to the inner body member 14 near the rear end of the window panel 10 when the said window panel 10 is closed and is in substantial horizontal alignment with the window hinge mechanism hereinbefore described, the said cam pin guide element 51 having a downwardly and rearwardly disposed cam guide slot 52 therein open at the lower edge thereof as best shown in Fig. 1. This cam construction shown in Figs. 1, 2 and 7 is employed to guide the window panel 10 downwardly and slightly rearwardly during the initial lowering thereof from its fully closed position shown in Fig. 1 to its ventilation position shown in Fig. 2. During this initial lowering of the window panel 10, the swingable link 24 pivots about the swingable link pivot 25 before the window panel 10 begins to pivot about the window panel pivot 23 disposed at the forward end of the swingable link 24. During the pivoting of the window panel 10, the cam pin 50 is out of engagement with the cam guide element 51.

When the window panel 10 is pivoted from a partial or full open position to its ventilation position shown in Fig. 2, and arrives at that position, the cam pin 50 becomes engaged with the cam guide 51, and, upon further closing of the window by the window regulator operating element 12, the window panel 10 is moved upwardly and forwardly to its fully closed position in weather sealed contact with its adjacent window element 31 as shown in Fig. 1. In its closed position the upper and rear portions of the window panel 10 are in engagement with a glass channel, not shown, carried by the automobile body. In the embodiment of the invention shown in the drawings, a weather sealing strip 54 of suitable form is carried by the forward edge of the window panel 10 and the window panel 10 is provided with a peripheral trim strip 55 of usual construction. Obviously, the weather sealing strip 54 may be omitted, and a suitable glass channel or sealing strip may be carried by the forwardly adjacent element 31 against which the forward edge of the window panel 10 abuts.

In the operation of the multi-directional window regulator, the opening and closing force is applied to the lower rear portion of the window element 10 through the sector type operating element 12 and the window lifting arm 17 which engages the window element 10 through the guide pin or roller 19 and the horizontal guideway 20. When opening the rear quarter window, the window element 10 first moves downwardly and slightly rearwardly responsive to force applied thereto by the sector type operating element 12 from its fully closed position shown in Fig. 1 to its ventilation position shown in Fig. 2 by the downward swinging of the swingable link 24 and the guidance of the cam guide element 51 into which the cam pin 50 is slidingly engaged. Upon the window element 10 arriving at its full ventilation position, the swingable link is in contact with its stop 30, and, any additional actuation of the operating element 12 to further open the rear quarter window causes the window element 10 to pivot about its pivot 23, the cam pin 50 leaving the cam guide element 51. In closing the rear quarter window, the operating element 12 pivots the rear quarter window panel 10 about its pivot 23 from an open position as shown in Fig. 3 to its full ventilation position shown in Fig. 2, and, additional actuation of the operating element 12 raises the window panel 10 upwardly and forwardly under guidance of the cam pin 50 in the cam guide element 51. The upward force of the window lifting arm 17 applied by the operating element 12 to the window panel 10 at the horizontal guideway 20 when the cam pin 50 is engaged in the cam guide element 51 lifts the window panel 10 upwardly and forwardly which is permitted by the upward swinging of the forward end of the swingable link 24 to which the window panel is pivoted by the window panel pivot 23.

Referring now to the alternative embodiment of the invention disclosed in Figs. 9 and 10, the construction is like and similar to the embodiment of the invention shown in Figs. 1-8 inclusive except that an X-type window lifting element 60 is employed rather than the window lifting arm 17, necessitating a longer horizontal guideway 61. A cam guide element 62 having an inverted L-shaped cam slot 63 therein and a cam 64 replace the cam guide element 51, the cam guide slot 52 and the cam pin 50. Also, a stabilizer fin 65 extending rearwardly from the upper rear corner of the trim strip 55 of the rear quarter window panel 10 replaces the stabilizer shoe 34 extending rearwardly from the horizontal guideway 20. The arcuate guide 36 is changed to an arcuate channel shaped guide 66, the latter being re-located to slidably receive the stabilizer fins 65 and retain the window panel 10 in its proper alignment during the raising, lowering and pivoting thereof. A suitable stop 67 is preferably provided at the lower end of the arcuate channel shaped guide 66 engageable by the stabilizer fin 65 to limit the downward pivoting of the window panel 10.

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In the alternate embodiment of the invention, the two arms 600 and 601 of the X-type window lifting element 60 are preferably hinged together by a double-shouldered rivet 68 which also rigidly splices together the two halves 6010 of the arm 601 by virtue of the flat sides 69 of the said pivot 68. The cross arm 600 is riveted at its lower end to the toothed sector 16 of the window regulator by suitable rivets 18, and the upper end of the cross arm 600 and 601 are each provided with a guide pin or roller 19 which rides in the horizontal guideway 61. On the lower end of the cross arm 601 is the cam 64 which, when the rear quarter window panel 10 is closed or "up" as shown in Fig. 9, is positioned in the horizontal portion of the inverted L-shaped cam guide slot 63 between horizontal cam guide members 630. When the cam 64 is so positioned, the window panel 10 is positively prevented from unauthorized manual movement. In other words, by the use of the cam guide arrangement disclosed in Fig. 9, the window panel 10 cannot be moved initially downward from its closed or nearly closed position except by manipulation of the window regulator handle, not shown, which moves the toothed section 16 through the pinion 15.

When the window panel 10 is lowered by the window regulator, the cam 64 travels horizontally between the horizontal cam guide members 630 until it arrives at the vertical portion of the inverted L-shaped cam guide slot 63 during which time the window panel 10 lowers vertically. After the said cam 64 arrives opposite the vertical portion of the inverted L-shaped cam guide slot 63, the window panel 10 begins to pivot around the window panel pivot 23 responsive to additional movement of the window regulator until it is fully open whereupon the stabilizer fin 65 arrives at the stop 67. Obviously, the mechanism operates in an opposite manner during the closing of the window panel 10 by the window regulator at which time the window panel 10 first pivots to its horizontal position short of closing and then moves upwardly to its fully closed position.

In both embodiments of the invention it may be desirable to provide the window mounting arm 22 with a cam pin 70 which engages a cam surface 280 formed on the edge of the face plate 28 secured to the hinge mechanism mounting plate 26 when the window panel 10 is opened, see Figs. 4 and 8. This feature prevents unauthorized movement of the several elements of the window regulator mechanism when the window panel 10 is opened.

Thus, with the improvements in multi-directional window regulators herein disclosed, a moderate amount of ventilation may be obtained with a pivoted window by lowering the window a pre-determined distance before any pivotal action takes place. Also, the downward movement of the window may be directed at a relatively small angle away from the element against which the forward edge of the window panel abuts, thereby relieving all of the friction between the window panel and the abutting element except that which occurs at the beginning of the initial downward opening movement and at the end of upward closing movement of the window panel.

Although but two embodiments of the invention have been disclosed and described herein, it is obvious that many changes may be made in the size, shape, arrangement and detail of the various elements of the invention to accommodate it to use with any type of manual or power operating elements and to use in connection with many types of windows other than automobile rear quarter windows, all within the scope of the invention as defined by the appended claims.

I claim:

1. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member with the free end thereof disposed

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under one corner of said window panel, means pivoting said window panel to the free end of said link, a stop limiting the vertical movement of said link, means spaced from said swingable link engaging and supporting said window panel including mechanism for moving and pivoting said window panel to open and close the same, and guide means having a portion on the body and a portion on the window panel for limiting the initial opening and final closing movements of said window panel to downwardly and upwardly movements respectively.

2. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member with the free end thereof disposed under one corner of said window panel, means pivoting said window panel to the free end of said link, a stop limiting the vertical movement of said link, spring means constantly urging said swingable link toward said stop, means spaced from said swingable link supporting said window panel including mechanism for moving and pivoting said window panel to open and close the same, and guide means having a portion on the body and a portion on the window panel for limiting the initial opening and final closing movements of said window panel to downwardly and upwardly movements respectively within limits permitted by the movement of said swingable link.

3. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member, means pivotably connecting one corner of said window panel to said swingable link, stop means limiting the vertical movement of said swingable link, a window lifting arm slidably connected to said window panel at a point spaced from said swingable link, means for actuating said lifting arm to open and close said window, and guide means engageable by an opposite corner of said window panel during the initial opening and final closing movements thereof limiting the movement of said window panel downwardly and upwardly on said swingable link respectively prior and subsequent to pivotal movement of said window panel.

4. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member, means pivotally connecting one corner of said window panel to said swingable link, stop means limiting the vertical movement of said swingable link, means constantly urging said swingable link toward said stop, a window lifting arm slidably connected to said window panel at a point spaced from said swingable link, means for actuating said lifting arm to open and close said window, and guide means adjacent said arm engageable by an opposite corner of said window panel during the initial opening and final closing thereof limiting the movement of said window panel upwardly and downwardly on said swingable link.

5. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member with the free end thereof disposed under one corner of said window panel, means pivoting said window panel to the free end of said link, a stop limiting the vertical movement of said link, spring means constantly urging said swingable link toward said stop, means spaced from said swingable link supporting said window panel including mechanism for opening and closing the same, an arcuate guide on said body and guide engaging shoes carried by said window panel riding said arcuate guide whereby to prevent lateral movement of the non-pivoted corner of said window panel, and guide means positioned adjacent the lower edge of said window, said guide means limiting the initial opening and final closing of said window panel by said opening and closing mechanism to downwardly and upwardly movements respectively within limits permitted by the movement of

the said swingable link prior and subsequent to pivotal movement of said window panel about its pivot.

6. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member, means pivotally connecting one corner of said window panel to said swingable link, stop means limiting the vertical movement of said swingable link, means constantly urging said swingable link toward said stop, a window panel lifting arm supporting said window panel slidably connected thereto at a point spaced from said swingable link, means for actuating said lifting arm to open and close said window, an arcuate guide on said body and guide engaging shoes carried by said window panel riding said arcuate guide whereby to prevent lateral movement of the non-pivoted corner of said window panel, and guide means adjacent said arm engageable by an opposite corner of said window panel during the initial opening and final closing thereof limiting the movement of said window panel downwardly and upwardly on said swingable link prior and subsequent to pivotal movement of said window panel about its pivot.

7. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member with the free end thereof disposed under one corner of said window panel, means pivoting said window panel to the free end of said link, a stop limiting the vertical movement of said link, mechanism mounted on said body member for moving and pivoting said window panel to open and close the same including a single cantilever arm engaging and supporting said window panel, and guide means adjacent said panel and arm and engageable by said panel for limiting the initial opening and final closing movements of said window panel to downwardly and upwardly movements respectively.

8. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member with the free end thereof disposed under one corner of said window panel, means pivoting said window panel to the free end of said link, a stop limiting the vertical movement of said link, mechanism mounted on said body member for moving and pivoting said window panel to open and close the same including an X-type element engaging and supporting said window panel, and guide means on said body member also engaged by said X-type element limiting the initial opening and final closing movements of said window panel to downwardly and upwardly movements respectively.

9. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member, means pivotally connecting one corner of said window panel to said swingable link, stop means limiting the vertical movement of said swingable link, an X-type window lifting element slidably connected to said window panel at points spaced from said swingable link, means for actuating said X-type window lifting element to open and close said window, and guide means on said body member engageable by said X-type window lifting element during the initial opening and final closing movements thereof limiting the movement of said window panel downwardly and upwardly on said swingable link respectively prior and subsequent to pivotal movement of said window panel.

10. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member, means pivotally connecting one corner of said window panel to said swingable link, stop means limiting the vertical movement of said swingable link, means constantly urging said swingable link toward said stop, an X-type window lifting element slidably con-

nected to said window panel at points spaced from said swingable link, means for actuating said X-type window lifting element to open and close said window, and horizontal guide means engageable by said X-type window lifting element during the initial opening and final closing thereof limiting the movement of said window panel upwardly and downwardly on said swingable link, the said horizontal guide means preventing movement of said window panel except as authorized by said actuating mechanism when said X-type window lifting element is engaged thereby.

11. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member, means pivotally connecting one corner of said window panel to said swingable link, stop means limiting the vertical movement of said swingable link, means constantly urging said swingable link toward said stop, a window panel X-type lifting arm supporting said window panel slidably connected thereto at points spaced from said swingable link, means fixed to said body member for actuating said X-type lifting arm to open and close said window, an arcuate guide on said body member and means carried by said window panel cooperating with said arcuate guide whereby to prevent lateral movement of the non-pivoted corner of said window panel, and horizontal guide means on said body member engageable by said X-type lifting arm during the initial opening and final closing of said window panel limiting the movement of said window panel downwardly and upwardly on said swingable link prior and subsequent to pivotal movement of said window panel about its pivot, the said horizontal guide means preventing movement of said window panel except by said actuating means when engaged by said X-type lifting arm.

12. A multi-directional window regulator for vehicle bodies having a window opening and a window panel closing said opening, a vertically swingable link pivoted to a body member with the free end thereof disposed under one corner of said window panel, means pivoting said window panel to the free end of said link, a stop limiting the vertical movement of said link, mechanism mounted on said body member for moving and pivoting said window panel to open and close the same including an X-type element engaging and supporting said window panel, an inverted L-shaped guide means on said body member and cam means on said X-type element engaging said guide means limiting the initial opening and final closing movements of said window panel to downwardly and upwardly movements respectively.

13. A window regulator for opening and closing a window panel of vehicle bodies, a pivot on which said window panel is pivoted, means engaging and supporting said pivot on a body member permitting limited generally rectilinear bodily movement of said pivot and said window panel, means supporting said window panel spaced from said pivot supporting means, an operating element mounted on said body member cooperating with said window panel supporting means for moving said panel in a generally rectilinear path and for pivoting said window panel about its pivot in the plane of said rectilinear movement to open and close the same, and guide means having a portion mounted on the body and a portion on the window panel for guiding the generally rectilinear initial opening and final closing movements of said window panel downwardly prior to and upwardly subsequent to pivotal movement of said window panel during the opening and closing thereof.

14. A window regulator for opening and closing a window panel of vehicle bodies disposed in abutment against an adjacent abutting element when closed, a pivot on which said window panel is pivoted, means supporting said pivot on a body member movable in respect thereto permitting limited generally rectilinear bodily movement of said pivot and said window panel, means engaging and

supporting said window panel spaced from said pivot supporting means, an operating element cooperating with said window panel supporting means for moving said panel in a generally rectilinear path and for pivoting said window open and closed about its pivot in the plane of said rectilinear movement, and guide means having a portion mounted on the body and a portion on the window panel for guiding the generally rectilinear initial opening and final closing movements of said window panel downwardly prior to and upwardly subsequent to the pivotal movement thereof, said means supporting said pivot and said guide means directing said initial opening movement of said window panel away from the adjacent abutting

element and the final closing movement thereof against said abutting element.

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