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J. W. LAKIN ET AL

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WINDOW REGULATOR

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2 Sheets-Sheet 2

Fig. 2.

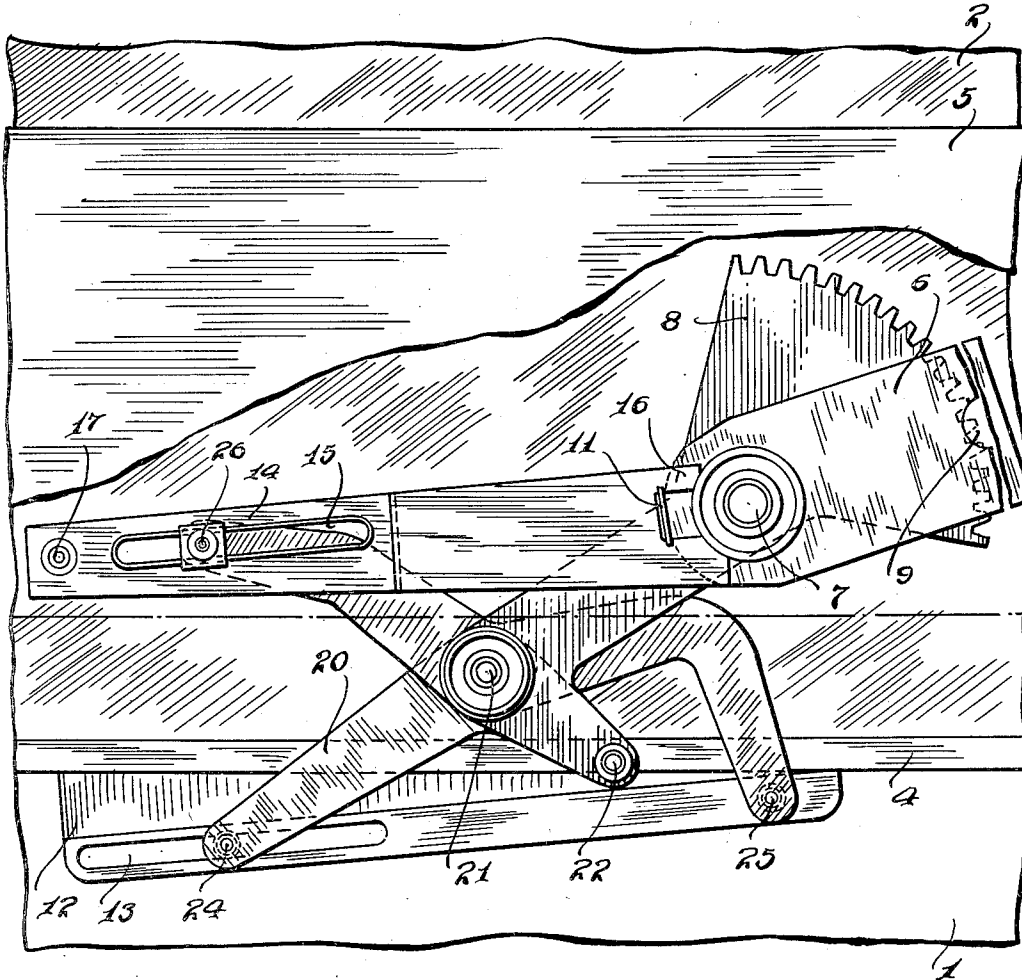
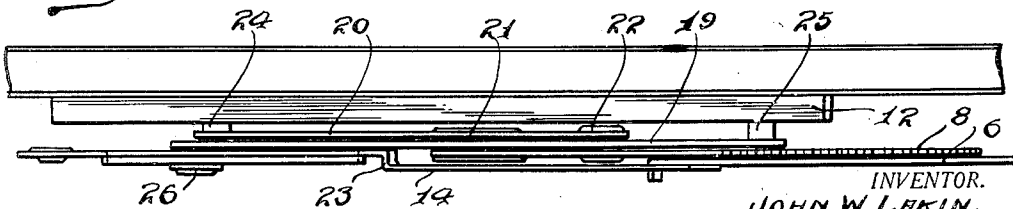


Fig. 3.



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WINDOW REGULATOR

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This invention relates to a window regulator and more particularly to a regulator of the type having a two-point lifting contact with the window.

In vehicle window construction it is common practice to have the window guided in its upward and downward movement between a pair of parallel glass runs. Each of these runs usually comprise a metal channel having a felt lining for cushioning the window and making the same substantially air-tight. A common difficulty is that of the window cocking in its own plane thereby causing the window, and particularly the upper corners to dig into the felt lined channel run-ways. Sometimes the runways are not truly parallel and thereby permit one edge of the glass to travel unguided with the result that the operation of the window regulator tilts the window edgewise causing the other edge, particularly at its upper corner, to dig into the bottom of the felt lined runway. This digging in causes the window to work with difficulty, and very often is sufficient to stop the same from being moved upwardly and downwardly. This difficulty of the window cocking has been present here where the channel runways are inclined from the vertical so that the window travels in a slanted position.

It is an object of this invention to overcome this cocking and sticking of the window in the window runways, and this has been achieved by suspending the window on a window regulator at two spaced points which are always on opposite sides of the center of the bottom edge of the window, one of which contacts determines the path of travel of the window as a straight line.

It is an object of this invention to produce a window regulator of the type that will at all times balance the window during its upward and downward movement to prevent cocking of the window in its own plane.

It is an object of this invention to produce

a window regulator that will positively require the window to travel a straight line path.

In the drawings:

Figure 1 is a view of a door showing the window regulator in operative position.

Figure 2 is a detail view of the regulator in a partly lowered position.

Figure 3 is a top plan view of the regulator.

Figure 4 is an assembly perspective of the regulator.

Figure 5 is a section along the line 5—5 of Figure 1.

Figure 6 is a view similar to Figure 5 only showing a different type of window runway.

Referring more particularly to the drawings, there is shown a vehicle door 1 having a window glass 2 which is adapted to move upwardly and downwardly in the parallel inclined channel runways 3. The window glass 2 has fixed to the bottom edge thereof the sash channel 4. The sash 4 is preferably maintained in a horizontal position as the window glass moves upwardly and downwardly in the inclined channel runways 3. Hence, the sash 4 is angularly disposed relative to the runways. The door is provided with the usual lock board 5 upon which is mounted the window regulator.

The window regulator has the support plate 6, which is fixed to the lock board 5. The support plate 6 has journaled therein the stud 7 which carries the gear sector 8. The sector 8 is arranged to be driven by any suitable window regulator clutch and pinion (not shown), a hole 9 being provided therefor in plate 6. The sector 8 is counter-balanced by the coil spring 10, one end of which is hooked over a transverse lug 11 carried by the plate 6.

The lower window sash 4 carries the bracket 12. The bracket 12 has the guide-way 13 which is inclined relative to the sash 4. The inclination of the guide-way 13 rela-

tive to the sash 4 depends upon the angle or incline at which the window travels in its upward or downward movement because it is desirable to have the guide-way 13 extend
 5 perpendicularly to the vertical path of travel of the window. The lock board in turn carries a plate 14 which may be an extension of the regulator support plate having a
 10 slotted guide-way 15 which is parallel to the guide-way 13. The plate 14 is provided with the bifurcated end 16 which fits over the lug 11 of the regulator support plate, the other
 15 end of the plate 14 being secured to the lock board by any suitable means such as the screw 17.

Since it is an object of the invention to produce a window regulator having a two contact engagement with the window which
 20 contacts are always spaced one on each side of the center of the bottom edge of the window, and one of which contacts determines the path of travel of the window as a straight line, to this end the regulator is comprised
 25 of the gear sector 8 having the L-arm 18, the vertical lifting arm 19, and the L-extension 20. The regulator arm members are shown in perspective in Figure 4 in the order of their assembly. As stated above, the
 30 sector 8 and L-arm 18 are pivotally mounted on the regulator support plate 6. The vertical lift arm 19 is pivotally mounted as at 21, between the arms 20 and 18. The arm 20 is fixed to the arm 18 as at 22. Hence, the arms
 35 20 and 18 are rigidly connected and together form a loop about the arm 19. It is necessary to loop the arms 18 and 20 about the vertical lift arm 19 to permit the regulator
 40 arms to swing from the uppermost position as shown in Figure 1 to the lowered position shown in Figure 2 or still further down. By looping the arms 18 and 20 about the
 45 arm 19 collision between the suspension contacts 24, 25 and pivotal points 7 and 26, of the regulator arms with the arms themselves is prevented. It will be noted that the plate
 50 14 is offset as at 23, to likewise permit the moving parts of the regulator to operate freely in their up and down movement.

The arm 20 carries the stud 24 which slidably engages the guide-way 13. The vertical
 55 lift arm 19 has a fixed pivotal connection as at 25, with the bracket 12. The other end of the vertical lifting arm 19 carries the stud 26 which slidably engages in the slotted
 60 guide-way 15. It will be noted by referring to Figures 1 and 2 that a straight line through the points of suspension 24 and 25 is at all times parallel to a line through the
 65 pivot 7 and the stud 26. Further, that a line through the pivot 7 and point of suspension 25, will at all times be perpendicular to the lines extending through 24, 25 and 26, 7. Hence, in assembling the regulator to the
 lock board the parallel guide-ways 13 and 15 are first positioned at an angle from the

horizontal equal to the angular inclination of the window run-ways 3 from the vertical, and the regulator is then mounted upon the
 70 lock board 5 so that a line through the fixed pivotal connection 25 and the pivot 7 is parallel to the runways 3. It will also be noted that the distance from 24 to 21, 25 to 21, 26 to 21, and 7 to 21 are all equal.

In Figure 5 there is shown one form of runway which comprises the channel member 30
 75 having the felt covered rubber lining 31. It is evident that if the window is not balanced against a tilting action in its own plane, then the window will dig into the flexible lining
 80 31 along the bottom 32 of the channel runway. To avoid this difficulty the points of suspension 24 and 25 are at all times one on each side of the center of the bottom edge
 85 4 of the window, thereby the window is balanced and effectively prevented from cocking or tilting in its own plane and digging into the runway.

In Figure 6, I have shown a modified form of runway. In this instance the vertical
 90 edges 35 of the window are not guided and are spaced from the pillar 36. The garnish moulding 37 and the outer door panel 38 each carry the felt beads 39 in the grooves 40 which engage the inner and outer faces of the
 95 window glass to keep out the weather and to cushion the window against in and out movement in the window opening. Inasmuch as the window is movably suspended at 24 and
 100 fixedly suspended at 25 on opposite sides of the center of the lower edge, there is no need to guide the same along its vertical edges 35.

In operation when the sector 8 is pivoted about its pivot 7 the suspension contact 24
 105 travels in an arcuate path about the pivot 7 whereas the lower end of the vertical lift arm 26 travels back and forth in a straight line in the guide-way 15 thereby requiring the fixed pivot 25 to travel up and down in a
 110 straight line. Inasmuch as the straight line movement of the fixed pivot 25 is parallel to the runways 3, the course of the window is automatically determined in a path parallel to the runways 3. It will be noted that the
 115 looping of the arms 18 and 20 about the vertical arm 19, that is, the pivotal mounting of the arm 19 between the arms 18 and 20 which are rigidly fixed together, effectively obviates collision between any of the moving
 120 parts of the regulator, and permits the arm 19 to pass by the pivot 7 and the arm 20 to pass by the sliding stud 26 in the raising and lowering of the window. Although the arm 19 preferably has a fixed pivotal
 125 connection 25 with the window glass 2, it is understood that the invention is not limited to such a fixed pivotal connection between the arm 19 and the glass 2. The window regulator will function and properly balance the
 130 window glass against cocking even though the pivotal connection 25 is not a fixed pivotal

connection because the points of suspension 24 and 25 are always on opposite sides of the center of the lower sash channel 4, and these points of suspension 24 and 25 exert continuous and equal lifting forces upon the window.

We claim:

1. The combination with a window glass adapted to be reciprocated upwardly and downwardly for closing and opening a window opening, a regulator mechanism comprising an element connected to the glass, another element having sliding connection with the glass at a point spaced from the first connection, said elements serving to stabilize the glass from cocking in the plane in which it is normally positioned, and means for actuating said elements to raise and lower the same at the points of connection with the glass for shifting the glass, the point of connection between the first named element and the glass being fixed relative to the glass, the fixed connection of the element with the glass being constrained to raise and lower in a straight line path whereby sidewise motion of the glass in its plane is prevented.

2. The combination with a window glass adapted to be reciprocated upwardly and downwardly for closing and opening a window opening, a regulating mechanism comprising a pair of elements, each element having an operative connection with the glass spaced relative to the connection of the other element with the glass, said spaced operative connections stabilizing the glass from cocking in the plane in which it is normally positioned, and means for actuating the said elements to raise and lower the glass, one of the said operative connections between an element and the glass being movable relative to the glass, the other operative connection between an element and the glass being fixed relative to the glass and constrained to raise and lower in a straight line path whereby sidewise movement of the glass in its plane is resisted.

3. The combination with a window glass adapted to be reciprocated upwardly and downwardly for closing and opening a window opening, a regulating mechanism comprising a pair of elements, operative connections between the elements and the glass, one of said operative connections between the element and the glass being fixed relative to the glass and the other being movable relative to the glass, the said operative connections being spaced one on each side of the vertical center line of the window, means for actuating the said elements to raise and lower the window, and means operatively connected to the element having a fixed connection with the window causing the said fixed operative connection to raise and lower in a straight line path to resist sidewise movement of the glass in its plane.

4. The combination with a window glass adapted to be reciprocated upwardly and downwardly for closing and opening a window opening, a regulating mechanism comprising an element having a fixed pivotal connection with the window, a second element having an operative connection movable relative to the window, the said elements being rotatably connected, means for actuating the said elements to raise and lower the window, and guide means for the first element whereby the fixed pivotal connection of the said element with the window travels in a straight line path.

5. A window regulator comprising in combination a support, a pair of arms, one of said arms adapted to have a fixed pivotal connection and the other a movable connection with a window glass, one of said arms having a fixed pivotal connection and the other of said arms a relatively movable connection with the said support whereby the connection with the window of one of said arms travels in a rectilinear path.

6. A window regulator comprising a support plate, a pair of pivotally connected arms, one of said arms adapted to have a fixed pivotal connection with a window glass and the other adapted to have a sliding connection with the window glass, guide means operatively connected with the one arm causing the fixed pivotal connection to travel in a straight line path, a pivotal connection between the other arm and the support plate, and means for actuating the said arms whereby the window is raised and lowered.

7. A window regulator comprising a support member, a pair of pivotally connected arms, one adapted to have a fixed pivotal connection and the other a movable connection with a window, the one arm being looped about the other, and guide means operatively connected to the one arm causing the fixed pivotal connection to travel in a straight line path.

8. A window regulator comprising a support, an arm pivotally carried by the said support and adapted to have a sliding engagement with a window, a second arm pivotally mounted on the aforementioned arm and adapted to have a fixed pivotal connection with the window, and rectilinear guide means for another portion of the second arm whereby the fixed pivotal connection between the arm and the window travels in a straight line path when the arms are actuated, the first arm having a portion on either side of the second arm.

9. A window regulator comprising a support plate, a looped arm pivoted on the said support plate, means for pivoting the said arm about its pivot, a second arm pivotally connected to the looped arm in the said loop, and a guide carried by the said support adapted to be engaged by the second said

arm, the looped arm adapted to have a relatively movable connection with a window and the second arm adapted to have a fixed pivotal connection therewith whereby when the
5 said arms are actuated the window is constrained to move in a straight line path.

10 10. The combination with a window glass adapted to be reciprocated upwardly and downwardly for closing and opening a window opening, regulating mechanism comprising a pair of elements, said elements having spaced operative connections with the glass adapted to stabilize the glass from cocking in the plane in which it is normally positioned, and means for actuating the elements
15 to raise and lower the glass, one of said operative connections being movable relative to the glass, the other said operative connection between an element and the glass being constrained to raise and lower in a straight line path.

20 11. A window regulator comprising in combination a support, a pair of pivoted arms, spaced operative connections adapted to connect the arms to a window, one of said operative connections being movable relative to the window, the said operative connections with the window being positioned on opposite sides of the center of the lower edge of the window and at equal distances from the pivots of the respective arms, and means operatively connected to the other of said arms causing the operative connection between the
30 said arm and the window to travel in a straight line path.

35 In testimony whereof we affix our signatures.

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