

[54] **WINDOW REGULATOR MECHANISM**

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[58] Field of Search **49/103, 349, 351, 227**

[56] **References Cited**

UNITED STATES PATENTS

2,955,817	10/1960	Campbell et al.	49/227 X
3,231,301	1/1966	Gray	49/351 X
3,659,381	5/1972	Frey et al.	49/103

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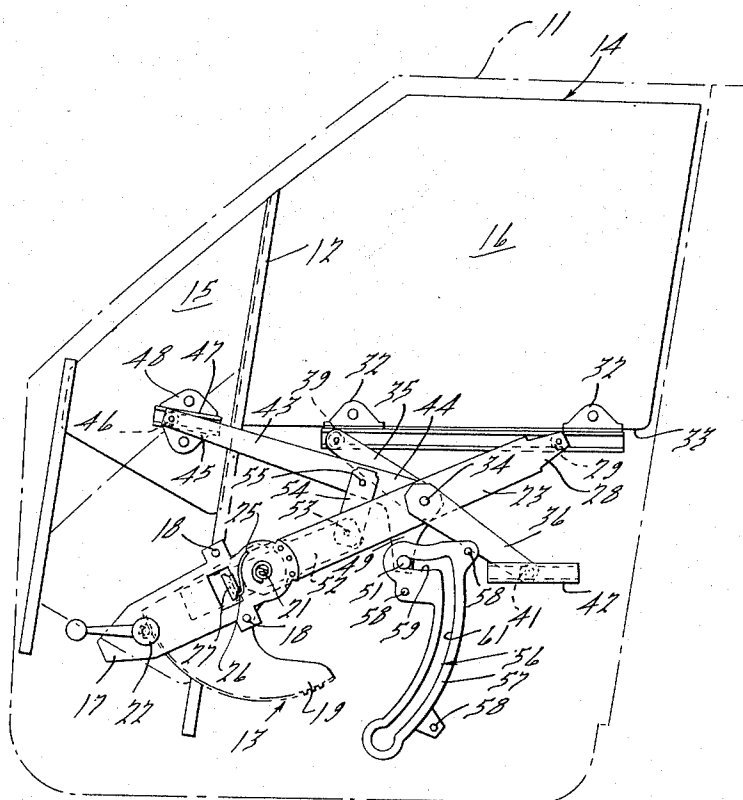
[57] **ABSTRACT**

A window regulator mechanism adapted to lower or raise a window panel into and out of a window well

between vehicle body panels, the window panel being divided into separate vertically movable ventilation and visibility sections. With the window panel in raised condition, the mechanism first may be actuated to lower the ventilation section into the window well to provide a ventilation exhaust opening in the vehicle body and then, if desired, further actuated to lower the visibility section into the window well. From a lowered condition, the sequence of movements to raise the panel sections is reversed.

Movement of the panel sections is controlled by a pair of regulator arms, one of which is swingable about a pivot axis on the window regulator mounting plate and is connected to the visibility section and the other of which is swingable about a pivot axis on the plate mounted arm and is connected to the ventilation section. A drive means couples the gear sector to the ventilation section arm to translate rotation of the gear sector in window panel lowering or raising direction into panel section lowering or raising movements of the regulator arms. A cam follower means coupled to the ventilation section arm and engaged with cam slot means mounted on a body panel controls the sequence of movements of both regulator arms and thereby the sequence of movements of the window panel sections.

3 Claims, 4 Drawing Figures



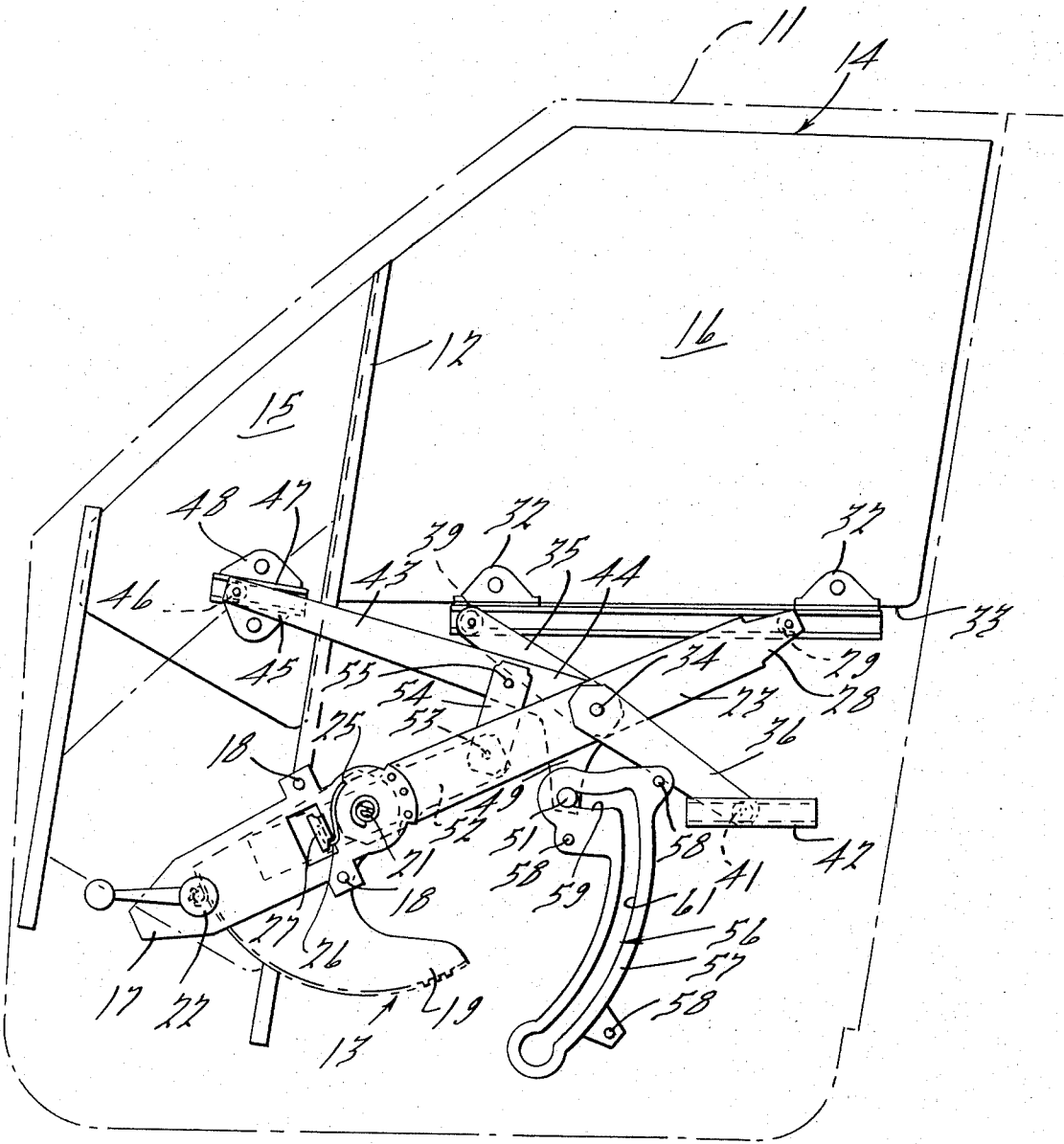
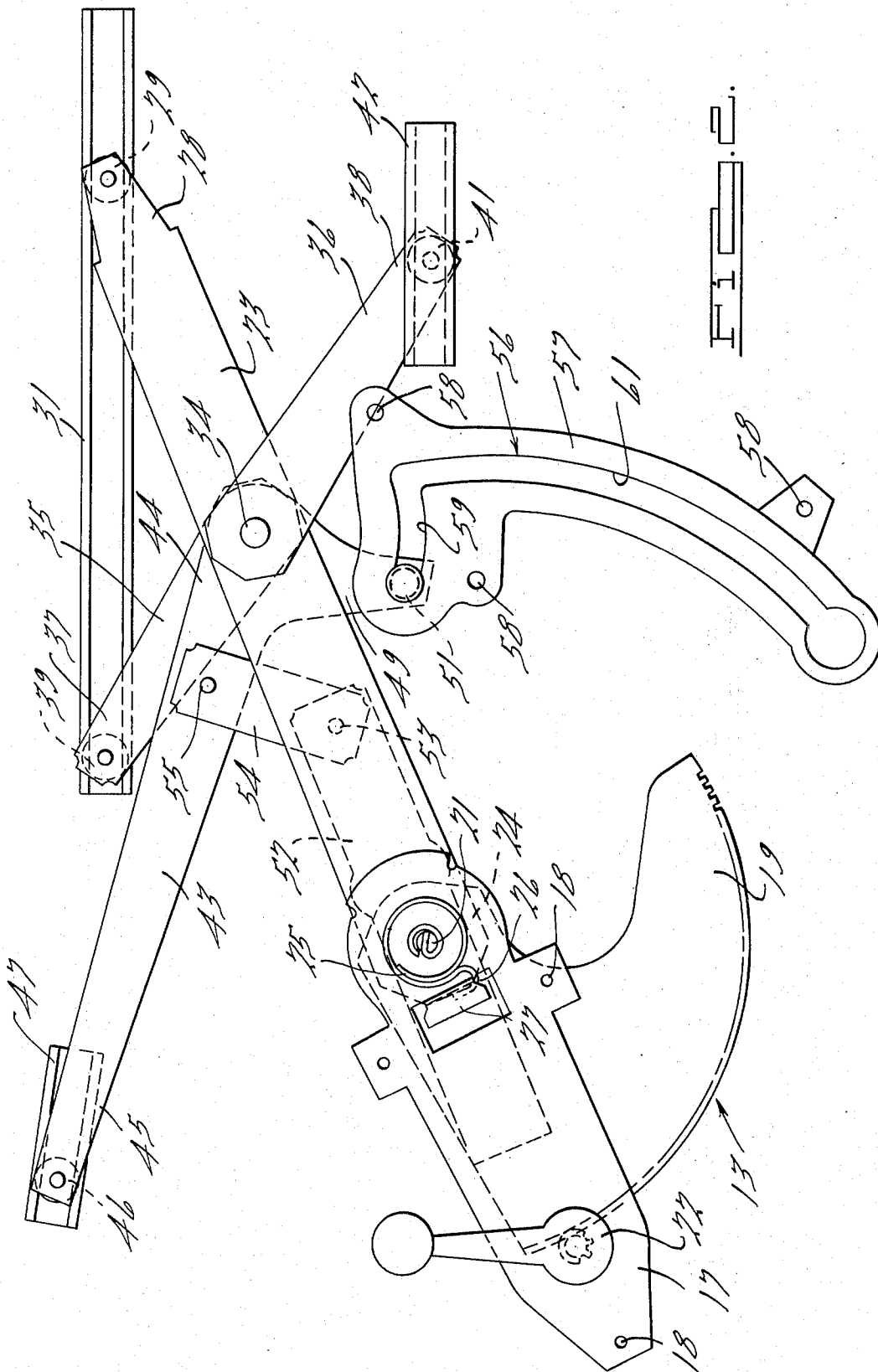
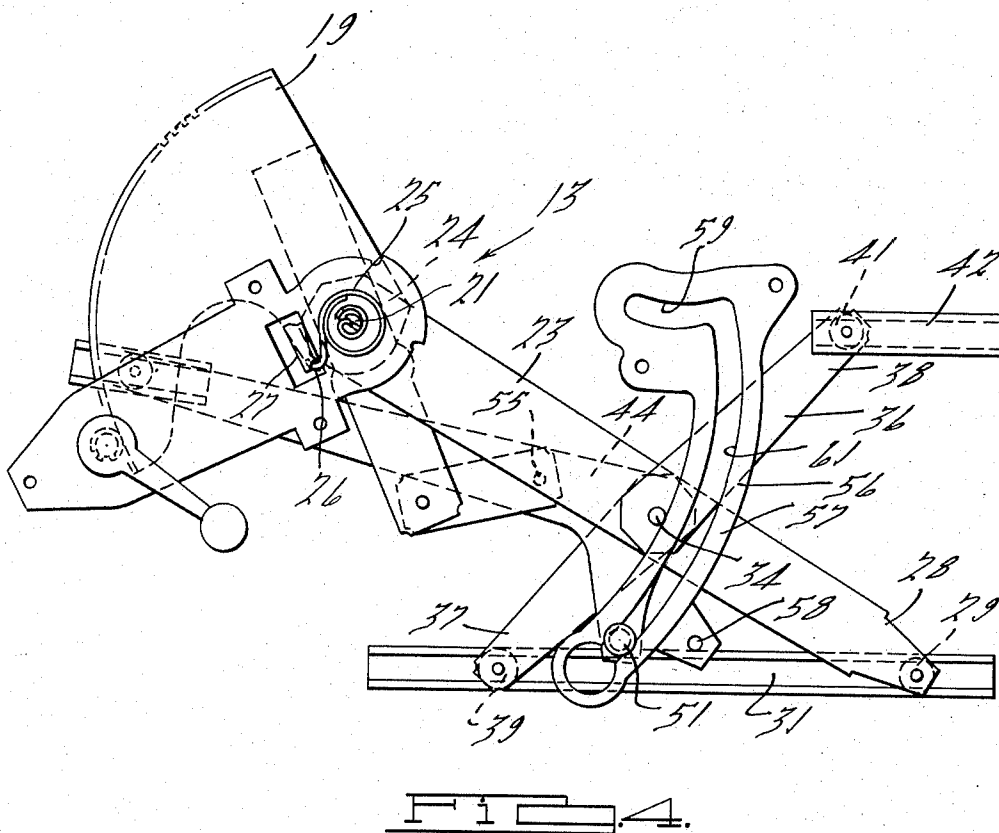
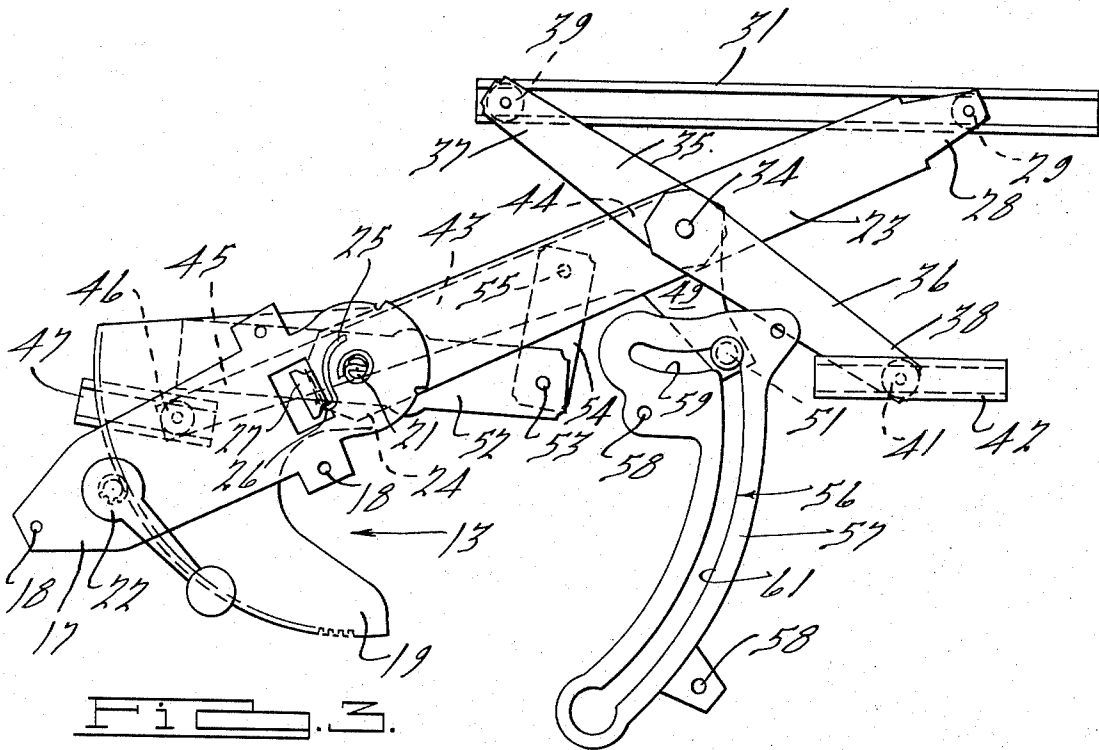


FIG. 1.





WINDOW REGULATOR MECHANISM**BACKGROUND OF THE INVENTION**

U.S. Pat. No. 3,659,381 issued to Stewart M. Frey et al. on May 2, 1972 and U.S. Pat. No. 3,670,454 issued to Harold C. Gebhard on June 20, 1972, each disclose variations of window regulator mechanisms for raising and lowering in a window opening in a vehicle body structure a window panel divided into separate vertically movable ventilation and visibility sections. A single window regulator mechanism is utilized to raise and lower each panel in controlled sequence. The mechanism disclosed in each patent is somewhat complicated in that a unique and complex latch mechanism is provided to hold the large visibility section against movement in any position of the ventilation section other than when the latter is fully lowered.

It is an object of the present invention to provide a single window regulator mechanism for raising and lowering the visibility and ventilation sections in which no complex latch mechanisms are used and in which the sequence of movements and the restraint of the visibility section against movements in any position of the ventilation section other than in fully lowered position of the latter is achieved through a cam follower movable in a suitably programmed cam slot in a cam plate.

SUMMARY OF THE INVENTION

This invention relates to a window regulator mechanism adapted to lower or raise a window panel into or out of a window well between vehicle body panels, the window panel being vertically divided into separately movable ventilation and visibility sections. The window regulator mechanism comprises a mounting plate secured to one of the body panels. A gear sector is pivotally mounted on a pivot shaft journaled in the mounting plate. A first regulator arm means is coupled to the mounting plate and to the visibility section and a second regulator arm means is coupled to the first regulator arm means and to the ventilation section.

The gear sector is coupled to the second regulator arm means by a drive means. Upon rotation of the gear sector in window panel lowering direction, the drive means transfers movement of the gear sector to the second regulator arm means and through the latter to the first regulator means. A cam follower means engaged with a cam slot means is coupled to the second regulator arm means. The cam follower means is movable in the cam slot means to control the sequence of movements of both the first and second regulator arm means so that in window panel lowering direction of movement the ventilation section is lowered a predetermined distance while the visibility section is held against downward movement. Then after completion of the ventilation section movement, the visibility section is released for downward movement.

The sequence of movements is reversed in window panel raising direction of movement.

DESCRIPTION OF THE DRAWINGS

Other objects, advantages and features of the present invention will become more apparent as the description proceeds, reference being had to the accompanying drawings wherein:

FIG. 1 is a side elevational view of a vehicle body structure, such as a vehicle door, having a sectional

window panel mounted therein adapted to be raised and lowered by a window regulator mechanism embodying the present invention;

FIG. 2 is a side elevational view of the window regulator mechanism illustrating the parts thereof in window panel raised position;

FIG. 3 is a view in part similar to FIG. 2 illustrating the parts thereof in a relationship in which the ventilation section of the window panel has been lowered and the visibility section is ready to begin its downward movement;

FIG. 4 is a view in part similar to FIG. 2 illustrating the parts of the window regulator mechanism when both the ventilation and visibility sections are in their lowermost positions within the vehicle body structure.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, there is illustrated in dot and dash outline a portion of a vehicle body structure, such as a vehicle door, generally designated 11. The door 11 has conventional inner and outer panels (not shown) defining a window well and providing a support for the various mechanical hardware items found on a vehicle door such as a door latch mechanism (not shown), a window guide or division bar 12, and a window regulator mechanism, generally designated 13, embodying the present invention.

The window panel, generally designated 14, is vertically divided into two separately movable sections, a small front ventilation section 15 and a much larger main or visibility section 16. As in a conventional vehicle installation, the window panel 14 is adapted to be raised and lowered into and out of the window well defined by the inner and outer panels of the door structure 11. In accordance with the present invention, the window regulator mechanism 13 is constructed and arranged to raise and lower the window panel sections 15 and 16 in sequential movements, as will be more fully explained.

The window regulator mechanism 13 comprises a horizontally elongated base or mounting plate 17 adapted to be mounted as by bolts 18 to the inner door panel. A gear sector 19 is rotatably journaled on a pivot shaft 21 positioned at one end of the mounting plate, the gear sector 19 being freely rotatable on the shaft. The gear sector 19 is illustrated as being drivable in window raising or lowering direction by a conventional hand crank window regulator drive pinion and clutch assembly 22.

A first regulator arm means is coupled to the mounting plate 17 and to the visibility section 16. This first regulator arm means comprises an elongated arm 23 which is connected at one end 24 to the pivot shaft 21 for turning movement with the latter. Also connected to the pivot shaft 21 is a spiral counterbalance spring 25 which has its free end 26 anchored to a tab 27 on the regulator mounting plate 17. As the arm 23 is swung downwardly in window panel lowering direction, the spring 25 will be wound up to counterbalance the weight of the window panel section 16. This follows conventional practice in window regulator mechanisms.

The free end 28 of the arm 23 carries a roller 29 which rides in a channel section 31 that is supported on brackets 32 on the lower edge 33 of the visibility section 16. The channel section 31 extends a substantial

distance along the bottom edge of the panel section 16.

The arm 23 has a pivot shaft 34 journaled therein intermediate its ends 24-28. The pivot shaft 34 has coupled to it a stabilizing arm means which consists of two separate arm sections 35 and 36. Each of the arm sections is nonrotatably fixed to the pivot shaft 34 on opposite ends of the latter and therefore on opposite sides of the regulator arm 23. The free end 37 of the arm section 35 carries a roller 39 which rides in the channel section 31 attached to the lower end of the visibility section 16. The free end 38 of the arm 36 carries a roller 41 which rides in a short channel section 42 which is fixed to the body panel to which the regulator mechanism mounting plate 17 is bolted.

A second regulator arm means supports the ventilation section 15. It comprises an elongated arm 43 which is at its end 44 freely swingable about the pivot shaft 34 journaled in the regulator arm 23. The free end 45 of the arm 43 is connected by a roller 46 to a channel section 47 attached by a bracket 48 to a centrally located position on the ventilation section 15. The arm 43 has an extension or short arm 49 which extends substantially at right angles to the end 44 of the arm and radially of the pivot shaft 34. The extension or short arm 49 carries a follower means or roller 51, for a purpose to become apparent.

Movement of the gear sector 19 in window panel lowering or raising direction is translated to the regulator arms by a drive means which consists of an arm 52 fixed to the gear sector 19 for swinging movement about the gear sector pivot shaft 21. At its end projecting beyond the gear sector the arm 52 is pivoted at 53 to one end of a link 54 which is pivotally coupled at its other end by a pivot stud 55 to the second regulator arm 43.

As noted, the extension or short arm 49 on the second regulator arm 43 carries a cam follower 51 in the form of a roller. The cam follower engages a cam slot 56 in a cam plate 57 which is adapted to be held by bolts 58 to the body or door panel to which the regulator mounting plate 17 is bolted. The cam slot 56 is programmed to control the sequential movements of the ventilation and visibility sections. It has an arcuate section 59 extending in a generally horizontal direction. The center of the radius of curvature of the arcuate section 59 is the center of the pivot shaft 34 when the arms of the regulator mechanism are in their up or raised position, as seen in FIG. 2.

The cam slot 56 has a substantially vertically depending arcuate section 61 which follows a path equivalent to that taken by the follower means 51 as the latter moves downwardly as will be explained with regard to the operation of the window regulator mechanism.

OPERATION

The sequential operation of the window regulator mechanism may best be understood with reference to FIGS. 2 to 4, inclusive. FIG. 2 illustrates the parts of the mechanism as they appear when both panel sections 15 and 16 are in their raised position. In this position, the ventilation section arm 43 is braced by the drive arm 52 and drive link 54. The visibility section arm 23 is braced by the short arm 49 since the follower 51 carried on the lower end is positioned against the end of the cam slot horizontal arcuate section 59.

If it is desired to lower the window panel sections, the crank assembly 22 must be rotated in a counterclockwise direction as viewed in the drawings. This causes the gear sector 19 to swing about the pivot shaft 21 in a clockwise direction and results in a downward movement of the end of the drive arm 52 connected to the drive link 54. The drive link 54 is then pulled downwardly causing the ventilation section regulator arm 43 to swing downwardly in a counterclockwise direction about its pivotal connection to the visibility section regulator arm 23.

During the sequence of movement in which the regulator arm 43 is being swung in ventilation section lowering movement, there is no downward movement of the regulator arm 23 and the visibility section 16 to which it is coupled. This is because the cam follower 51 is moving from left to right (as viewed in the drawings) in the horizontal arcuate section 59 of the cam slot 56 about the pivot center 34. The short arm 49 between the cam follower 51 and the pivot shaft 34 continues to brace the regulator arm 23 against downward movement. This action continues until the parts of the window regulator mechanism reach the position shown in FIG. 3 in which the ventilation section reaches what is considered a fully lowered position, as shown in dot-and-dash outline in FIG. 1. In this latter position the ventilation section 15 idles as programmed by the cam follower 51 while the cam follower moves transitionally into the vertical arcuate section 61 of cam slot 56. In this position the regulator arm 23 is no longer blocked against downward movement. As the drive arm 52 continues to pull down on the drive link 54, the fulcrum point for the regulator arm 43 shifts from the pivot shaft 34 to the roller 46. The cam follower 51 moves down the cam slot section 61 and the pivot shaft 34 moves downwardly carrying the regulator arm 23 in a downward clockwise direction around its pivot shaft 21. The stabilizer arms 35-36 swing about their centrally located pivot shaft 34 as the visibility section 16 is driven downwardly by the arm 23. As the arm 23 swings it winds up the counterbalance spring 25 which upon reversal of direction of the arm assists in raising the visibility section.

From a lowered position, the sequence of movements is reversed upon the gear sector 19 being rotated in the opposite direction.

It will be understood that downward movement of the window panel respective sections 15 and 16 may be interrupted at any time so that the ventilation section 15 may be partially or fully opened and the visibility section, after the ventilation section has been fully opened, may also be placed in a partially or fully opened condition. Conversely, during raising movement from a fully lowered position of both panel sections, the operation of the mechanism may be interrupted at any time so that the visibility section 16 may be partially or fully closed. Subsequently, after the visibility section 16 is fully closed, the ventilation section 15 may be moved to a partially opened or fully closed position.

It is to be understood that this invention is not limited to the exact construction illustrated and described above, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:

1. A window regulator mechanism adapted to lower or raise a window panel into or out of a window well between vehicle body panels,

the window panel being divided into separate vertically movable ventilation and visibility sections, the window regulator mechanism comprising:
a mounting plate secured to one of the body panels,

a gear sector rotatably mounted on a pivot shaft journaled in the mounting plate,

a first regulator arm swingable about one of its ends on the gear sector shaft and coupled at its other end by a roller and channel connecting means to the visibility section,

a pivot member journaled on the first regulator arm intermediate the ends of the latter,

a second regulator arm pivotally mounted at one end on the pivot member and coupled at its other end by a roller and channel connecting means to the ventilation section,

drive means coupling the gear sector to the second regulator arm for driving the latter and the first regulator arm in window lowering or raising directions upon movement of the gear sector in window lowering or raising directions,

and cam follower means engaged with cam slot means,

the cam follower means being coupled to the second regulator arm and being movable in the cam slot means to control the sequence of movements of both the first and second regulator arms.

2. A window regulator mechanism according to claim 1, in which:

the drive means comprises a drive arm fixed to the gear sector for swinging movement about the gear sector pivot axis,

and the drive arm is connected to the second regulator arm by a drive link whereby rotary movement of the gear sector in window panel lowering or raising direction is translated into lowering or raising movement of the second regulator arm and thereby the first regulator arm.

3. A window regulator mechanism according to claim 1, in which:

the second regulator arm has a short arm that extends radially from the pivot member and carries the follower means,

and the cam slot means is mounted on the one body panel.

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