United States Patent [19]

Heesch

[11] **3,733,748**

[45] **May 22, 1973**

[54] **MULTIPLE STAGE WINDOW REGULATOR**

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[73] Assignee: **Hancock Industries, Inc.**, Jackson, Mich.

[22] Filed: **Dec. 16, 1971**

[21] Appl. No.: **208,556**

[52] **U.S. Cl.** **49/103**

[51] **Int. Cl.** **E05f 11/38**

[58] **Field of Search** 49/48, 73, 103, 227, 49/349, 350, 351, 363

[56] **References Cited**

UNITED STATES PATENTS

3,659,381	5/1972	Frey	49/103
3,670,454	6/1972	Gebhard	49/103
2,955,817	10/1960	Campbell et al.	49/227 X

Primary Examiner—J. Karl Bell
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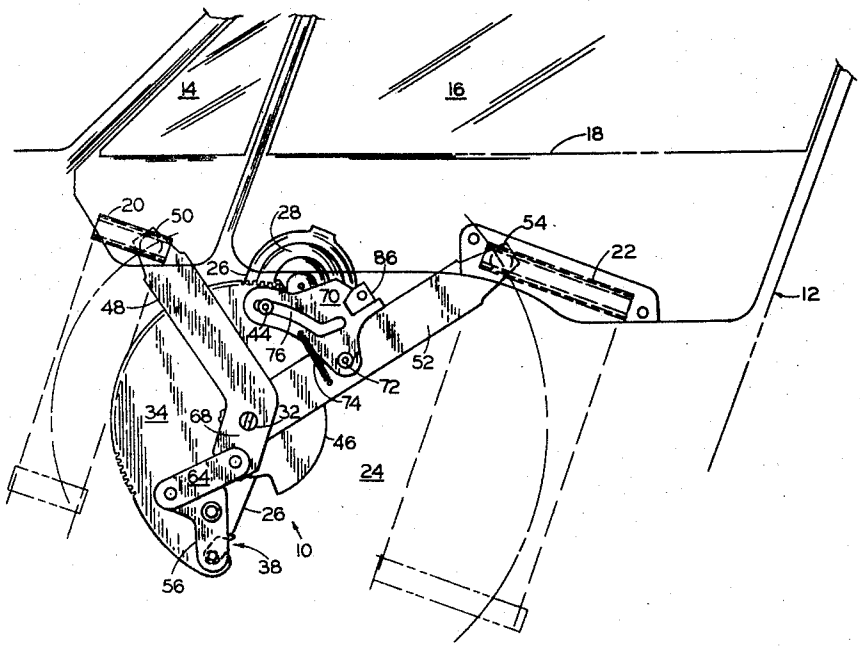
[57] **ABSTRACT**

A window regulator for sequentially operating two, substantially coplanar, separate, window panels slidably mounted within an automobile door, one of the window panels constituting a small vent, and the other window panel constituting a primary side window. Single operating means for both window panels, which is either manual or motorized, actuates the regulator mechanism through two consecutive stages of operation whereby movement of the regulator in a single direction first fully operates one window panel through its full range of adjustment, and upon such panel adjustment being completed, then operates the other panel through its adjustment range. The regulator includes a gear segment and a lever pivotally associated with each window panel. Lost motion means interconnecting the gear segment and the levers produces the sequential window regulation, and locking means are utilized with the levers to lock the window panels in desired terminal conditions.

15 Claims, 7 Drawing Figures



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SHEET 1 OF 4

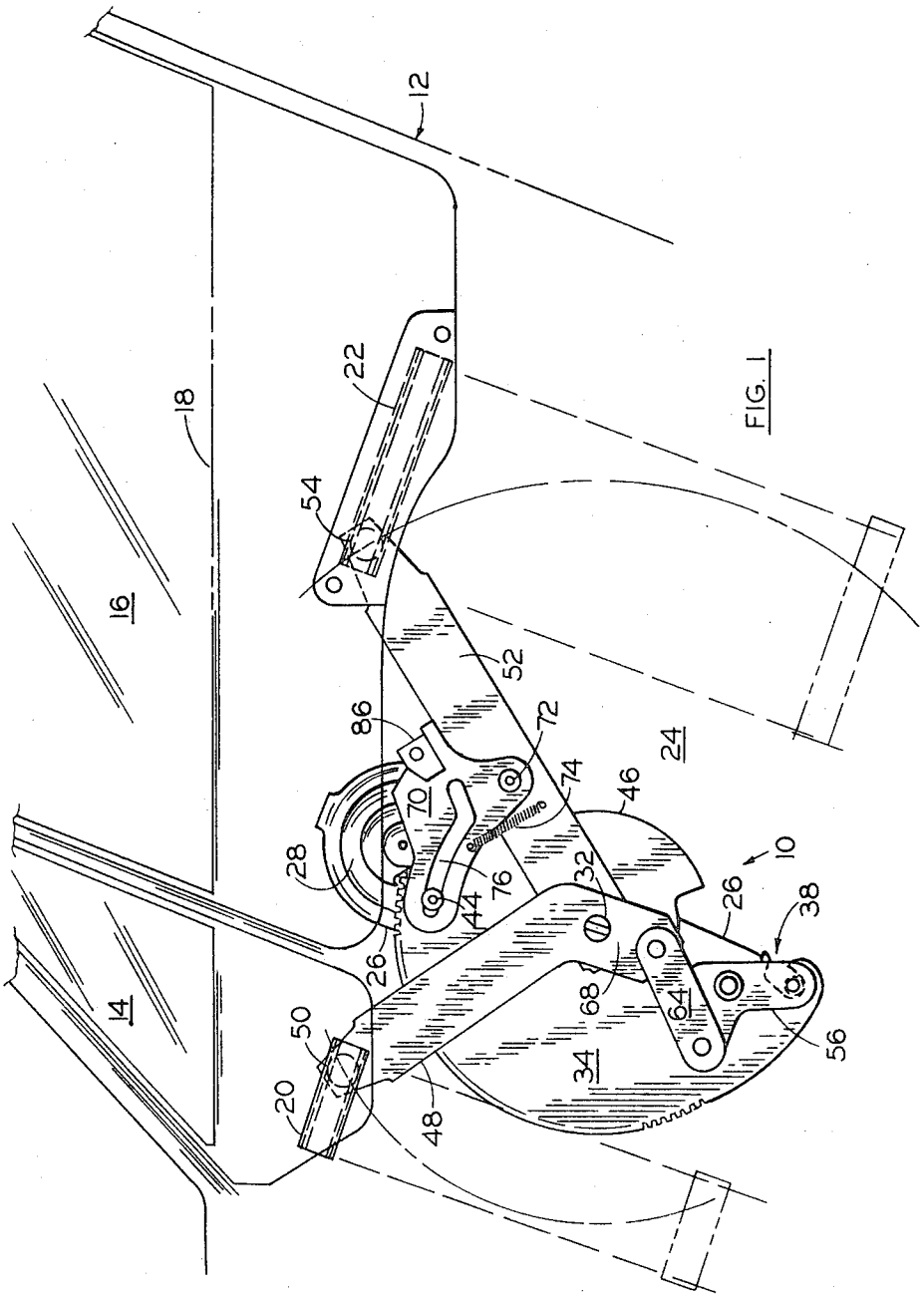

FIG. 1

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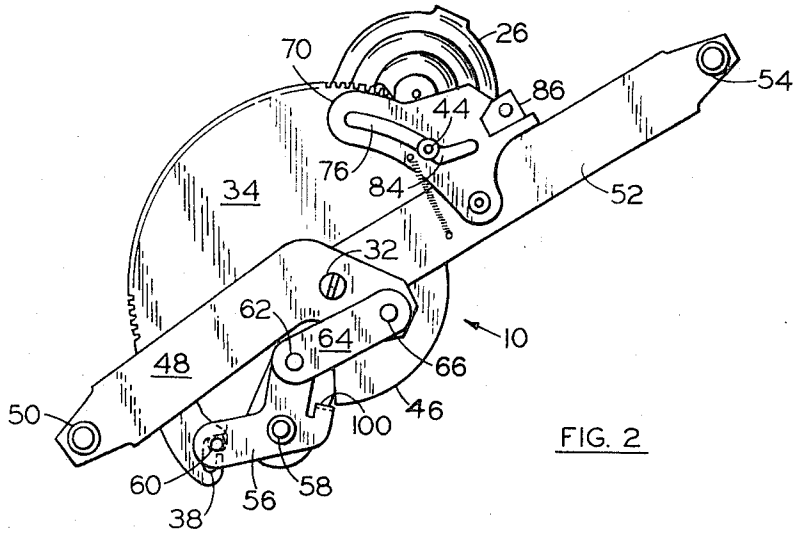

FIG. 2

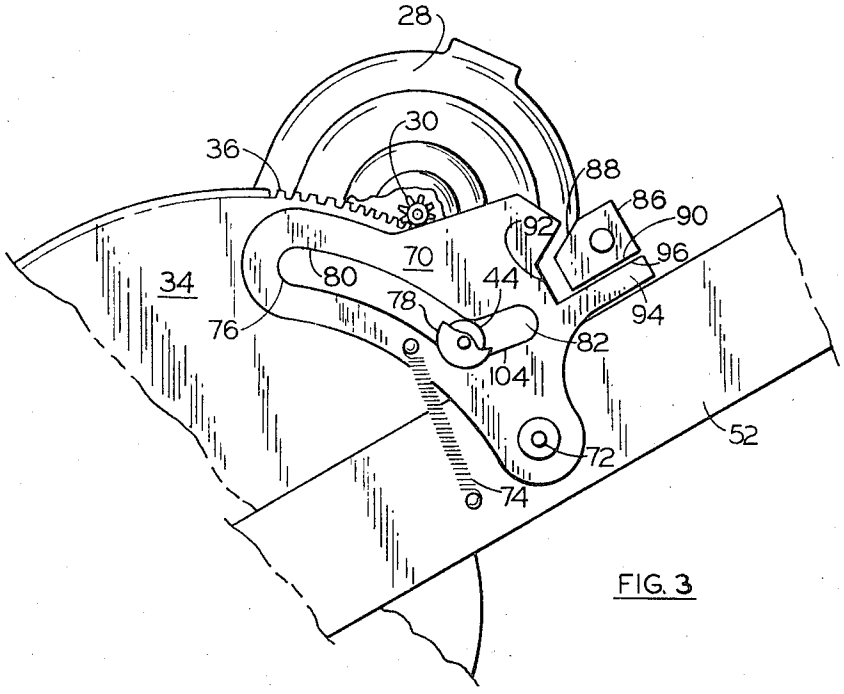

FIG. 3

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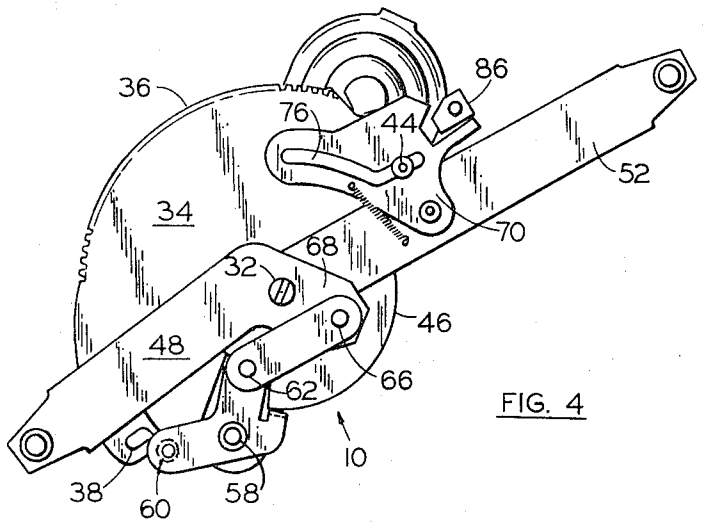

FIG. 4

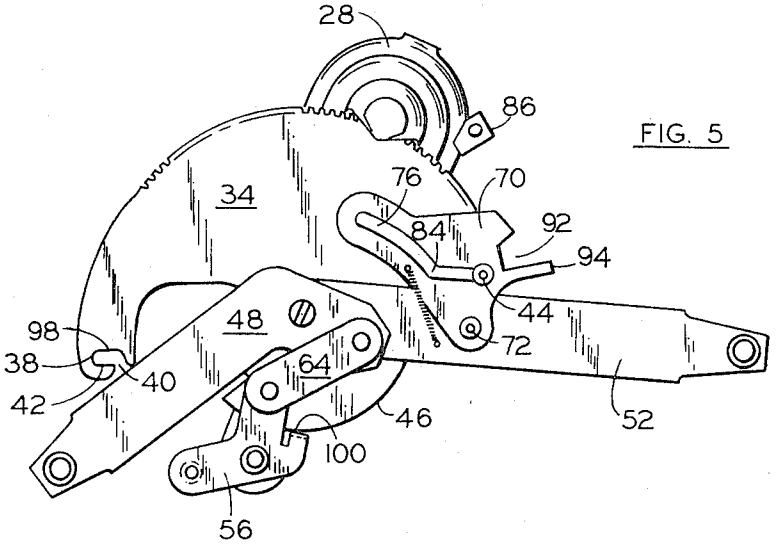

FIG. 5

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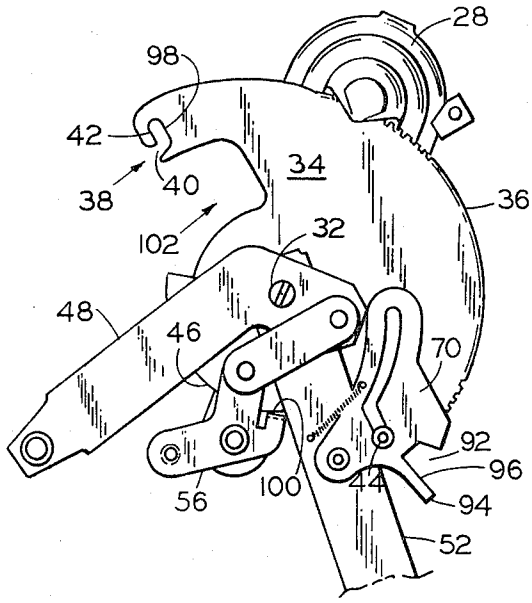

FIG. 6

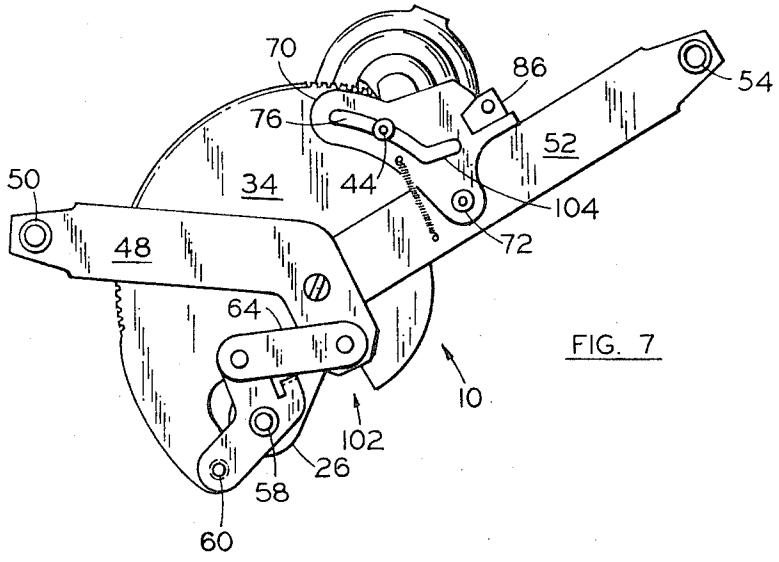

FIG. 7

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MULTIPLE STAGE WINDOW REGULATOR

BACKGROUND OF THE INVENTION

The invention pertains to a multiple stage automobile window regulator using common operating structure to regulate two window panels.

In the design of automobile ventilation systems it is known to incorporate small vent windows into the vehicle window system whereby improved air circulation and venting may be readily achieved. Usually, the vent window is located at the forward portion of the window space of the automobile front door, and the most common window vent construction mounts the vent window upon a substantially vertical pivot axis such that the vent window may be pivoted between opened and closed positions.

The operation of vent windows may include a direct manipulation of the window wherein a handle, often a pivotal locking handle, directly mounted upon the vent window frame is grasped to position the vent. A more expensive construction entails the use of vent window regulators incorporated into the vehicle door employing a gearing system whereby a manually operated crank rotatably mounted upon the door interior is employed to pivot the vent window. In more expensive automobiles vent window operation may be motorized and controlled by an electric switch.

For purposes of convenience, economy, space conservation, and other factors, it has been proposed to operate both the vent window, and the larger primary window panel located in the same door as the vent, from a common crank handle rotatably mounted upon the door interior. In such arrangements the windows operate in stages or sequence, and devices of this type are shown in U.S. Pat. Nos. 2,152,055; 2,448,796 and 2,955,817.

When controlling the regulation of two window panels from a common regulator various problems are encountered which are not present with the more conventional single window panel regulator operation. For instance, in an arrangement whereby a regulator controls a single window panel, locking of the window in the closed position is achieved merely by cranking the window regulator to the full up condition. If the window panel vibrates downward slightly, the desired fully closed condition can be reachieved by crank handle operation. However, in a multiple stage regulator where sequential operation between stages is produced, the locking of one window panel in a closed condition may not be directly achieved by the operator if such window to be locked is raised prior to the raising of the second window panel due to the sequential operation of the regulator. Thus, the operation of two window panels from a common window regulator requires locking and constructional feature uniquely adapted to operational characteristics, and as existing multiple stage window regulator do not comply with present safety and operating requirements the regulator in accord with the invention has been developed to comply with present automobile standards.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a multiple stage window regulator capable of operating two vertically slidable window panels from a single manually operated crank, or motor.

In the practice of the invention a relatively small vertically slidable vent window is mounted adjacent a large primary vehicle window panel which is slidable in a plane generally coincident with the plane of operation of the vent window. It is desired to regulate both the vent window panel and the primary window panel by the same regulator, which may be either manually operated through a conventional crank, or may be motor operated. When both window panels are in the up or closed position, operation of the regulator in the down direction first fully lowers the bent window, and then lowers the main window panel only after the vent has been completely retracted to its lowermost position. Reversal of the direction of movement of the regulator apparatus raises the main window panel to the fully closed position, and locks the main panel in such closed position prior to raising the vent window from its fully lowered position. Means are also provided for locking the vent window in the fully lowered position during regulation of the main window panel, and lost motion means are employed to insure the proper sequence of operation.

The invention employs a gear segment or sector pivotal about an axis of rotation. A manually rotated crank pinion, or motor driven pinion, meshes with the teeth of the gear sector whereby the gear sector may be rotated in either direction of movement by the manual rotation of the pinion, or by the motorized driving thereof. A first lever pivotally mounted upon the gear sector axis has an outer end connected to the vent window panel by a conventional track and follower device. A second lever, also pivoted to the gear sector axis, includes an outer end connected to the primary window panel through a track and follower. Lost motion means are interposed between the first lever and the gear sector for selectively establishing connection between the first lever and the gear sector during movement of the gear sector in either direction during a predetermined arc of movement of the sector. Likewise, additional lost motion means are interposed between the second lever connected to the main window panel and the gear sector producing operation of the second lever through movement of the gear sector in either direction through a second arc of movement.

In order that the primary window panel may be locked in its full up or closed position, even though the vent window may be partially open, a fixed detent is employed as locking structure which cooperates with a pivoted locking latch mounted upon the primary window panel lever which insures that the desired closing pressure for the primary window panel is achieved at all times.

When the vent window is fully retracted it is desired that the vent panel not inadvertently lift under shock or impact, until raised by the regulator, and locking means are also interposed between the gear sector and vent lever mechanism to prevent raising of the vent window until allowed by the regulator.

The lost motion structure interposed between the vent lever and the gear sector includes a third pivotally mounted lever having an abutment receivable within a notch defined on the gear sector during pivoting of the gear sector through its first arc of movement. In this manner the notch and the third lever, which is linked to the vent lever, establishes a mechanical drive interconnection between the vent lever and the gear sector during sector movement through its first arc. The lost

motion connection between the primary window lever and the gear sector is incorporated into the locking latch mounted upon this lever, and such structure includes a cam slot defined in the latch receiving a cam follower mounted upon the gear sector. The configuration of the cam slot is such that the latch is pivoted free from engagement with the locking detent during the initial movement of the gear sector through its second arc of movement during window retraction.

The operation of the lost motion means is automatically achieved, and the locking of the window panels at their selected terminal positions is likewise automatically accomplished without attention on the part of the operator. The desired window movement and regulation is produced merely by rotation of the window crank in the desired direction, or actuation of the drive motor, and no special skills are required to produce the desired sequence of operation, and locking of the window panels.

It is therefore an object of the invention to provide a multiple stage window regulator capable of regulating the position of two window panels through a common actuator wherein sequential window panel raising and lowering may be achieved, and locking of the window panels at selected positIons is automatically achieved.

DESCRIPTION OF THE DRAWINGS

The aforementioned objects and advantages of the invention will be appreciated from the following description and accompanying drawings wherein:

FIG. 1 is an elevational, partially schematic, view of multiple stage window regulator apparatus in accord with the invention illustrating 'he regulator structure in the position where both window panels are fully closed,

FIG. 2 is an elevational view of the window regulator structure, per se, illustrating the vent window lever in the fully retracted position, and prior to release of the primary window panel lock,

FIG. 3 is an enlarged, elevational view of the primary window panel lever, detent and locking latch illustrating the latch partially removed from the detent,

FIG. 4 is an elevational view of the window regulator apparatus illustrating the initial movement of the primary window panel lever, and illustrating its locking latch substantially cleared from the locking detent,

FIG. 5 is an elevational view of the window regulator structure illustrating the primary window panel lever in the approximate one half open position,

FIG. 6 is an elevational view of the window regulator structure illustrating the primary window panel lever in the fully open position, and

FIG. 7 is an elevational view illustrating the vent window lever in a partially opened condition, the primary window panel lever being in the locked condition.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 the window regulator **10** in accord with the invention is illustrated as associated in the front door of an automobile schematically represented at **12.** The window structure is only generally disclosed as it forms no specific part of the invention, and includes a small vent window panel **14,** and a primary larger window panel **16.** The window panels **14** and **16** are located in substantially the same general plane, and are movable in a vertical direction between the full up positions illustrated in FIG. **1,** to fully retracted positions within the confines of the door **12** wherein the upper edge of the window will be disposed below the door sill as indicated at **18.** The window panels are guided for movement within conventional vertically disposed guides or tracks, not illustrated, and the vent window panel **14** includes a conventional track **20** of the known U-shaped transverse cross-sectional configuration for receiving the roller or follower mounted upon the window regulator lever. The primary window panel **16** also includes a like track **22** for receiving its associated window regulator lever, and the path of movement and the lower positions of the panel tracks **20** and **22** are illustrated in dotted lines in FIG. **1.** When the window panel tracks are in the lower dotted line positions the associated window panel is in the fully open or retracted position.

The window regulator **10** in accord with the invention is mounted upon an internal metal panel **24** located within the vehicle door **12** below the sill **18** as is well known in automobile door construction. The regulator apparatus includes a base plate **26** attached to the door inner panel by screws or bolts, not shown, and the base plate includes a pinion gear housing **28** for rotatably supporting a pinion gear **30,** FIG. **5,** in suitable bearings. The pinion gear **30** may be rotated by a crank mounted upon the door interior side, in the well known manner, or the pinion gear may be connected to reversible electric motor dive means in those embodiments wherein window operation is to be motorized.

The base plate **26** includes a pivot axis shaft **32** extending from the base plate toward the viewer, FIG. **1.** The regulator structure further includes a gear sector **34** rotatably mounted on the pivot shaft **32.** The gear sector includes a circumferential portion concentric to the pivot shaft **32** upon which gear teeth **36** are defined which mesh with the teeth of pinion gear **30.** Thus, in the well known manner, rotation of the pinion **30** by either a crank or a motor will rotate the gear sector **34** about its pivot axis shaft **32.**

The gear sector **34** also includes a portion in which notch **38** is defined. The notch **38** includes an entrance opening **40,** and a portion **42** defining a hook for purposes which will be later appreciated. A cam follower **44** is mounted on the gear sector adjacent the toothed periphery of the sector, and a cam surface **46** concentric with the shaft **32** is defined on the gear sector for locking the vent window in the fully retracted position as will be later described.

Two window panel operating levers are mounted upon the pivot axis shaft **32** for oscillation thereon. The first lever **48** is associated with the vent window panel **14** and includes an outer end upon which the roller **50** is mounted for reception within the vent window panel track **20.** Thus, as the lever **48** is pivoted about its axis, the vent window **14** will be raised and lowered in its guide tracks. In a like manner, the primary window panel lever **52** is mounted upon the axis shaft **32** and includes a roller **54** received within the window track **22** such that pivoting of the lever **52** will raise and lower the window panel **16** in the known manner.

A bell crank lever **56** is pivotally mounted on the base plate **26** by a pivot shaft **58,** and the bell crank lever includes a roller pin **60** constituting an abutment which is selectively receivable within the notch **38.** The bell crank lever also includes a pivot pin **62** pivotally connecting link **64** thereto, and the other end of the link **64** is pivotally connected at **66** to the arm **68** of the

vent window lever **48.** Thus, it will be appreciated that the bell crank lever **56** is connected to the lever **48** through the linkage **64** for producing actuation of the lever **48** in dependence upon the position of the bell crank lever. Also, the dimensions between the roller pin **60** and the shaft **58,** and the shaft **58** and the pin **62,** as well as the dimension between the pin **66** and the shaft **32,** are such that a multiplication of extent of movement is produced, i.e., movement of the bell crank lever **56** through an arc of approximately 60° will actuate and move the vent lever **48** through an arc of approximately 90°.

A latch **70** is mounted upon the primary panel lever **52** and is pivotally affixed thereto by the pivot pin **72.** The latch **70** is preferably biased in a counterclockwise direction with respect to rotation about the pivot pin **72** by a spring **74** as shown in FIG. **3.** The latch includes a cam slot **76** in which the gear sector mounted cam follower **44** is received. The cam follower **44** includes a washer **78** of a diameter greater than the slot **76** which engages the latch side adjacent the slot, and the portion of the cam follower within the slot is of a diameter substantially corresponding to the slot width. The cam slot **76** includes a circular portion **80** having a radius equal to the radius of the cam follower **44** from the shaft **32,** and the cam slot further includes a portion **82** transversely disposed to the portion **80.** The intersection of the two cam slot portions is represented at **84.**

The latch **70** serves as a lost motion interconnection between the gear sector **34** and the lever **52,** and further serves to lock the lever **52** with respect to the vehicle door structure under certain conditions. Such locking is achieved by a detent block **86,** which is fixed with respect to the vehicle door **12.** While it is possible to mount the detent **86** upon the base plate **26,** in the preferred embodiment, the detent block will be mounted upon the door structure **12** by suitable adjustable means such that the detent may be accurately located. The detent block includes a tapered surface **88,** and an opposed positioning surface **90,** and a complimentary shaped notch **92** is defined in the latch **70** for closely cooperating with the detent block **86** in order to accurately and firmly maintain the lever **52,** and the primary window panel **16** in its closed condition with a predetermined force. The latch **70** includes an extended finger **94** upon which the surface **96** is defined, and the finger extends outwardly from the latch for cooperation with the detent block **86** in a manner later described.

Operation of the multiple stage window regulator in accord with the invention will be appreciated from the following:

Assuming the window panels **14** and **16** to be in their upper or closed positions, the window regulator structure will be in the relationships as represented in FIG. **1.** In this condition the lever **52** is locked with respect to the detent block **86** as the detent block is closely received within the notch **92** of the latch **70.** The latch **70** cannot pivot in the counterclockwise direction to remove the detent block from the latch notch due to the presence of the cam follower **44** within the slot portion **80,** and the detent block **86** is so positioned that the window panel **16** will be maintained in its up or closed position with sufficient force to meet operational requirements with respect to sealing and comply with government safety regulations. Thus, the presence of the detent block **86** permits the window panel **16** to be held in the closed position with sufficient force to prevent water leakage past window seals, and rattling or other undesirable vibrations of the window panel will be eliminated.

In the relationship shown in FIG. **1,** the bell crank lever roller pin **60** is located within the hooked portion **42** of the gear sector notch **38,** and the notch surface **98** will be bearing upon the pin **60** endeavoring to rotate the lever **56** in a counterclockwise direction. Such a force on a lever **56** transmits a clockwise force on the lever **48** tending to hold the vent window **14** in its uppermost position as shown.

When it is desired to lower the vent window **14** the operator rotates the pinion gear **30,** either manually, or by motor, to rotate the gear sector **34** in a clockwise direction. This operation causes the notch hook portion **42** to be engaged by the roller pin **60** rotating the crank lever **56** in a clockwise direction. Due to the interconnection by the link **64,** the lever **48** is now rotated at an accelerated rate in a counterclockwise direction which will lower the vent window **14.** As will be appreciated by comparing FIGS. **1** and **2,** the arc of movement through which the gear sector **34** rotates to pivot the lever **48** from its fully up position shown in FIG. **1** to the full lower position shown in FIG. **2** may be only in the neighborhood of 10° to 15°, while approximately a 90° oscillation is produced in the lever **48.** This portion of rotation of the gear sector **34** producing operation of the lever **48** is hereinafter designated as the gear sector first arc of movement for purpose of reference.

From FIG. **2** it will be appreciated that as the gear sector is rotating through its first arc of movement to lower the window vent **14,** the cam follower **44** is moving through the circular latch slot portion **80.** However, as the latch slot portion **80** is concentrically related to the axis shaft **32** when the latch **70** is in locking relationship with the detent block **86,** movement of the gear sector to produce vent window operation causes no movement of the latch with respect to the lever **52.**

The crank lever **56** includes a cam follower surface **100** formed by a flange turned inwardly with respect to the viewer which lies within the plane of the gear sector **34,** however, interference between the lever cam follower **100** and the gear sector does not occur during the previously described operation in view of the fact that the gear sector is recessed at **102** FIG. **6,** in order to permit unimpeded rotation of the lever **56** during vent window panel operation.

When the vent lever **48** reaches its full down position, the roller pin **60** aligns with the notch entrance opening **40,** and further rotation of the gear sector **34** in the clockwise direction permits the pin **60** to leave the notch **38,** disengaging the lever **56,** link **64** and lever **48** from the gear sector. As this position represents the lowermost position of the vent window **14,** stop means, not shown, will normally be included in the window structure against which the vent window rests, and continued rotation of the gear sector **34** causes the gear sector cam surface **46** to engage the crank lever cam follower surface **100** and thereby lock the levers **56** and **48** in this lower position, preventing the vent window **14** from moving upwardly, or "bouncing" in its guides due to impacts or vibration occurring during the normal use of the automobile. As will be appreciated from the drawings, the cam follower surface **100** is in engagement with the gear sector cam surface **46** at all times except when the lever **48** is interconnected to the

gear sector through the associated link **64**, lever **56** and notch **38**.

After the vent window **14** has been fully retracted the second sequence of operation begins. The beginning of this sequence is illustrated in FIG. **3** wherein the cam follower **44** has moved into the cam slot intersection **84** of the latch **70**. Upon the cam follower **44** entering intersection **84** the cam follower will engage the cam surface **104** of the portion **82** and simultaneously begin pivoting the latch **70** in a counterclockwise direction about pivot pin **72** and imposing a force upon the latch which tends to move the lever **52** in a clockwise direction. Thus, the combined counterclockwise direction of rotation the latch **70** on the lever **52** tending to remove the notch **92** from the detent block **86**, and the tendency of movement of the lever **52** in a clockwise direction permits the detent block and the latch notch to be separated which unlocks the lever **52** and permits the main window panel **16** to begin lowering.

FIG. **4** illustrates the position at which the notch **92** has substantially released the detent block **86** and the cam follower **44** has partially moved into the cam slot portion **82**. Continued clockwise rotation of the gear sector **34** fully retracts the latch **70** to the position shown in FIG. **5**, and the cam follower **44** will move to the end of the cam slot portion **82** under the influence of spring **74** pivoting the latch. Further clockwise rotation of the gear sector **34** continues to pivot the lever **52** in the clockwise direction as the follower **44** bears on surface **104** lowering the window panel **16** to its fully lowered position. The relationship of the window regulator components at the fully lowered position of the main window panel **16** is shown in FIG. **6**.

It will be noted from FIGS. **4** through **6** that during the entire movement of the gear sector **34** through its second arc of movement constituting the operation of the lever **52** that the gear sector cam surface **46** is disposed adjacent the cam follower surface **100** of the lever **56** to lock the vent window panel **14** in its down or open condition.

When it is desired to raise the window panel **16** the operator reverses the direction of rotation of the pinion gear **30** to rotate the gear sector **34** in the counterclockwise direction, and the partially raised condition is now represented in FIG. **5**. Lifting of the lever **52** occurs through the cooperation of the cam follower **44** with the latch cam slot portion **82**, and a positive interconnection between the gear sector and lever **52** is achieved during raising of the window panel **16** due to an "over center" relationship between the follower **44** and the latch pivot pin **72** causing the follower to bear against the end of the cam slot portion **82** during lifting. The spring **74** insures that the latch will be properly oriented to the follower **44** while the panel **16** is in the lowered position to produce a positive lift on the lever **52** when the gear sector is rotated counterclockwise.

As the lever **52** approaches the detent block **86** the surface **96** of the finger **94** will engage the detent surface **90**, FIG. **4**, and further counterclockwise rotation of the lever **52** causes the latch **70** to pivot in a clockwise direction about its pivot pin **72** restoring the locking condition between the latch and the detent block **86** as represented in FIGS. **1** and **2**. As soon as the latch notch **92** and the detent block **86** are fully engaged, the window panel **16** will be locked in its up position with the desired force.

If, after raising of the window panel **16**, it is also desired to raise the vent window panel **14**, continued rotation of the gear sector **34** in the counterclockwise direction causes the roller pin **60** to enter the notch **38** through opening **40**, and the gear sector thereby "picks up" the operation of the lever **48**. As the pin **60** is received within the notch **38** it engages the notch surface **98** causing sufficient rotation of the lever **56** to fully position the pin within the notch, and at this time the recess **102** formed in the gear sector **34** has aligned with the cam follower surface **100** so that counterclockwise rotation of the bell crank lever is possible, as shown in FIG. **2**.

As continued movement of the gear sector **34** in the counterclockwise direction continues, the lever **48** is pivoted in a clockwise direction raising the vent window panel **14** to the closed condition shown in FIG. **1**, and upon the vent window being fully raised the window regulator operation is stopped.

It will be appreciated from the foregoing description that two separate and distinct stages of operation are produced each time the gear sector **34** is moved through its complete cycle of oscillation in either direction. The lost motion interconnection between the lever **48** and the gear sector **34** insures that the window **14** will only be operated during movement of the gear sector through its first arc of movement, and the configuration of the latch cam slot **76**, and the use of the latch as a locking element cooperating with detent block **86**, insures that the lever **52** will not move until the vent window operation is completely terminated and the gear sector moves into its second arc of movement operating the primary window panel.

During rotation of the gear sector through its second arc of movement the sector is disconnected from the lever **48** except with respect to the locking action produced by cam surface **46** and cam follower surface **100** which prevents lifting of the vent window.

Locking of the vent window in its open position, and locking of the primary window panel **16** in its upper position is automatically achieved by the window regulator requiring no attention by the operator. By accurately positioning the detent block **86** a closing force of relatively high magnitude may be maintained upon the window panel **16** without requiring excessive forces being imposed upon the window regulator due to the mechanical advantages existing within the cam slot portion **80** with respect to the tendency to pivot the latch **70** upon the lever **52** due to forces imposed thereon through the detent block.

It is appreciated that various modifications to the inventive concept may be apparent to those skilled in the art without departing from the spirit of the invention.

I claim:

1. A multi-stage automobile window regulator for sequentially operating a pair of slidable window panels comprising, in combination, first and second window panels each slidably movable between fully open and fully closed positions, an actuating member pivotally mounted upon an axis for selective rotation in window panel opening and closing directions and having first and second arcs of movement, a first pivotally mounted lever connected to said first window panel pivotal between window open and closed positions, first lost motion means operatively connecting said first lever to said actuating member during pivoting of said member through said first arc of movement, a second pivotally

mounted lever connected to said second window panel pivotal between window open and closed positions, second lost motion means operatively connecting said second lever to said actuating member during pivoting of said actuating member through said second arc of movement, and first locking means locking said second lever in its window closed position during all positions of said actuating member within said first arc of movement.

2. In a multi-stage automobile window regulator as in claim **1**, second locking means connected to said first lever locking said first lever in its window open position during rotation of said actuating member through said second arc of movement.

3. In a multi-stage automobile window regulator as in claim **1** wherein said first locking means comprises a detent fixed with respect to said actuating member and said second lever, and a pivotally mounted latch mounted on said second lever selectively lockingly cooperating with said detent during positioning of said actuating member in said first arc of movement.

4. In a multi-stage automobile window regulator as in claim **3**, a cam surface defined on said latch and a cam follower mounted on said actuating member and engaging said cam surface during movement of said actuating member in said second arc of movement disengaging said latch from said detent.

5. In a multi-stage automobile window regulator as in claim **1**, wherein said first lost motion means includes movement multiplication means interposed between said actuating member and said first lever.

6. In a multi-stage automobile window regulator as in claim **1** wherein said actuating member comprises a gear sector having gear teeth, pinion gear drive means meshing with said gear teeth for pivoting said gear sector about said axis, said first and second levers being pivotally mounted on the gear sector axis.

7. In a multi-stage automobile window regulator as in claim **6** wherein said first lost motion means includes a notch defined in said gear sector, a pivotally mounted third lever linked to said first lever having an abutment defined thereon, said abutment being received within said notch during pivoting of said gear sector through said first arc of movement to actuate said first lever and removed from said notch during pivoting of said gear sector through said second arc of movement.

8. In a multi-stage automobile window regulator as in claim **2** wherein said first lost motion means includes a notch defined in said actuating member, a pivotally mounted third lever linked to said first lever having an abutment defined thereon, said abutment being received within said notch during pivoting of said actuating member through said first arc of movement to actuate said first lever and removed from said notch during pivoting of said actuating member through said second arc of movement, said second locking means comprising a cam follower defined on said third lever and a cam surface defined on said actuating member engaging said cam follower during rotation of said actuating member through said second arc of movement to lock said first lever in its window open position.

9. A multi-stage automobile window regulator for sequentially operating a pair of slidable window panels comprising, in combination, first and second window panels each slidably movable between fully open and fully closed positions, a toothed gear sector pivotally mounted upon an axis for selective rotation in window panel opening and closing directions and having first and second arcs of movement, a drive gear meshing with the teeth of said sector for the selectively rotation thereof, a first lever pivotally mounted on said axis having an outer end connected to said first window panel and pivotal between window open and closed positions, first lost motion means operatively connecting said first lever to said gear sector during pivoting of said sector through said first arc of movement, a second lever pivotally mounted on said axis having an outer end connected to said second window panel pivotal between window open and closed positions, second lost motion means operatively connecting said second lever to said gear sector during pivoting of said sector through said second arc of movement, a fixed detent, and detent locking means mounted on said second lever engaging said detent to lock said second lever in its window closed position during positioning of said gear sector within said first arc of movement.

10. In a multi-stage automobile window regulator as in claim **9**, first lever locking means operatively connected to said first lever locking said first lever in its window open position during rotation of said gear sector through said second arc of movement.

11. In a multi-stage automobile window regulator as in claim **9** wherein said detent locking means comprises a latch pivotally mounted on said second lever having a cam surface defined thereon, and a cam surface follower mounted on said gear sector engaging said cam surface, said cam follower and cam surface defining said second lost motion means.

12. In a multi-stage automobile window regulator as in claim **9** wherein said first lost motion means includes a notch defined in said gear sector, a third lever pivotally mounted adjacent said gear sector linked to said first lever to produce actuation thereof and having an abutment received within said notch during movement of said sector through said first arc of movement, said abutment being removed from said notch during said sector second arc of movement.

13. In a multi-stage automobile window regulator as in claim **12**, a cam follower defined on said third lever, a cam surface defined on said gear segment adjacent said third lever, said cam follower engaging said cam surface throughout gear sector second arc movement locking said first lever in its window open position.

14. A multi-stage automobile window regulator for sequentially operating a pair of slidable window panels comprising, in combination, first and second window panels each slidably movable between fully open and fully closed positions, an actuating member pivotally mounted upon an axis for selective rotation in window panel opening and closing directions and having first and second arcs of movement, a first pivotally mounted lever connected to said first window panel pivotal between window open and closed positions, first disengageable drive means operatively connecting said first lever to said actuating member during pivoting of said member through said first arc of movement and disconnecting said first lever from said actuating member during pivoting of said member through said second arc of movement, a second pivotally mounted lever connected to said second window panel pivotal between window open and closed positions, second disengageable drive means operatively connecting said second lever to said actuating member during pivoting of said actuating member through said second arc of move-

ment and disconnecting said second lever from said actuating member during pivoting of said member through said first arc of movement, and first locking means locking said second lever in its window closed position during all positions of said actuating member within said first arc of movement.

15. In a multi-stage automobile window regulator as in claim **14**, second locking means connected to said first lever locking said first lever in its window open position during rotation of said actuating member through said second arc of movement.

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