

Dec. 16, 1947.

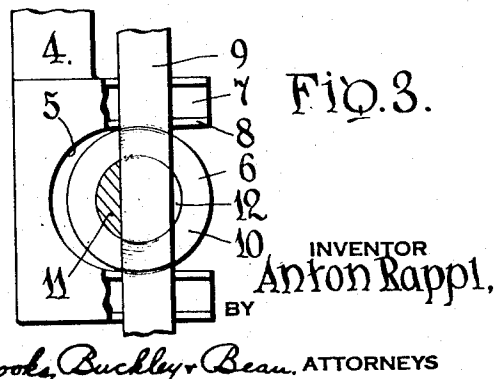
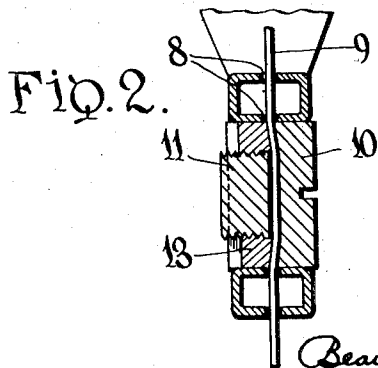
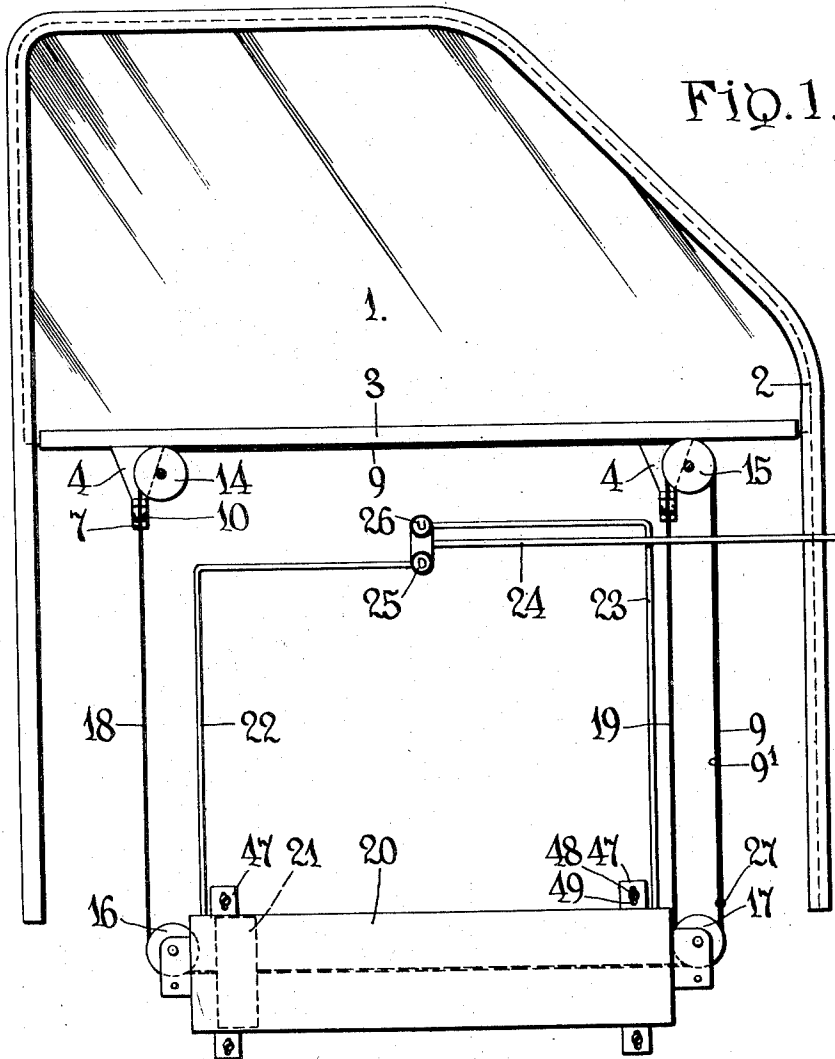
A. RAPPL

2,432,799

WINDOW OPERATOR

Filed Aug. 13, 1942

4 Sheets-Sheet 1



Dec. 16, 1947.

A. RAPPL

2,432,799

WINDOW OPERATOR

Filed Aug. 13, 1942

4 Sheets-Sheet 2

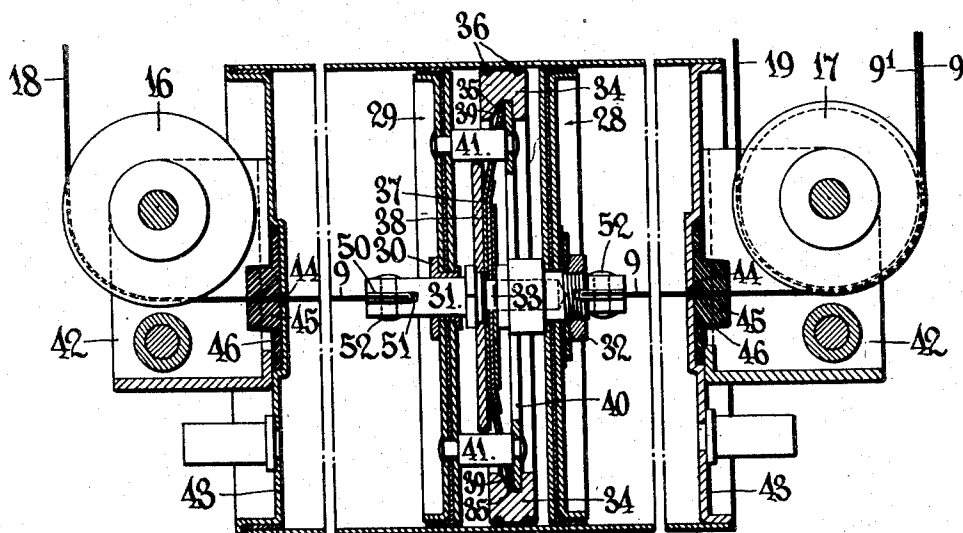


FIG. 4.

FIG. 6.

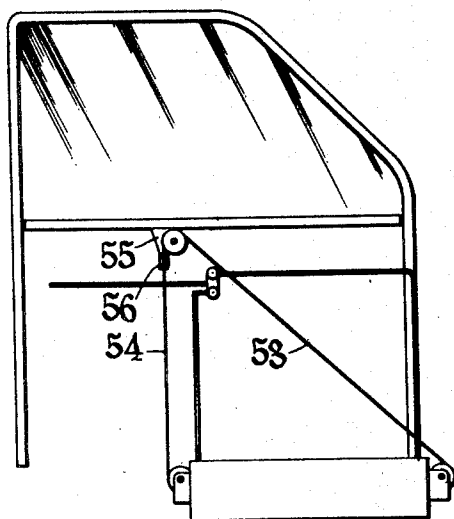
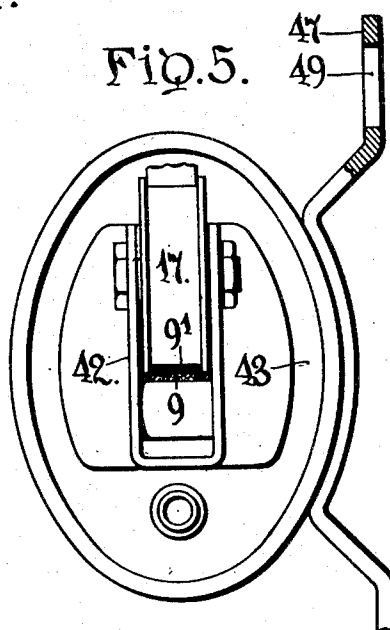


FIG. 5.



INVENTOR
Anton Rappl,
BY
Beau, Brooks, Buckley & Beau,
ATTORNEYS

Dec. 16, 1947.

A. RAPPL

2,432,799

WINDOW OPERATOR

Filed Aug. 13, 1942

4 Sheets-Sheet 3

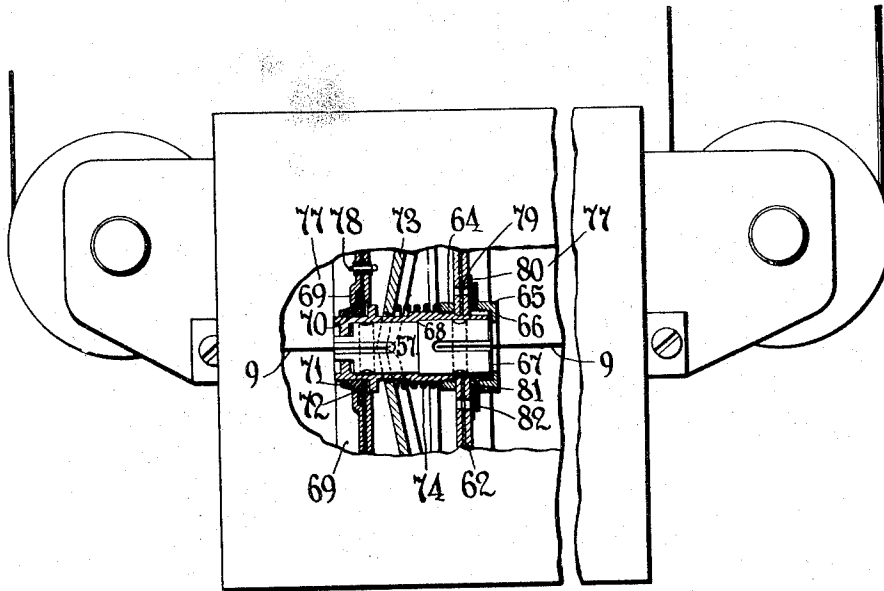


FIG. 7.

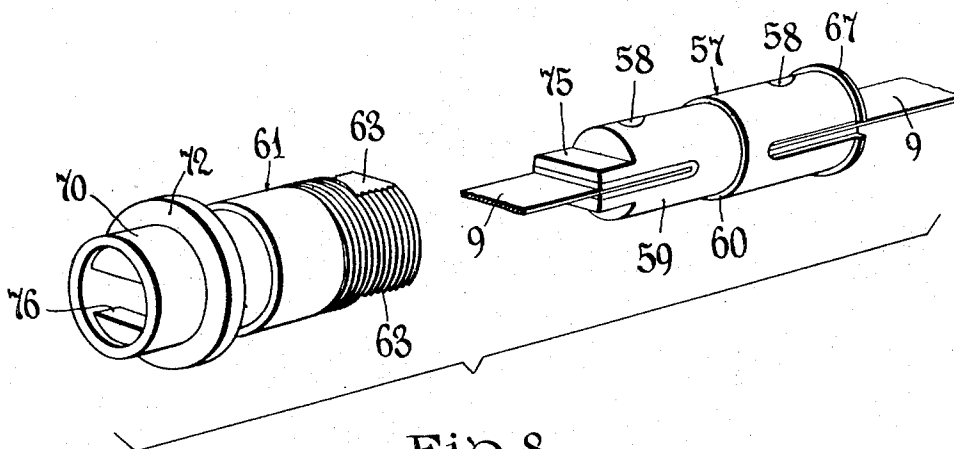


FIG. 8.

INVENTOR
Anton Rappl,
BY
Beau, Brooks, Buckley & Beau,
ATTORNEYS

Dec. 16, 1947.

A. RAPPL

2,432,799

WINDOW OPERATOR

Filed Aug. 13, 1942

4 Sheets-Sheet 4

FIG. 9.

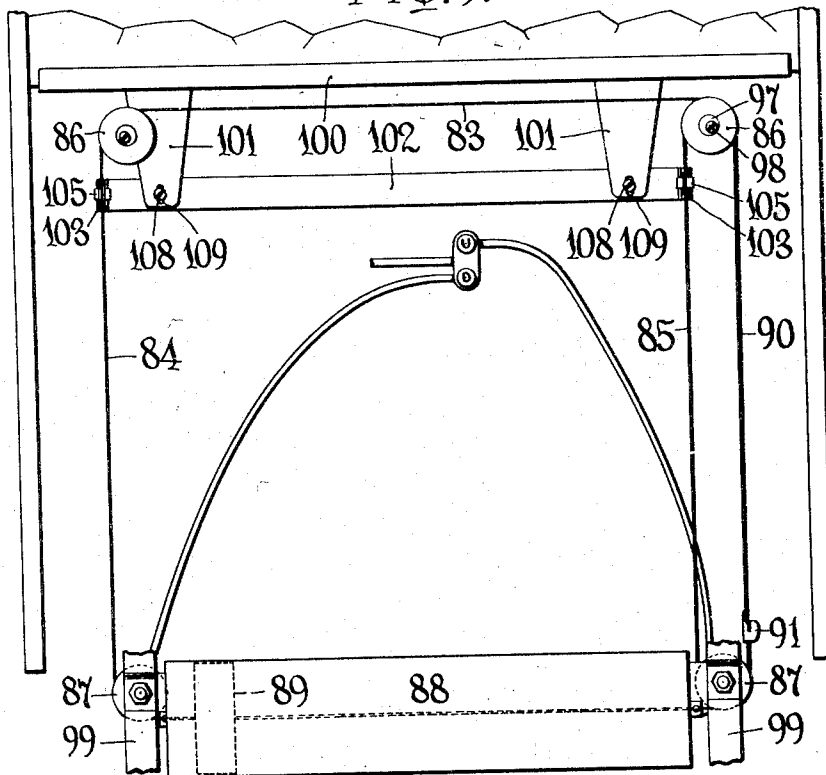


FIG. 10.

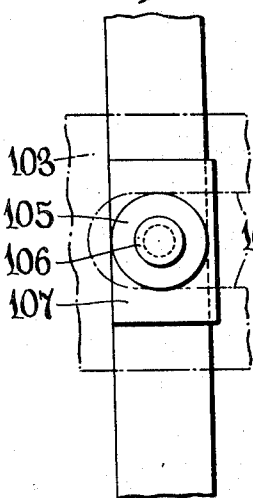


FIG. 11.

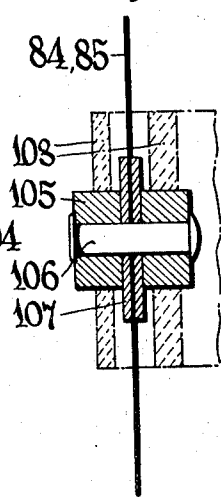


FIG. 12.

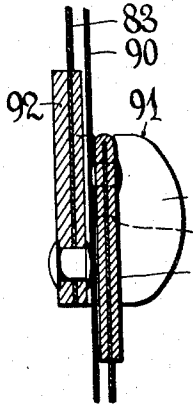
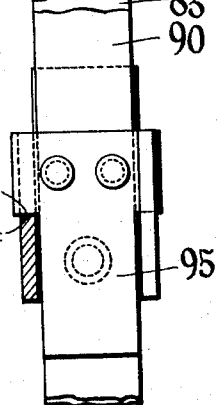


FIG. 13.



INVENTOR
Anton Rappl,
BY
Beau, Brooks, Buckley & Beau
ATTORNEYS

UNITED STATES PATENT OFFICE

2,432,799

WINDOW OPERATOR

Anton Rappl, Buffalo, N. Y., assignor to Trico Products Corporation, Buffalo, N. Y.

Application August 13, 1942, Serial No. 454,634

24 Claims. (Cl. 268—125)

1

This invention relates to a window operating mechanism and primarily to a mechanism for the operation of the vertically slidable windows of motor vehicles wherein the window is mounted in vertical guideways for opening and closing movement into and out of a well provided to receive it in the vehicle door or body.

It has heretofore been proposed to manipulate the vertically slidable window through suitable linkage with or without the aid of suitable counterbalance means and because of the fact that the window panel is frequently of odd shape, such as with the top beveled which shortens one vertical edge relative to the other, extreme care must be given to avoid the canting of the panel and causing an objectionable binding of the same in its guides.

The object of the present invention is to provide a practical and simple support for the window panel which will be efficient in operation while effectively holding the panel against binding in its guideway but rather provide for a smooth and even movement during window adjustment.

The invention further aims to provide a power operated window regulator which is compact in design for facilitating its installation in the confined space available in the modern motor vehicle.

In the drawing

Fig. 1 is a diagrammatic view depicting the present invention in one embodiment associated with the window of a motor vehicle;

Figs. 2 and 3 are detailed views showing the manner of connecting the window panel to its adjustable support and operating mechanism;

Fig. 4 is an enlarged longitudinal sectional view through the power unit of the mechanism, parts being broken away;

Fig. 5 is an end elevation of the motor;

Fig. 6 is a modified showing of the present invention;

Fig. 7 is an elevation, partly in section, of a modified motor construction;

Fig. 8 is an exploded perspective of the piston rod connecting means;

Fig. 9 is a diagrammatic view, similar to Fig. 1, depicting a further embodiment;

Figs. 10 and 11 are detailed views of the self-adjusting connector between the window and the active portion of the flexible operator shown in Fig. 9; and

Figs. 12 and 13 are detailed views of the coupling for the ends of the flexible operator in Fig. 9.

Referring more particularly to the drawing, the

2

numeral 1 designates a glass window panel which is slidable vertically in guideways 2 in the usual well provided in the vehicle body. Along its bottom edge the window panel carries a frame member 3 which is equipped with a pair of depending brackets 4, each having a bearing or seat 5 to receive a lug 6. The seat 5 is illustrated as being in the form of an open slot having upper and lower horizontally extending wall parts 7, each with a slot 8 in which the adjacent one of a pair of endless flexible members or bands 9 and 9' engages. The connecting lug 6 is fixed on its flexible member and may be in the form of a headed screw 10, having its shank 11 formed with a chordal slot 12 to receive the flexible member, and a nut 13 which is threaded on the shank 11 to clamp upon the head. The head of the screw and the nut preferably have supporting engagement with the wall parts of the bearing 5 in a manner to permit the connecting lug riding therein in accommodation of differences which may occur between the movements of the flexible member and the window. By means of the clamp nut 13 the lug is adjustably secured in a fixed position on its flexible member which latter is preferably in the form of a thin flat tape or ribbon of steel or other suitable material. The flexible members are supported on guide pulleys 14, 15, 16 and 17 to provide the active flights or portions 18 and 19 on which the connecting lugs 6 are fixed. The shorter member 9' is supported solely by the pulleys 15 and 17 while the longer member 9, after taking about pulleys 14 and 16 may also pass about the pulleys 15 and 17 on top of the shorter member for movement in unison therewith.

Between the lower pulleys 15 and 17 is arranged the drive for moving the flexible support for the window, the drive herein depicted being of the power type and comprising a fluid motor having a cylindrical or tubular casing 20 with a chamber in which operates a piston 21. The opposite ends of the casing chamber are connected by conduits 22 and 23 to a fluid pressure supply line 24 which in turn is connected to a source of power, such as the intake manifold of the motor vehicle internal combustion engine. While superatmospheric pressure may be used, suction is preferred, and in the illustrated embodiment the source of suction is in constant communication with the chamber 20 at both sides of the piston 21 to thereby balance the pressure on opposite sides thereof. When it is desired to operate the motor either valve 25 or valve 26 will be operated to interrupt the suction communication and vent the respec-

tive side of the chamber to the atmosphere, thereby creating an unbalanced condition and providing a pressure differential for moving the piston toward the low pressure side. For example, if valve 25 is actuated to open the left hand end of chamber 20, as viewed in Fig. 1, to the atmosphere the relatively higher pressure of the outside atmosphere will enter the chamber and act upon the piston 21 to move it to the right. This causes the flexible portions or flights 18 and 19 to move the connecting lugs downwardly and lower the window. Actuation of the valve 26 will cause an upward movement of the window to a closed position. In the illustrated embodiment the longer flexible member incorporates the piston structure as a part thereof to make an endless form by being connected directly to the opposite sides thereof and is joined to the shorter flexible member 9', as by means of a fastener 27, for movement in unison therewith. Consequently the driving force of the motor as imparted to the longer flexible member by the piston 21 will impart like movement to the shorter endless member and the two active portions 18 and 19 will have like movement for actuating the window in a well-balanced manner.

To prevent the window from being opened from the outside the piston is of a self-locking construction such as is shown in Fig. 4 wherein is illustrated a section 28 firmly anchored to the flexible member 9 and a floating section 29 which is movable relative to the anchored or fixed section, the relatively movable section having a central sleeve 30 slidably supporting the same on a link rod 31 in a substantially fluid tight manner. In the illustrated embodiment, this rod serves as a connecting link for the opposite ends of the lower flexible member and is rigidly attached to the piston section 28 by a clamp nut 32. The connector 31 may comprise separable parts threadedly connected as at 33 for ease of assembly, and while the connector passes continuously through the piston it serves to connect the flexible member to the opposite sides of the piston.

Interposed between the piston sections is an expansible clutch or lock comprising one or more shoes 34 supported on resilient toggle-like arms 35 and embraced by encircling resilient rings 36 which not only serve to contract the shoes and hold them in position on the toggle arms but also may actually constitute the active face for the window locking shoes. The spring arms 35 may constitute radial extensions of a spring plate 37 rigidly connected to the piston rod 31 and suitably backed by a body plate 38, these two plates being conveniently clamped in position by the separable parts of the piston rod insert. The outer ends of the toggle arms are engaged in pockets 39 formed in the back or inner side of the brake shoe means along with a coupling plate 40 which latter is rigidly connected to the floating piston section by spacers 41. By reason of this construction fluid pressure actuation of the floating section will move the lock shoes relative to and toward the fixed piston section, thereby deflecting the toggle arms to permit the lock shoes contracting from effective engagement with the chamber wall under the influence of the spring retaining rings 36. However, any attempt to lower the window from the outside will be frustrated by imparting an inward movement of the rod 31 relative to the floating section 30 (movement to the right in Fig. 4) which will cause the body plate 38 to press on the toggle arms and

thereby expand the shoes into firm locking contact with the chamber wall.

The pulleys 16 and 17 may be journaled in brackets 42 which are in turn mounted upon the end walls 43 of the motor chamber 20, and the strip-like flexible piston rod 9 is passed through openings 44 in such end walls, each opening being suitably packed by a gasket 45 held in position by a plate 46. By having the flexible members of ribbon-like form the fluid tight sealing of each end of the motor chamber is facilitated by reason of the fact that the ribbon design actually presents two flat surfaces joined by the narrow edges. Consequently, the gasket has a slit therein, the opposing sides of the slit wiping in sealing contact the flat surfaces of the flexible band. The narrow edges are effectively sealed by the sides of the slits hugging the same where they join each other.

The arrangement of the pulleys 16 and 17 on the opposite ends of the motor provides a compact unit which facilitates the mounting and installation of the motor in confined quarters, such as obtain in the window well of a vehicle door, and for such purpose a pair of brackets 47 are provided, one at each end of the motor. The mounting is rendered adjustable at each end whereby any slack in the flexible support may be taken up, such adjustment being herein provided by a screw 48 passing through a slot 49 in each bracket. By adjusting either or both brackets the endless flexible members may be maintained taut. The piston attached ends of the flexible piston rod are reinforced by clips 50 and engaged in slots 51 in the outer ends of the separable parts of the connector 31, being suitably anchored in place as by the rivets 52.

The two active portions 18 and 19 impart an evenly guided movement to the window panel so as to move the same up and down in a smooth and well-regulated manner while the connecting lugs 6 play in and out of the bearing 5 to accommodate any irregularity of movement between the window and the flexible window support.

In lieu of two actuating bands a single one may be utilized as illustrated in the modification shown in Fig. 6, wherein the flexible member 53 has an active flight or portion 54 to which the window bracket 55 is connected by a play connection 56, similar in construction with that illustrated in Figs. 2 and 3. The bracket 55 is preferably arranged beneath the center of gravity of the window for a simple balanced construction to which the horizontal disposition of the fluid motor is well adapted. However, it is obvious that manual or other types of power drives may be utilized to regulate the flexible support for the window, which latter term is used herein to include doors and similar closures.

In Figs. 7 and 8 a different form of connection between the flexible member and the piston is illustrated. The opposite ends of the ribbon-like piston rod 9 are joined by a connector rod or link 57, being secured in slots in the ends thereof by rivets 58. The link 57 in this view is in the form of a cylindrical plug having a reduced end portion 59 to provide a shoulder 60, and this plug is detachably fitted within a sleeve 61 fixed to the piston section 62. The sleeve has a flat formation 63 received by a like shaped opening in the piston section 62 to hold the latter against rotative movement thereon, and the piston section is secured in position on the sleeve by two embracing clamp nuts 64 and 65, the latter nut having a flange 66 overhanging the rim 67 of the plug 57

to cooperate with the internal shoulder 68, on which the plug shoulder 60 seats, in locking the plug in place.

The floating piston section 69 has limited sliding movement on the cylindrical end portion 70 of the sleeve, the packing member 71 serving to seal this sliding fit. A shoulder 72 limits the fluid driven movement of the section on the end portion 70 during which motion the locking shoes at the outer ends of the toggle arms 73 are released in a manner similar to that in the embodiment of Fig. 4. The rigid toggle arms have pivotal bearing against the back of shoulders 72, being held thereagainst by a light coiled spring 74 which also places the shoes under a light pressure sufficient to support them ready for immediate response to window imparted movement. The reduced end portion 59 of the link plug has a flat tongue 75 engaging in a slot 76 in the end of the sleeve to resist relative turning of the parts.

In this embodiment the shoe space between the piston sections is provided restricted communication with the opposite ends of the motor chamber 77, as by means of a small bleed port 78, Fig. 7, or by a larger port 79, adapted to be closed by a check valve 80. This check valve is in the form of a ring plate freely movable on a spacing washer 81 as limited by the retaining ring 82, the retaining ring and spacing washer being conveniently held in place along with the piston section 62 by the clamp nuts 64 and 65. The function of either or both of these restricted communications is to normally maintain a pressure equalization on opposite sides of each piston section to frustrate any attempt to manipulate the window to an open position and, further, to provide ready fluid responsive operation of the window.

Referring to the embodiment of Figs. 9 through 13, a single flexible member 83 is utilized to provide the two active portions or flights 84 and 85 supported by upper pulleys 86 and lower pulleys 87, the latter being carried by and at the opposite ends of the fluid motor 88. The flexible member is fastened at one end to one side of the piston 89, similar to that shown in Figs. 4 and 7, and after taking upwardly over the adjacent pair of upper and lower pulleys is extended across to the companion upper pulley and thence down to the underlying pulley 87. This forms an idle portion 90. The member is then passed about the lower pulley, and back up to the immediately overlying pulley, taking about the latter in superposed relation to the portion already thereon by passing beneath the same. This produces the active flight portion 85, and thereafter the flexible member is interrupted by a crossover coupling 91 to dispose the continuation of the flexible member upon the outside of that portion first passed about the lower pulley, in which relation the continuation takes about such lower pulley and into the motor chamber where it is fastened to the other side of the piston. The coupling 91 with the adjacent member portions provides, in effect, a second idle flight portion.

As illustrated in Figs. 12 and 13, the coupling 91 comprises separable parts, one part 92 having side ears 93 with registering seats 94 while the companion part 95 is receivable between the ears and has lateral shoulders 96 engaged in the seats 94. After the parts 92 and 95 are interengaged the slack in the flexible member is taken up and this is accomplished herein by mounting the upper pulley 86 on eccentric spindles 97 which may be rotated clockwise or counterclockwise by means

of a screw 98. The screws 98 may be rendered accessible through the interior finishing of the vehicle so that adjustment may be made from time to time to take up any slack in flexible window support. Because of this arrangement the motor may be permanently mounted on the vehicle body structure by the brackets 99.

Depending from the window frame 100 is a pair of brackets 101 supporting a transverse bar 102 which has band straddling arms 103 at each end formed with horizontal bearings 104 similar to those in Figs. 2 and 3. Oppositely extending lugs 105 are carried by the flexible band and engage in the bearings 104, the lugs being fixed by a pin 106 to a cleat 107 on the flexible member. As the window is operated, the lugs will be free to ride in and out in accommodation to any difference between the guided movement of the window and that of the active portion. A set screw 108 engaged in a slot 109 of each bracket 101 permits the transverse bar 102 to be adjusted for properly disposing the bearings 104.

The flexible support provides a positive and well guided window movement. The flexible member is disposed axially of the piston so that the latter pushes and pulls on the flexible band in the direction of piston travel and within the plane of the piston path. The positive support provided by the flexible member is due primarily to the fact that the latter is of fixed lineal extent throughout and since it is mounted in tension on fixed points of support, each flight or portion between any two adjacent points of support will likewise be of fixed lineal extent. The fixed points of support, as provided by the pulleys or wheels, afford a roller bearing mount for the firm though flexible window support. Therefore, the window is held to a straight course and against canting to a binding tilt in its guideways. The window is given, in effect a rigid support which rides over and about its four points of support with a minimum of friction and without substantial uncontrolled play or looseness. The two points of attachment with the window are related to bodily support the window properly positioned. The window cannot be tilted counter-clockwise, as viewed in Fig. 1, into binding engagement with its guiding channels 2 because of the predetermined lineal dimension of the control part of the flexible member which extends over the upper pulleys 14 and 15 and one lower pulley 17 in passing between the two points of window attachment. Likewise, the window cannot be tilted clockwise because of the invariable length of the power part of the flexible member which extends beneath the lower pulleys 16 and 17 and over upper pulley 15 in passing from one point of attachment to the other. The upper part transmits the required portion of the force applied to one side of the window as may be necessary to move the other side in an even and well guided manner. In other words it transmits equalized parallel movements to all parts of the window. The window adjusting or moving force is applied to the power or lower part of the flexible member which is also acting in tension. The power part is, in effect, divided by the piston into fore and aft sections, the aft section being the one to which the pull is applied while the fore section is the one which pays out through the front end of the motor chamber, and these two sections are normally acting in tension. However, since the fore section is likewise supported in a taut state, it will cooperatively assist the control part in maintaining the window in proper position. The pull on

7

the aft section will act through the tensioned control part and in cooperation with the fore section, the endless member moving on its roller support as a rigid non-extensible body having a predetermined lineal dimension which maintains the window poised for an even and smooth motion of translation. Upon reversal of the motor the fore section becomes the aft section, and vice versa. In this connection it will be observed that the two sections of the power part enter and emerge from the motor chamber to substantially the same extent in order to preserve this solid or firm mounting for the window, and that each section, while being a single ply, nevertheless serves to move plural active portions which are herein arranged to the same side of their respective supporting wheels. The arrangements illustrated produce, in effect, two endless members, a shorter one including the active portion 19 (85) and a larger one including the active portion 18 (84). The cross-over coupling 91 ties the two endless members together with the shorter one located in the larger, while the coupling 27 ties the individual endless members in the same relation, the two individual endless members in this instance constituting the flexible band member. In both constructions the points of attachment will be held in a predetermined relationship for holding the window properly poised on the active portions.

Furthermore, since the flexible member, which comprises the dual active portions of Figs. 1 and 9, is acting in tension, it will be apparent that any window imparted movement will be transmitted by the flexible member to the window lock for immediately setting the latter. Therefore, the weight of the window normally will set the lock sufficiently to support the window elevated when the motor becomes inoperative.

While the foregoing description has been given in detail it is not the intention thereby to preclude the use of the inventive principles involved in other physical embodiments or to restrict their scope beyond the definition of the appended claims.

What is claimed is:

1. In a motor vehicle having a slidable closure adapted to be moved into and out of a well provided in the body wall of a motor vehicle, a flexible member arranged within the well and having an active vertical portion therein, means connecting the closure to the active portion, a fluid motor comprising a chamber and a piston, the opposite ends of the flexible member being connected to the opposite sides of the piston, bracket extensions carried beyond the opposite end walls of the chamber, a pulley journaled on each bracket extension, the flexible member taking over the pulleys and passing through openings in the end walls, means connecting the flexible member to opposite sides of the piston, and other bracket means supporting the chamber and its carried pulleys as a unit for selectively adjusting either pulley to take up slack in the flexible member.

2. Closure regulating means comprising an endless member with supporting means therefor to provide an active portion, a second endless member fastened to the first endless member at a point spaced from such active portion for movement in unison therewith, means spaced from the first supporting means and supporting both endless members adjacent their point of securement and providing an active portion of the second endless member in substantial parallel relation to the first active portion, means directly engaged with the first endless member for reciprocating

8

the active portions, and means on the active portions for supporting a closure thereon.

3. Closure regulating means comprising an endless member with supporting means therefor to provide an active portion, a second endless member, means spaced from the first supporting means for supporting an active portion of the second member in substantial parallel but spaced relation to the first active portion, a part of said second supporting means also supporting the first endless member in superimposed relation thereto, means operable for reciprocating the active portions, means on the active portions for connecting the latter to a closure for adjusting the same, said connecting means embodying spaced bracket parts each depending from the lower edge of the window and straddling one of the active portions, and means fixed to each active portion and interengaging with the straddling bracket part for establishing the connection.

4. Closure regulating means comprising a flexible support mounted to provide spaced active flexible portions substantially in parallel relation, means for reciprocating the active portions, and means for connecting the active portions to a closure for adjusting the same, said connecting means embodying spaced bracket parts one for each portion and each part provided with spaced bearing portions extending transversely of and straddling the adjacent active portion, and a member carried by each active portion and having bearing portions at the opposite sides thereof engaging with the spaced bearing portions of the respective bracket part for limited riding movement therein to accommodate relative lateral movement between a connected closure and the active portions.

5. Closure regulating means comprising an endless band with supporting means therefor to provide an active portion, a second band fastened to the endless band for simultaneous movement therewith, means spaced from the first supporting means and supporting an active portion of the second band substantially in parallel relation to the first active portion, means operable for reciprocating the active portions, and means on the active portions for connecting the latter to a closure for adjusting the same, said reciprocating means comprising a motor having a chamber and a reciprocable part therein to which the ends of the second band are connected, the two supporting means each including a wheel carried by the motor, both active portions extending substantially at a normal to the path of reciprocation for the motor part, the second band taking over one wheel alone and over the other wheel jointly with the endless band.

6. A closure regulator comprising a flexible member, pairs of upper and lower pulleys, the flexible member passing from the lower pulley of one pair to its associated upper pulley to provide one active portion and thence over to and about the pulleys of the adjacent pair to provide another active portion and a third portion, a cross-over coupling member on the third portion, the flexible member having oppositely extending terminals at the opposite sides of the third portion connected by the coupling member for movement as a unit, means on the active portion for operatively connecting the same to a window, and an actuator to which the flexible member is connected.

7. A closure regulator comprising a flexible member, a pair of pulleys over which the member passes to provide an active portion and a parallel

portion, the latter overlying a terminal portion of the member, a second pair of pulleys, the member extending from one end of said parallel portion over to and about the second pair of pulleys to provide a second active portion and then from the latter back to the first pair of pulleys there terminating in superposed relation to the other end of said parallel portion whereby the two terminal portions lie upon opposite sides of said parallel portion, means on the active portions for connecting the latter to a closure, and means detachably coupling the terminal portions together.

8. In a motor vehicle, a slidable window adapted to be lowered within a well provided in the body of a motor vehicle, a flexible member arranged within the well and having an active portion supported therein between a pulley fixed in the well adjacent its top and spaced pulleys adjustably arranged beneath the fixed pulley, means connecting the window to the active portion, and a fluid motor comprising a chamber and a piston, the opposite ends of the flexible member being connected to and extending from the opposite sides of the piston, said adjustable pulleys being carried on the opposite ends of the chamber for adjustment therewith as a unit toward and from the fixed pulley to render the flexible member operative.

9. A vertically slidable window of a motor vehicle, guide means for the window, fixed upper pulley means, a fluid motor unit beneath the pulley means and including a chamber and a piston in the chamber with a pulley journaled on each end of the chamber, a flexible transmission member of fixed length supported in tension by the pulley means and said pulleys to provide spaced vertical active portions, the ends of the flexible member being joined to the opposite sides of the piston, spaced attachment means on the window positioning the latter on the active portions for translatory motion when such active portions elevate and lower the window, and means adjustably mounting the fluid motor unit to take up slack throughout the length of the flexible member to thereby tension the latter for preserving such translatory motion.

10. A window, guide means slidably supporting the window, a flexible power transmission comprising a plurality of wheels journaled to provide four fixed points of support and an endless flexible member having a fixed lineal dimension and mounted in tension on the wheels to provide an endless power transmitting member adapted to move about the fixed points of support as a rigid body, such fixed points of support defining a pair of substantially parallel active portions and a pair of intertying cross portions, each of the four portions having a fixed lineal extent between its two fixed points of support, means bodily supporting the window at spaced points on the two active portions whereby to divide the endless member into opposing control parts of predetermined length acting in tension to transmit a translatory motion to the window, and a fluid motor having a piston interposed in one cross portion to apply the operating fluid pressure impulses thereto in an axial direction.

11. A window, guide means slidably supporting the same, a regulator comprising flexible means supported in tension to provide a pair of active portions, actuating means for the portions, said active portions being in the form of flat bands supported by like wheels, a pair of arms carried by the window and providing lateral guideways extending in planes paralleling the flat faces

of the bands, means carried by each active portion movably engaging a respective one of the guideways for supporting the window for bodily movement, said guideway engaging means projecting normally to the planes of the flat faces and adapted to ride in the guideways to accommodate any unparallel relation between the fixed guide means and the active portions, the bands being supported in tension by the wheels against flexing in the direction of extent of the guideways, and means adjustably mounting the arms for positioning the window with respect to its guide means.

12. A vertically slidable window, guide means slidably supporting the same, pulley means fixedly mounted adjacent the path of the window, a fluid motor unit including a chamber, a piston in the chamber, a pulley journaled on each end of the chamber, and a flexible member of predetermined length connected to the opposite sides of the piston and serving as the piston rod for the motor, said flexible member taking over said pulleys and removably passing about the pulley means for mounting and demounting with the motor as a unit with respect thereto, means adjustably mounting the motor with respect to the pulley means for tensioning the flexible member, and means detachably and operatively connecting the window to the flexible member.

13. A motor vehicle having a window panel slidable in guideways from across a window opening into a well in the side wall structure of the vehicle body, bearings arranged in the well to provide four relatively fixed points of support, flexible window supporting means having a flexible member portion supported by two adjacent bearings to provide in effect a short endless member with an active part and a second part, said window supporting means also having a flexible member portion supported by all four bearings to provide in effect a relatively longer endless member with an active part and a second part, means bodily supporting the window panel positioned on the two active parts against binding in the guideways, and means operable to reciprocate the window supporting means, the two flexible member portions being interconnected for movement of the two active parts in unison whereby to impart a motion of translation to the window against binding throughout its movement.

14. A window, guide means slidably supporting the same, wheels arranged to provide four relatively fixed points of support, a ribbon-like band having a section extending about the four points of support in succession and back again about the third point beneath the band portion thereon, said band having another section taking over the fourth point on top of the band portion thereon, cross-over means interlocking together the ends of the two sections at opposite sides of the band part between the third and fourth points, means coupling the opposite ends of the two sections to form in effect an endless power transmitting member having companion active portions supported by the first two and the last two points of support respectively, means positioning the window on the two active portions for a motion of translation on the guide means, and means operable to reciprocate the band to so move the window.

15. A window, guide means slidably supporting the same, wheels arranged to provide four relatively fixed points of support, a ribbon-like band having a section extending about the four points of support in succession and back again about

11

the third point beneath the band portion thereon, said band having another section taking over the fourth point on top of the band portion thereon, cross-over means interlocking together the ends of the two sections at opposite sides of the band part between the third and fourth points, means coupling the opposite ends of the two sections to form in effect an endless power transmitting member having companion active portions supported by the first two and the last two points of support respectively, means positioning the window on the two active portions for a motion of translation on the guide means, means adjustably mounting one wheel for tensioning the endless power transmitting member about all of the wheels, said cross-over means permitting relative movement of said band part to effect such tensioning adjustment, and means operable to reciprocate the band to so move the window.

16. A window, guide means slidably supporting the same, two pairs of upper and lower wheels arranged to provide four relatively fixed points of support, flexible transmission means extending about the four points of support in succession and retaking about the third and fourth points to define substantially parallel active parts at the corresponding sides of said pairs for movement in unison, means supporting the window on said active parts for translatory movement on the guide means, and means operable to reciprocate the endless means.

17. A vertically slidable window, guide means slidably supporting the same, a regulator for the window in the form of a flexible flat band supported in tension at four relatively fixed points of support to provide a pair of substantially vertical active portions with opposed inner faces, window carried bracket arm parts straddling and extending across the opposite flat faces of each active band portion, lug means projecting from the opposite faces of each active band portion, said lug means engaging the bracket arm parts at the opposite sides of each active band portion for providing equalized support for the window against the flexing of the band portion, and means for imparting back and forth movement to the active band portions.

18. A vertically slidable window, guide means slidably supporting the same, a regulator for the window in the form of a flexible flat band supported in tension at four relatively fixed points of support to provide a pair of substantially vertical active portions with opposed inner faces, a connector lug fixed to and extending substantially normal from a flat face of each active band portion, a bracket arm part fixedly carried by the window and extending across the lug carrying face, said arm part movably engaging its lug at upper and lower points of contact within the width of the band whereby the load of the window will be transmitted to the band lengthwise thereof, means operatively holding the fixed bracket arm part against riding off the lug incidental to the flexing of the band, and means for moving the band back and forth.

19. A motor vehicle having a closure, a flexible member having an active portion supported between spaced pulley means, means connecting the closure to the active portion for being opened and closed thereby, a fluid motor comprising a chamber and a piston, the piston having two relatively movable sections, the flexible member being connected to and extending in opposite directions from one of the piston sections whereby

12

upon movement of the closure in either direction said one piston section will be pulled in a corresponding direction by the flexible member according to the direction of closure movement, and locking means carried by the other of said piston sections and connected to be operated by and upon a closure imparted pull of the flexible member in one direction to lock the piston against movement in the chamber, an opposite pull on the flexible member serving to pull said one piston section to hold the locking means inoperative for closure imparted movement of the flexible member and said one piston section as a unit.

20. A window system comprising a window, a fluid motor for operating the same having a chamber and a piston therein, a transmission operatively connecting the piston to the window for back and forth movement as a unit and including a power transmitting member slidable through the piston for limited relative movement, and a lock carried by the piston and operable by a window imparted movement of the power transmitting member relative to the piston for locking the latter against movement, said piston being fluid responsive and slidable on the power transmitting member initially to render the lock inoperative and thereafter to move the power transmitting member for adjusting the window.

21. A window system comprising a window, a fluid motor for operating the same having a chamber and a piston therein, a transmission operatively connecting the piston to the window for back and forth movement as a unit and including a flexible power transmitting member slidable through the piston and supported in tension by a pair of wheels at the opposite ends of the chamber, means limiting the relative movement between the piston and the flexible power transmitting member, and a lock operable by a window imparted movement of the power transmitting member relative to the piston for locking the latter against movement, said piston being fluid responsive and slidable along the flexible power transmitting member to initially render the lock inoperative and thereafter to move the flexible power transmitting member for adjusting the window.

22. A window system comprising a window, a fluid motor for operating the same having a chamber and a piston therein, an endless power transmitting member operatively connecting the piston to the window for back and forth movement as a unit and slidably extending through the piston for limited play movement with respect thereto, and a lock carried by the piston and operable by a window imparted movement of the endless power transmitting member relative to the piston for locking the latter against movement, said piston being fluid responsive and slidable upon the endless power transmitting member initially to render the lock inoperative and thereafter to move the endless power transmitting member for actuating the window.

23. A motor vehicle having a vertically slidable window adapted to be lowered within a well provided in the body wall of the motor vehicle, an endless flexible member arranged within the well and having a control part and a power part, each part being of a predetermined length and having its opposite ends attached to the window at spaced points, spaced supporting means for the flexible member supporting both parts in tension, said parts bodily supporting the window

to cause the weight of the latter normally to exert a downward pull on the flexible member at the spaced points of attachment, a fluid motor chamber, a piston operating in the chamber and operatively connected to the power part for pulling the flexible member in one direction to lower the window and in the opposite direction to raise the window, and a lock operatively connected to the flexible member by a play connection for locking the piston arrested by a window imparted downward pull on the flexible member and for releasing the piston upon a reverse pull.

24. A motor vehicle having a vertically slidable window adapted to be lowered within a well provided in the body wall of said motor vehicle, an endless flexible member arranged within the well and having multiple points of attachment to the window spaced relatively to each other, said points of attachment effecting the bodily support of the window to cause the weight of the latter normally to exert a downward pull on the flexible member at the spaced points of attachment, a fluid motor chamber, a piston operating in the chamber and operatively connected to the flexible member for pulling it in one direction to raise the window, and a lock operatively connected to the flexible member by a play connection for locking the piston arrested by a window imparted downward pull on the flexible member and for releasing the piston upon a reverse pull.

ANTON RAPPL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,500,765	Norwood	July 8, 1924
2,323,731	Shetzline	July 6, 1943
1,963,790	Jepsen	June 19, 1934
1,198,138	Lovell	Sept. 12, 1916
1,622,886	Siller	Mar. 29, 1927
2,338,069	Horton	Dec. 28, 1943
1,573,541	Demand	Feb. 16, 1926
Re. 15,331	Demand	Apr. 11, 1922
1,834,701	Gustafson	Dec. 1, 1931
2,094,124	Huffman	Sept. 28, 1937
2,103,252	Gartin	Dec. 28, 1937
948,603	Altrichter	Feb. 8, 1910
1,834,235	Birrell	Dec. 1, 1931
1,627,697	Fredericks	May 10, 1927
1,612,232	Strandt	Dec. 28, 1926
1,328,584	Noonan	Jan. 20, 1920
1,919,671	Shetzline	July 25, 1933

FOREIGN PATENTS

Number	Country	Date
581,285	Germany	July 25, 1933
415,562	France	July 16, 1910
328,796	England	May 8, 1930
780,276	France	Jan. 29, 1935