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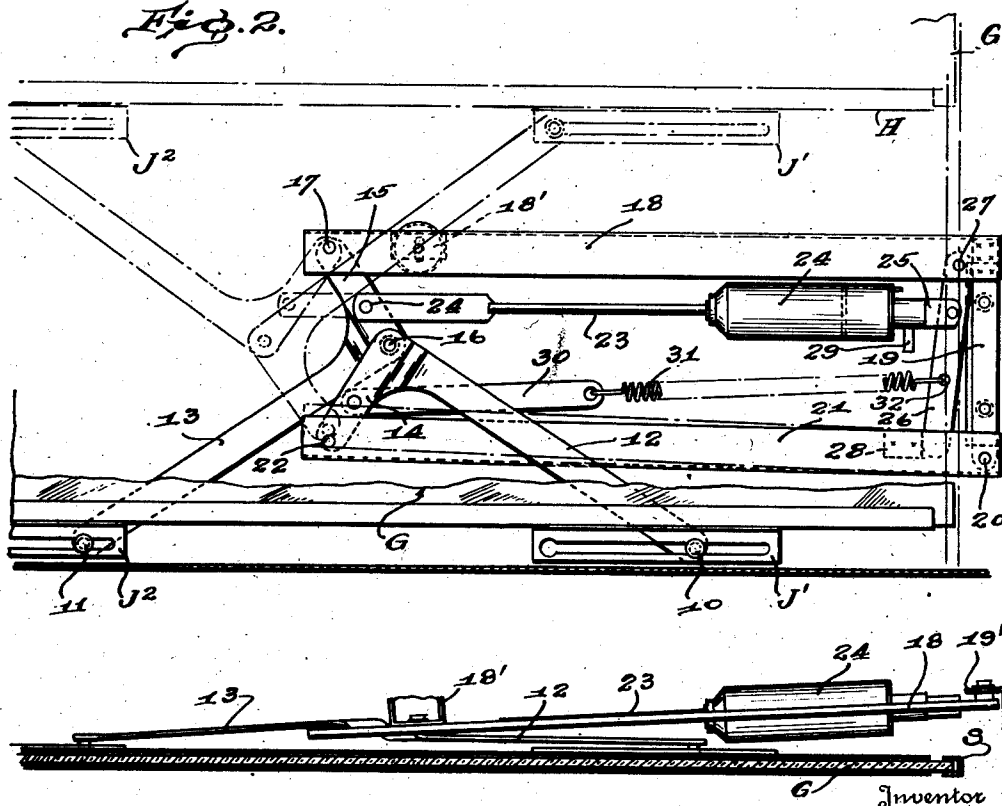
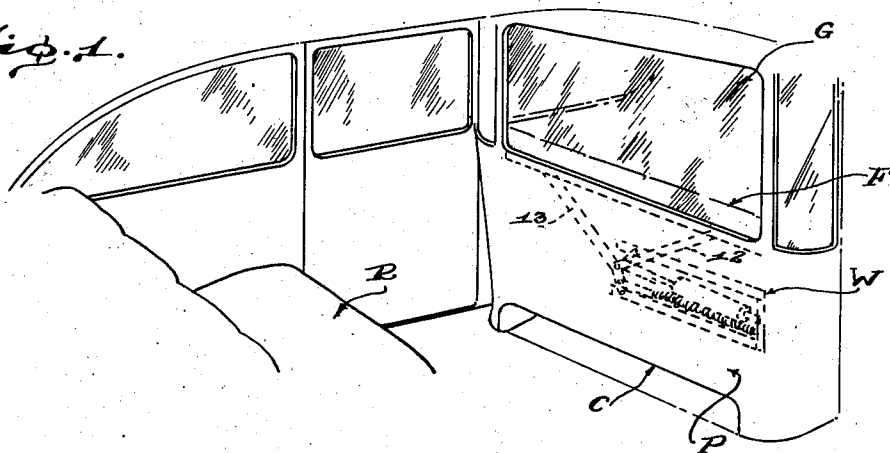
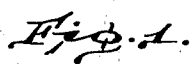
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2,371,183

WINDOW REGULATOR MECHANISM

Filed March 10, 1944

2 Sheets-Sheet 1



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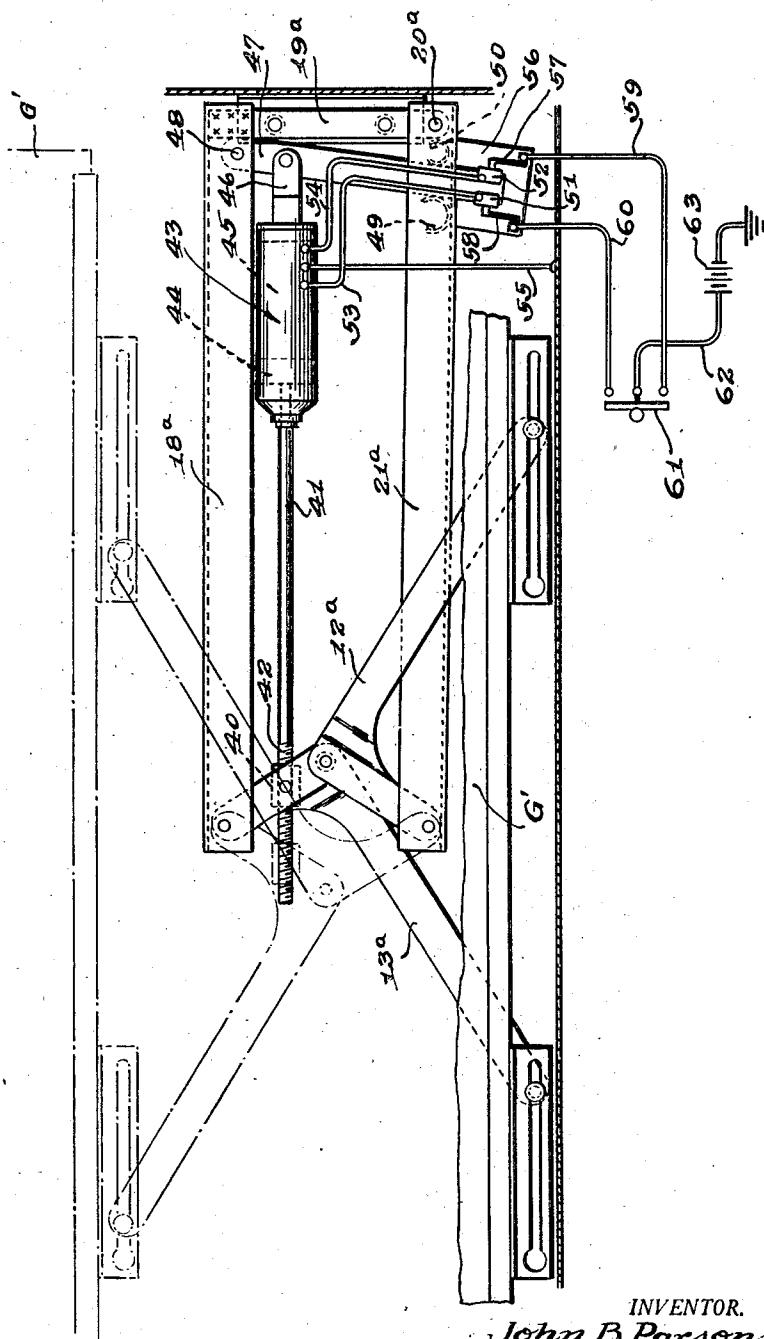
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Fig. 4.



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WINDOW REGULATOR MECHANISM

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Application March 10, 1944, Serial No. 525,879

10 Claims. (Cl. 268—125)

This invention relates to regulator mechanism for vehicle windows or other rectilinearly movable members, but more particularly to windows of automobile bodies which are mounted for sliding movement to cover or uncover a window opening, and an object is to produce a mechanism of this character which is sturdy and reliable in construction and operation, has a relatively small number of moving parts, can be inexpensively manufactured on a production basis and which can be built in the form of a unit so as materially to reduce the time and labor required for installation purposes.

Another object is to produce a window regulator mechanism comprising essentially a pair of pivotally connected bell crank levers which are so mounted and arranged that conjoint movement thereof can be readily effected to impart window movement.

A further object is to produce a regulator for vehicle windows comprising essentially a pair of pivotally connected swinging bell crank levers actuated by a rectilinearly reciprocating member, the leverage system cooperating with an helical coil spring.

A still further object is to produce a window regulator mechanism of the above character which requires a minimum amount of space in one dimension, thereby adapting it particularly for certain installations of vehicle bodies and enabling the operator for the mechanism to be disposed at any convenient place without the provision of trains of gears or other costly devices of that character.

A still further object is to produce a regulator mechanism of the above character employing a pair of pivotally connected swinging bell crank levers actuated by a rectilinearly reciprocating member driven by power means either in the form of an hydraulic piston and cylinder assembly or an electrically operated mechanism, the arrangement being such that the regulator mechanism can be rendered effective by actuation in one direction or the other by remote control means.

Other objects and advantages will hereinafter appear and for purposes of illustration but not of limitation, an embodiment of the invention is shown on the accompanying drawings in which

Figure 1 is a diagrammatic view in perspective of the inside of a limousine body showing in dotted lines the regulator mechanism for raising and lowering the partition glass or window between the back seat and the front or driver's seat;

Figure 2 is an enlarged side elevation of the regulator mechanism;

Figure 3 is a top plan view of the parts shown in Figure 2; and

Figure 4 is an enlarged side elevation similar to Figure 2, but embodying electrical mechanism for effecting swinging movement of the bell crank arms in one direction or the other.

The illustrated embodiment of the invention according to Figures 1 to 3 comprises a window regulator generally indicated at W for raising and lowering the partition glass or window G interposed between the front or driver's seat F and the rear seat R of a limousine body. It will be recognized that the regulator may be used in other locations but in this instance it is mounted in the wall P, in the lower portion of which is a recess or cavity C providing a foot rest for the occupants of the rear seat. This construction is such that the space for mounting the regulator mechanism is considerably restricted particularly when the extent of the window travel is considered. The window glass G is guided for its up and down movements by U-shaped guide strips S suitably mounted to engage the side edge portions of the window. Embracing the lower edge portion of the window G is a channel H to which are secured depending retainers J¹ and J², each formed with longitudinally elongate slots to receive the headed rivets or studs 10 and 11 respectively. The studs 10 and 11 project laterally from the free end portions of swinging arms 12 and 13 respectively. The arms 12 and 13 are relatively long and extend inclinedly in opposite directions and each forms one arm of a bell crank lever. It will be observed that the swinging arm 12 has an integral right angle extension 14 at its end and the arm 13 has a right angle extension 15 at its inner end, the extensions 14 and 15 projecting in opposite directions. That is, when the window glass is in its lowered or open position, the extension 14 inclines downwardly and the extension 15 inclines upwardly. The apices of the two bell crank levers are pivotally connected by a rivet 16. It will be observed particularly from an inspection of Figure 3 that the arms 12 and 13 of the bell cranks are slightly offset and incline outwardly away from the pivotal mounting 16.

The free end of the extension 15 is pivotally connected at 17 to a horizontally disposed frame arm 18, the outer end of which is spot welded to cross arm 19. The inner end portion of the frame arm 18 is fixed to a suitable support on the automobile body by a bracket 18' and the cross arm 19 is also suitably fixed to a part of the automo-

bile body by angle brackets 19'. The opposite end of the cross arm 19 is pivoted at 20 to a horizontally disposed frame arm 21. The free end of the extension 14 is pivoted at 22 to the inner end portion of the frame arm 21.

From the above description, it will be understood that swinging movement of the arms 12 and 13 which through studs engage the retainers, imparts upward or downward movement to the window glass G. During such movement or the movement from the full line position in Figure 2 to the broken line position, the pivotal connection between the bell cranks (rivet 16) has substantially horizontal translatory movement between the frame arms 18 and 21. Thus the pivot 16 moves from the full line position shown in Figure 2 outwardly or to the left to the broken line position when the window glass G is in its fully raised or closed position. At the same time that the pivot point 16 moves in the above manner, the frame arm 21 is enabled to rock about its pivot 20 to accommodate the toggle-like or spreading movement of the bell crank extensions 14 and 15.

In this instance, power means is provided for imparting movement to the swinging arms and, as shown, a piston rod 23 is pivotally connected by a rivet 24 to an intermediate portion of the extension arm 15. The rod 23 is substantially horizontally disposed and has a piston (not shown) operating within a cylinder 24. The cylinder 24 has a bracket 25 which pivotally connects to an arm 26 near one end thereof, such end being pivoted at 27 to the frame arm 18. The opposite end portion of the arm 26 is adapted to engage a stop 28 fixed to the frame arm 21 for limiting its swinging movement in a left-hand direction (Figure 2). The power device is preferably hydraulically operated, liquid being introduced into the cylinder through a pipe 29 to force the piston outwardly or to the left of Figure 2. Detail description of the construction and operation of the hydraulic device is not considered necessary since such specific structure forms no part of the present invention. Reference, however, is made to my Patent No. 2,346,387, dated April 11, 1944, entitled "Hydraulic regulator system," wherein complete illustration and description thereof is given. It is clear that other mechanism can be used in substitution for the hydraulic arrangement, such, for example, as a manually operated bar actuated in any suitable manner, such as by rack and pinion.

Spring means is provided in association with the regulator mechanism for assisting in the movement of the window glass G. Thus the spring assisted by the weight of the window glass G may assist in actuating the window glass downwardly or to its open position. The spring is so arranged and connected that it imposes a substantially uniform tension on window-engaging ends of the bell cranks throughout their swinging movement, this being of particular advantage in that the window moves smoothly free from jerks. As shown, a link 30 is connected to the extension arm 14 between the pivot points 16 and 22 but slightly nearer the pivot point 22 and extends in a generally horizontal direction. Connected to the outer end of the link 30 is a helical coil spring 31, the opposite end of which is hooked into an aperture 32 in the arm 26. It will be noted that in the position of the parts shown by full lines in Figure 2, with the window in its open position, the coil spring 31 inclines from the arm 26 slightly downwardly to the extension arm 14. This ar-

range is of importance because in following through with the swinging movement of the arms 12 and 13 from the lowered to the raised position of the window glass G, it is found that the tension exerted by the spring 31 on the window engaging ends of the arms is substantially uniform. The leverage system and coil spring cooperate in such manner that substantially uniform effort is required throughout the window movement.

Not only does the spring function in this manner but it so provides a cushion for any expansion of the liquid within the hydraulic cylinder 24. In the event the liquid should expand with the window G in its fully raised or closed position, then the cylinder 24 may be forced to the right of Figure 2, thereby rocking the arm 26 in a counterclockwise direction against the tension of the spring 31.

From the above description it will be apparent that I have provided an exceedingly simple and compact regulator mechanism which can be installed in an automobile body where space is very limited. It will particularly be observed that gears and other parts which are comparatively costly and which are ordinarily employed in regulators of this character, are eliminated. It is thus possible materially to reduce not only the cost of manufacture but of installation, inasmuch as the regulator is a unitary assembly and as shown, requires only three points of connection to the supporting structure.

The embodiment of the invention shown in Figure 3 is similar to that above described, except that the swinging arms are actuated in one direction or the other by an electric motor instead of an hydraulic piston and coil spring arrangement. As shown, similar horizontally disposed frame arms 18a and 21a are secured to a cross arm 19a, the former side arm being fixed to the cross arm and the latter side arm being pivotally secured to the cross arm at 20a. The swinging bell crank arms 12a and 13a are connected to the side arms, to each other and to the retainers depending from the window glass G' similar to the arrangement above described. It is not believed that further description thereof is deemed necessary to a complete understanding of the structure shown on this figure.

In this instance, a screw-threaded nut or sleeve 40 is pivotally connected to an intermediate portion of the shorter arm of the bell crank 13a. A horizontally disposed rod 41 has a screw-threaded end portion 42 which threadedly engages the pivoted sleeve 40. The opposite end of the rod 41 projects into a cylindrical housing 43 and is operatively connected to suitable planetary gearing indicated at 44 arranged within the cylinder. Manifestly any suitable reduction gearing may be employed for the purpose, planetary gearing being selected because of the space requirements. Arranged within the cylinder 43 is a suitable electric motor 45, the armature of which is operatively connected to drive the gearing 44 in such manner that the rod 41 rotates at a speed less than the speed of the motor armature. It will be manifest that upon rotation of the electric motor 45 in one direction, the sleeve 40 will be caused to move in one direction relative to the rod 41, thereby to swing the bell cranks 12a and 13a in one direction and upon rotation of the motor 45 in the opposite direction, the sleeve 40 will be moved along the rod 41 in an opposite direction, thereby to cause the bell cranks to move in an opposite direction.

The cylinder 43 has a laterally or horizontally extending arm 46 to which is pivotally connected a bracket arm 47 similar to the arm 26 above described, the arm 47 being pivoted at 48 to the frame arm 18a. The opposite end portion of the arm 47 is engaged by a pair of C-shaped springs 49 and 50 which are secured to the frame bar 21a. As shown, these springs engage respectively opposite sides of the bracket arm 47 and normally hold the arm in a predetermined position. The bracket arm 47 projects downwardly beyond the adjacent side bar 21a, and this end portion is equipped with a pair of electrical contact members 51 and 52 which are connected to the electric motor 45 by leads 53 and 54 respectively. As shown, the electric motor is suitably grounded by a lead 55.

Suitably fixed to the side frame bar 21a and depending therefrom is a mounting plate 56 and carried by the plate 56 are spring contact members 57 and 58 which are engageable respectively with the contact members 51 and 52 respectively. A lead 59 extends from the contact arm 57 and a lead 60 extends from the contact arm 58, these leads terminating adjacent a manual switch diagrammatically shown at 61. From the switch 61 extends a lead 62 to a battery 63 or other source of electrical current. The arrangement is such that by manually rocking the switch 61 in one direction, the electric motor 45 is energized to rotate the shaft or rod 41 in one direction and actuation of the switch 61 in the opposite direction energizes the motor to rotate the shaft 41 in the opposite direction. By rocking the switch 61 into contact with the lead 60, current will flow from the battery 63 through the lead 62, the switch 61 to the lead 60 and then through the contact arm 58, contact member 51 and through the lead 53 to the motor 45 and thence to ground through the lead 55. This causes rotation of the motor in one direction and manifestly by rocking the switch 61 into contact with the lead 59, rotation of the motor in the opposite direction will be effected through the connections above described.

In the event that the window glass G' encounters an excessive force or a force in excess of that exerted by the C springs 49 and 50, in its movement in one direction or the other, it will be manifest that the bracket arm 46 will rock in one direction or the other to move one of the contact members 51 and 52 away from the adjacent spring arm, thereby to break the electrical circuit and deenergize the electric motor 45. Thus the obstruction to the movement of the window glass G' must be removed before further movement thereof can be effected. Thus it will be necessary first to rock the switch 61 in an opposite direction to cause opposite movement of the window glass before the bracket arm 47 will be restored to its normal position determined by the C springs 49 and 50. This militates against an excessive load being imposed upon the motor with consequent injury to it.

This application constitutes a continuation in part of my application Serial No. 465,188 entitled "Window regulator mechanism."

It is to be understood that numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claims.

What I claim is:

1. Window regulator mechanism comprising a pair of bell crank levers, each lever having a rela-

tively short arm and a relatively long arm, means on the free ends of the long arms of said levers engageable with the vehicle window, a pivotal connection between said levers, a frame including a fixed arm to which one of said short arms is pivoted and a movable arm to which the other short arm is pivoted, means providing a connection between said frame arms, operating means engaging a short arm of one lever, and retracting spring means associated with said bell crank levers.

2. Window regulator mechanism as claimed in claim 1 in which the retracting spring means comprises a helical coil spring connected respectively to the short arm of the other lever and to the connecting means between the frame arms.

3. Window regulator mechanism as claimed in claim 1 in which said operating means comprises an hydraulic cylinder connected to said frame connecting means and a piston rod reciprocable in said cylinder connected to the short arm of one lever, and in which said retracting spring means comprises a helical coil spring connected respectively to the short arm of the other lever and to the connecting means between the frame arms.

4. Window regulator mechanism as claimed in claim 1, in which the bell crank levers are pivoted together at their angular portions and the frame is arranged at substantially right angles to the plane of window movement.

5. Window regulator mechanism as claimed in claim 1, in which the operating means includes a rectilinearly shiftable member movable in a plane at substantially right angles to the plane of window movement.

6. Window regulator mechanism comprising a pair of bell crank levers, each lever having a relatively short arm and a relatively long arm, means on the free ends of the long arms of said levers engageable with the vehicle window, a pivotal connection between said levers, a frame including a fixed arm to which one of said short arms is pivoted and a movable arm to which the other short arm is pivoted, means providing a connection between said frame arms, operating means including an elongate rod engaging a short arm of one lever, and power means for operating said rod thereby to impart swinging movement to said levers.

7. Window regulator mechanism comprising a pair of bell crank levers, each lever having a relatively short arm and a relatively long arm, means on the free ends of the long arms of said levers engageable with the vehicle window, a pivotal connection between said levers, a frame including a fixed arm to which one of said short arms is pivoted and a movable arm to which the other short arm is pivoted, means providing a connection between said frame arms, operating means including a rotatable rod having a screw-threaded end portion, a screw-threaded sleeve on a short arm of one lever engaging the screw-threaded rod portion, and power means for rotating said rod in one direction or the other thereby to swing said levers in one direction or the other.

8. Window regulator mechanism as claimed in claim 7 in which the power means comprises a reversible electric motor.

9. Window regulator mechanism as claimed in claim 7 in which said power means comprises a reversible electric motor, and means for deenergizing said motor in the event said arms encounter an excessive force or obstruction.

10. Window regulator mechanism comprising a pair of bell crank levers, each lever having a

relatively short arm and a relatively long arm, means on the free ends of the long arms of said levers engageable with the vehicle window, a pivotal connection between said levers, a fixed pivotal mounting for one of said short arms, a pivotal mounting for the other short arm enabling movement toward and away from said

fixed pivotal mounting, operating means including an elongate rod engaging a short arm of one lever, and power means for operating said rod thereby to impart swinging movement to said levers.

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