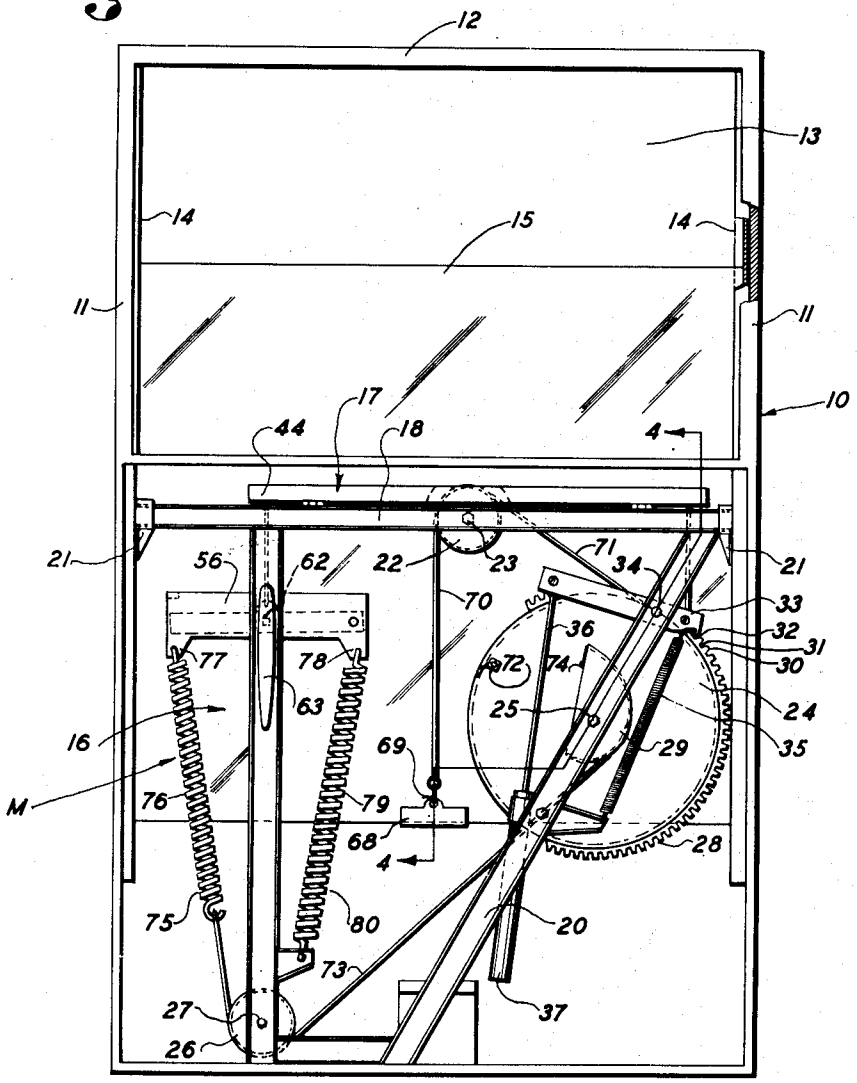
Nov. 3, 1953 R. CROW 2,657,925

CLOSURE, OPERATING, AND CONTROLLING DEVICE

Filed March 27, 1946 4 Sheets-Sheet 1

Fig. 1.



RECTOR CROW
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Nov. 3, 1953 R. CROW 2,657,925

CLOSURE, OPERATING, AND CONTROLLING DEVICE

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Fig. 2.

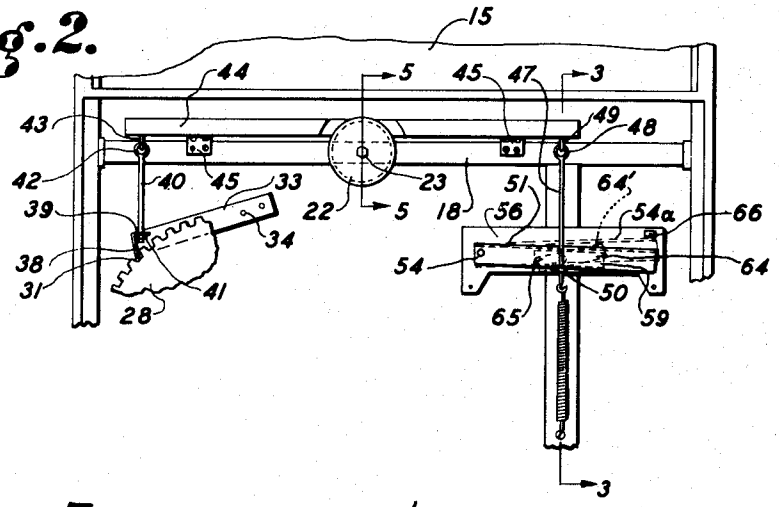


Fig. 3.

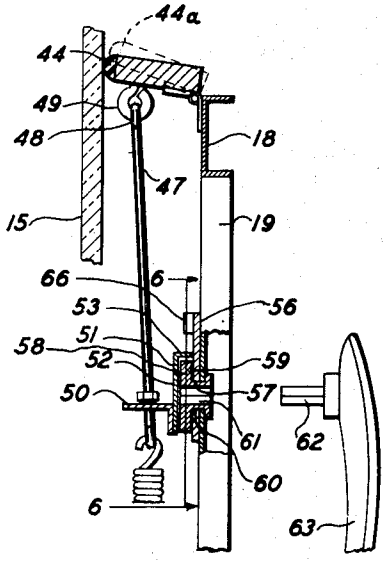


Fig. 5

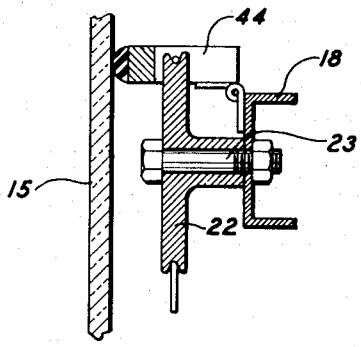
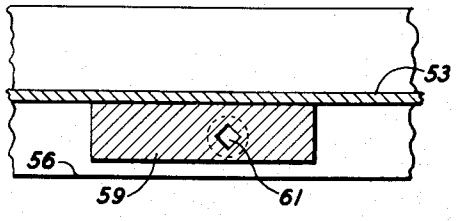


Fig. 6.



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Nov. 3, 1953 R. CROW 2,657,925

CLOSURE, OPERATING, AND CONTROLLING DEVICE

Filed March 27, 1946 4 Sheets-Sheet 3

Fig. 4.

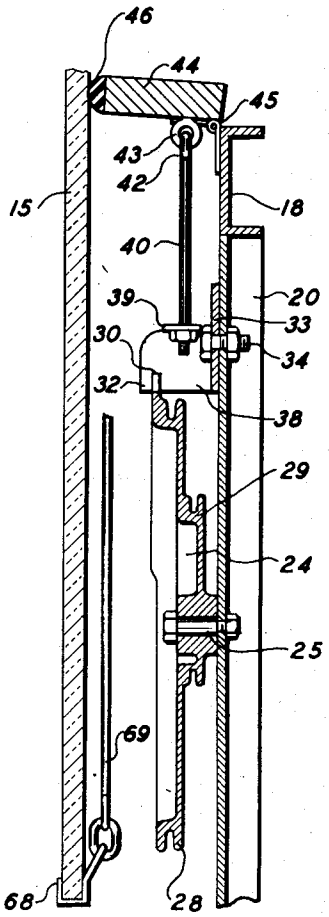


Fig. 7.

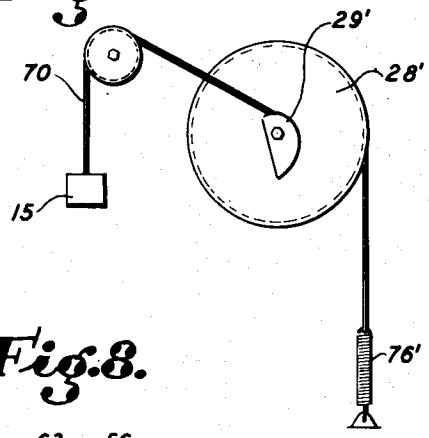


Fig. 8.

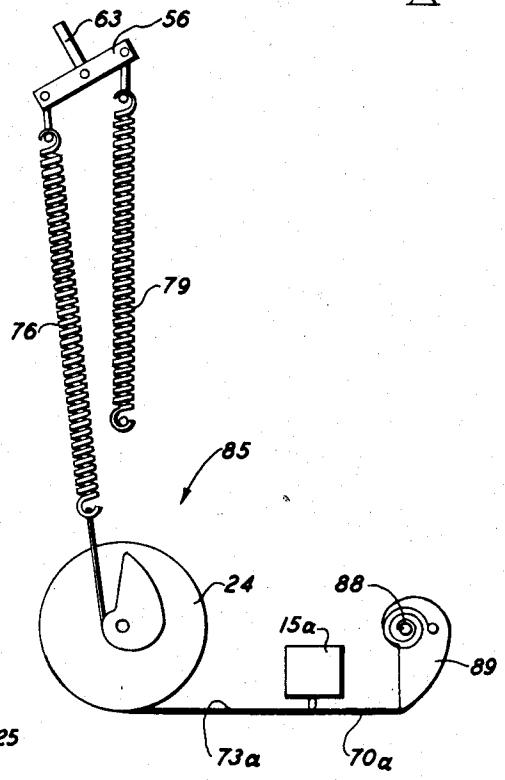
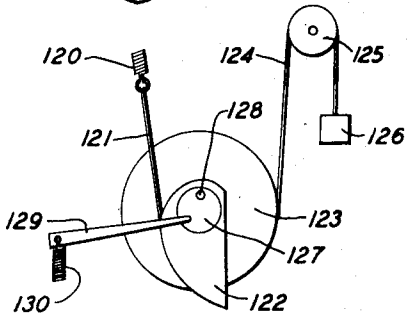


Fig. 10.



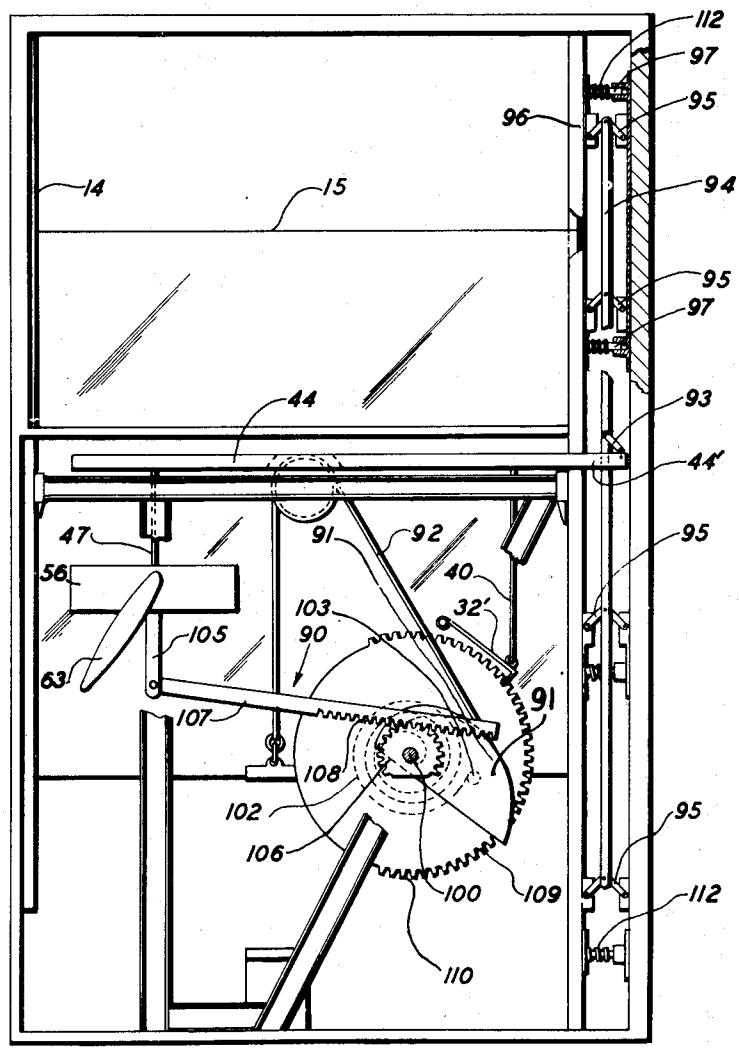
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CLOSURE, OPERATING, AND CONTROLLING DEVICE

Filed March 27, 1946 4 Sheets-Sheet 4

Fig. 9.



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Patented Nov. 3, 1953 2,657,925

UNITED STATES PATENT OFFICE

2,657,925

CLOSURE, OPERATING, AND CONTROLLING DEVICE

Rector Crow, Los Angeles, Calif.

Application March 27, 1946, Serial No. 657,494

8 Claims. (Cl. 268—122)

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My invention relates to a device for regulating movable objects such as doors, the closures of windows, etc., this regulating consisting of moving the object to a desired position and maintaining or locking it in such desired position.

Although the invention is useful in conjunction with many different types of movable objects, it is of especial utility as a means for regulating the positions of closures in windows of automobiles and other vehicles. At the present time, most automobile doors are provided with cranks as means for raising and lowering the window closures, it being ordinarily necessary to rotate the crank through several complete revolutions in order to move the closure from one extreme position to the other. It is an object of my invention to provide a means whereby the closure may be actuated from one position to another simply by small movement of a control lever or handle, thereby avoiding the necessity of turning a crank in order to move the closure.

It is an object of the invention to provide a device of the character set forth in the preceding paragraph having means for restraining movement of the closure or movable object, which restraining means is automatically released as the result of the initial movement of the operating handle.

It is a further object of the invention to provide a novel means for counterbalancing the forces tending to move the movable object or closure, this counterbalancing means being so formed that when the operating handle of the device is moved for the purpose of adjusting the closure or object, there will be a ready response and the movement will be accomplished without need for applying a heavy force to the operating handle.

A further object is to provide a device of the character set forth herein having means whereby counterbalanced forces are normally applied to the movable object so that the object is held stationary and having means for incurring unbalanced forces which will result in movement of the object from one position to another position in response to relatively small movement of a control or actuating handle.

A further object of the invention is to provide a device of this character having a novel means for applying a force to the movable object, either to counterbalance or move the same, this force applying means consisting of a spring and a linkage mechanism connecting the spring to the movable object in such a manner that the variable force exerted by the spring is converted into a substantially constant force.

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A further object of the invention is to provide a device of the character set forth in the preceding paragraph having means for changing the force exerted by the spring so as to unbalance the forces acting upon the movable object, this means for changing the force exerted by the spring being operated by relatively small movement of the actuating handle of the device.

It is a further object of the invention to provide a regulator of this character having a novel spring arrangement for producing a counterbalancing of force and novel means for varying the degree or effect of the counterbalancing force so as to accomplish movement of a movable object, and it is a further object to provide in the device a means for locking the linkage mechanism and also a release for this locking means which operates automatically in response to initial movement of the actuating handle of the device.

A further object of the invention is to provide a closure operating mechanism which may be made up as a unit and which may be installed in an automobile door or other similar wall cavity below a window through an opening of the wall cavity which is covered by the window sill.

A further object of the invention is to provide a novel means for holding the window closure so that it cannot rattle, this holding means being releasable so as to remove practically all friction from the closure so that the height of the closure may be adjusted with minimum application of force.

Further objects and advantages of the invention may be brought out in the following part of the specification.

Referring to the drawings which are for illustrative purposes only,

Fig. 1 is a face view of a form of my invention shown with the cover plate or panel removed so as to disclose the operating mechanism.

Fig. 2 is a rear face view of the upper portion of the operating mechanism.

Fig. 3 is a fragmentary sectional view taken as indicated by the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional view taken as indicated by the line 4—4 of Fig. 1.

Fig. 5 is a fragmentary sectional view taken as indicated by the line 5—5 of Fig. 2.

Fig. 6 is a fragmentary sectional view taken as indicated by the line 6—6 of Fig. 3.

Fig. 7 is a schematic view showing an alternative form of my linkage mechanism.

Fig. 8 is a schematic view showing the manner in which the opposing forces utilized by the invention are incurred by mechanical means.

Fig. 9 is a schematic elevational view showing an alternative form of the invention.

Fig. 10 is a diagrammatic view showing an eccentric means for unbalancing the counterbalanced forces.

In Fig. 1 I show a frame 10 which, in one practice of the invention, may be the frame of an automobile door. This frame 10 has vertical members 11, the upper portions of which cooperate with a header 12 to provide a window opening 13. The side members 11 carry channel guides 14 which receive the edges of a closure 15 consisting in the present instance of a pane of glass adapted to be moved from a raised position in which it fully closes the opening 13 to a lowered position wherein the window opening 13 will be unobstructed by the closure 15. In Fig. 1 the closure is shown in an intermediate position.

The closure 15 is controlled and regulated or operated by a window operating mechanism M which resides in the chamber 16 which occupies that portion of the frame 10 below the window opening 13. The mechanism M is carried by a frame structure 17 which includes a cross bar 18, a vertical bar 19 and a diagonal bar 20 connected in the manner shown. The ends of the cross bar 18 are received in the clips 21 mounted on the inner face of the side bars 11 below the lower margin of the window opening 13. Near the center of the cross bar 18 a sheave 22 is supported on a pin 23. A composite sheave member is supported on the upper portion of the diagonal bar 20 by means of a bolt 25, and an idler sheave 26 is mounted near the lower end of the vertical bar 19 by shaft means 27.

As shown in Figs. 1 and 4, the composite sheave member 24 comprises a circular sheave 28 disposed concentrically to the axis of the bearing bolt 25, and a spiral sheave 29 which is disposed eccentrically as shown in Fig. 1, this spiral sheave 29 being of a form and having a purpose which will be hereinafter described. For convenience, I have shown the sheaves 28 and 29 integrally formed in a single structure referred to as the composite sheave member 24.

A portion of the periphery of the composite sheave member 24 has extended teeth 30 defining notches 31 adapted to be engaged by locking means comprising a dog 32 carried at one end of a locking lever 33, which is pivotally supported on the diagonal bar 20 above the bolt 25 by a bolt 34. A spring 35 urges the rightward end of the lever 33, Fig. 1, downward to produce engagement of the dog 32 with a notch 31. The opposite, or leftward end, of the lever 33 is engaged by a rod 36 which extends to a dash pot 37 which, when the rightward end of the lever 33 is raised against the force of the spring, will retard clockwise rotation of the lever 33 to delay reengagement of the dog 32 with the composite sheave member 24.

As will be perceived from Figs. 2 and 4, the lever 33 comprises a flat plate, and a dog 32 consists of a plate portion 38 bent at right angles to the end of the lever 33. The upper part of the plate portion 38 is bent into a nearly horizontal position to provide a wall 39 through which the lower portion of a pull rod 40 may extend, this pull rod having on its lower end a stop, in the form of a nut 41, adapted to engage the lower face of the wall portion 39 when the pull rod 40 is lifted, thereby lifting the rightward end of the lever 33, Fig. 1, to remove the dog 32 from engagement with a notch 31 of the composite sheave member 24.

The upper end of the pull rod 40 has thereon a loop 42 which engages a loop 43 secured to the lower face of a horizontal detent bar 44 which is connected by hinges 45 to the upper edge of the horizontal bar 18 of the frame structure 17. When the pull bar 40 is lowered as shown in Fig. 4, the detent bar 44 resides in a nearly horizontal position, and a cushion 46 on the outer edge thereof engages the surface of the closure 15 so as to bind the closure 15 in the guide channels 14 and thereby frictionally hold the closure 15 and prevent rattling thereof. The detent bar 44 is swung upwardly from the detaining position in which is shown in Fig. 3 and Fig. 4 by a thrust bar 47, which has at its upper end a loop 48 engaging a loop 49 which is secured to the under face of the detent bar 44 at the opposite end of the bar 44 from the loop 43, as shown in Fig. 2. The thrust bar 47 extends downward through a tongue 50 which projects from the lower edge of a detent releasing lever 51 which has a vertical portion 52 and a horizontal or flange portion 53 at the upper edge of the vertical portion 52. The lever 51 extends transversely and is supported by a pivot 54. When the lever 51 is swung upwardly around the pivot means 54, as indicated by dotted lines 51a in Fig. 2, the tongue 50 thereof will engage a nut 55 on the thrust bar 47 and move the thrust bar 47 upward, this movement being transmitted through the loops 48 and 49 to the horizontal detent bar 44, to swing the detent bar 44 upwardly toward the position thereof indicated by dotted lines 44a in Fig. 3. This upwardly swinging movement of the detent bar 44 will in turn pull the pull rod 40 upward and lift the rightward end of the lever 33, Fig. 1, and carry the dog 32 out of engagement with the notch 31 of the composite sheave member 24 which it may be at the time engaging.

The pivot 54 which supports the detent releasing lever 51 is mounted upon a rocker arm 56 which is made from a flat plate as shown in Figs. 1, 2, and 3.

The rocker arm 56 is pivoted upon the sleeve or shank portion 57 of a cam member 58, which cam member 58 comprises a bar portion 59 which lies under the flange 53 of the detent releasing lever 51 as shown in Figs. 2, 3, and 6. The shank 57 extends from this bar portion 59 through an opening in the rocker arm 56 and through an opening 60 in the web of the vertical bar 19, and is turnable in such opening 60. The cam member 58 has a noncircular opening 61, such, for example, as square, which extends through the shank portion 57 and is adapted to receive the stem 62 of a handle 63. When the stem 62 is inserted in the opening 61, the handle 63 may be swung so as to impart rotation to the cam member 58 to swing this member 58 independently of the rocker arm 56, within certain limits of movement.

As shown in Figs. 2 and 6, the bar portion 59 of the cam 58 has a long end 64 and a short end 65 on opposite sides of the axis of rotation provided by the shank portion 57, the short end 65 of the bar portion 59 extending toward the pivot 54 on which the detent releasing lever 51 is swung. Viewing the lever 51 as shown in Fig. 2, if the handle 63 is rotated so as to cause the long end 64 of the bar portion 59 to swing upward as indicated by dotted lines 64', such long end 64 will swing the lever 51 upward until its free end

engages a stop 66 which projects from the end of the rocker arm 56 opposite the end thereof carrying the pivot means 54. Likewise, a rotation of the handle 63 so as to rotate the short end 65 of the bar portion 59 upward, will cause such short end 65 to engage the flange 63 of the lever 51 and swing the same upwardly into engagement with the stop 66. When the stop 66 is engaged by the lever 51, the rotation of the handle 63 will be transmitted through the bar portion 59 and the lever 51 to the rocker arm 56, to cause the rocker arm 56 to swing in desired direction. However, rotation of the rocker arm 56 will not be produced until the lever 51 is raised and the horizontal detent bar 44 swung upward into releasing position, and the dog 32 lifted from a notch 31, in accordance with the previously described result of the upward swinging of the detent releasing lever 51.

As shown in Fig. 1 and Fig. 4, a metal clip 68 provides a means for connecting the lower end 69 of a cable 70 to the lower edge of the closure 15. This cable 70 extends substantially vertically upwardly and over the idler sheave 22, and the remaining portion 71 of the cable 70 extends to and around the circular sheave member 28 of the composite sheave member 24, the cable 70 being attached to the sheave 28 by an attaching means 72. A second cable 73 has one end thereof attached at 74 to the spiral sheave 29, and from the attachment 74, the cable 73 is extended around the sheave 29 to the sheave 26 situated at the lower end of the vertical bar 19. The opposite end of the cable 73 is attached to the lower end 75 of a tension spring 76, the upper end 77 of this spring 76 being connected to the leftward end of the rocker arm 56, Fig. 1. The opposite, or rightward, end of the rocker arm 56 is connected to the upper end 78 of a tension spring 79, the lower end 80 of which is connected to the lower portion of the vertical bar 19. Since the rocker arm 56 is pivoted around its center, the springs 76 and 79 will be under equal tension when the device is in a static condition—that is to say, when no rotative force is applied to the handle 63.

The weight of the closure 15 is carried by the cable 70 which applies a constant torque to the circular sheave member 28. This torque from the tension in the cable 70 is counterbalanced by the torque resulting from the tension in the cable 73. Since the tension in this cable 73 is derived from the spring 76, it increases and decreases as the spring 76 is extended or contracted. Accordingly, the radius of the spiral sheave member 29 increases as the spring 76 contracts so that the tension exerted on the cable is decreased, and decreases as the cable 73 is extended, the result being that the torque applied by the cable 73 to the composite sheave member 24, expressed as the product of cable tension multiplied by the lever arm or radius of the spiral sheave member in all different positions thereof, is a constant value, and is equal to the constant torque applied by the cable 70 to the composite sheave member 24. The cables 70 and 71 are representative of lines acting in tension upon the composite sheave member 24. It is quite evident that the cables 70 and 73 can be replaced by straps, chains, steel ribbons, etc.

When the device, as shown in Fig. 1, is in a static condition—that is to say, with no torque transmitted through the handle 63 to the rocker arm 56—the rocker arm 56 will float between the upper ends 77 and 78 of the springs 76 and 79,

and have an angular or transverse position with relation to the vertical bar 19 which will result in equal tension to the springs 76 and 79. These springs 76 and 79 may be regarded as two divisions of a single spring element, with the rocker arm 56 as an intermediate connecting means which enables the springs 76 and 79 to be placed in substantially side by side relation instead of in alignment. Through the medium of the rocker arm 56, the force of spring section 79 is applied to the upper end of spring 76, the force of which is transmitted through the cable 73 to the sheave 29. The handle 63 operating through the cross bar 56 provides a means for varying the tension in that portion of the spring system which is connected to the cable 73, thereby varying the tension in the cable 73, with the ultimate effect of unbalancing the opposed torques applied to the composite sheave member 24. This unbalancing of the torques applied to the sheave member 24 will result in its rotation in a direction corresponding to the direction of the greatest torque and this rotation will result in raising or lowering of the closure 15. Accordingly, if the rocker arm 56, as viewed in Fig. 1, is rotated in clockwise direction, the tension in the spring 76 will be increased and the increased tension applied through the cable 73 to the spiral sheave member 29 will result in an increase in the clockwise torque applied to the composite sheave member 24 over and above the value of the counterclockwise torque applied thereto by the cable 70, and the composite sheave member 24 will be rotated in clockwise direction to move the closure 15 upward. The opposite condition will occur when the rocker arm 56 is rotated in counterclockwise direction. There will be a decrease in the tension in the spring 76 and a rotation of the composite sheave member 24 which will accomplish a lowering of the closure 15. However, the actuating means represented by the handle 63 cannot be utilized to unbalance the torques applied to the composite sheave member 24 unless it shall have first released the restraining means of the invention. In explanation of this, we may refer to the previous description herein of the manner in which the rotation of the handle 63 from an inoperative position first swings the lever 51, Fig. 2, upward and into the dotted line position 54a thereof, and thereafter rotates the rocker arm 56. In the foregoing I have used the term "restraining means" as including either or both the frictional detent bar 44 and the locking dog 32 and associated parts.

A feature of the invention is to provide a means for positively locking the linkage mechanism which acts to transmit the force of the spring 76 to the closure 15, such linkage mechanism consisting of the composite sheave member 24 and the cables 70 and 73. This locking means which includes the dog 32 prevents movement of the closure 15 as the result of the bouncing movement of the vehicle when it travels over a rough or uneven surface. In the disclosure I have shown the cables 70 and 73 attached respectively to the circular and spiral sheaves 28 and 29. This connection may be reversed in the practice of the invention. That is to say, the cable 70 may be connected to a spiral sheave and the spring 76 may be connected to a circular sheave of a composite sheave arrangement, if the circular and spiral sheaves are properly arranged and springs of proper length and strength are provided. In explanation of this I have in Fig. 7 shown schematically the attachment of a cable

76 to a spiral sheave 28' which is connected to a circular sheave 28'. A spring 76' applies to the sheave assembly a torque which increases as the spring 76' is elongated. So as to keep the tension of the cable 76 constant, the sheave 28' is made of increasing radius in clockwise direction, so that as the force exerted by the spring 76' gradually increases, the lever arm will gradually increase, thereby providing a means whereby a constant tension in the cable 76 will produce an increasing torque to counterbalance the increasing torque resulting from the elongation of the spring 76'.

In the form of the invention shown in Fig. 1, the movable member disclosed as a window glass 15 is associated with means for incurring opposing forces therein. The means provided for causing a force to act downwardly on the movable member 15 consists of the vertical guides 14 which support the movable member 15 so that gravity may act therein to incur a downward force. Opposing this downward force of gravity 15 we have an upward force resulting from the tension in the spring element comprising springs 76 and 79, such counterbalancing force being transmitted to the movable member 15 by the linkage mechanism consisting of the composite sheave member 24 and the cables 16 and 73. In the form of the invention schematically shown in Fig. 8, means are provided for applying or incurring forces in opposite directions whereby a movable member schematically shown as the part 15a will be held stationary when the forces are in balance, or will be moved when the forces are unbalanced. I have shown the member 15a connected by a cable 73a to a linkage mechanism 86 of the same character as employed in Fig. 1, and accordingly I have applied thereto the same numerals as previously employed.

A second cable 76a connects the movable member 15a with a spiral sheave or pulley 88 to which a varying counterclockwise force is applied by a spiral or torsion spring 88. It will be perceived that as the sheave 88 is rotated in clockwise direction, the effective radius thereof will decrease as the tension in the spring 88 increases. The composite sheave member 24 and the springs 76 and 79 are so proportioned that a constant counterbalancing tension will be exerted in the cable 73a, to counterbalance the tension in the cable 76a. When the rocker arm 56 is rotated in clockwise direction, the spring 76 will be elongated and the increased tensile force exerted thereby will cause the sheave member 24 to rotate in clockwise direction, since the tension in the cable 73a is now in excess of the tension which the spring 88 is capable of applying to the cable 76a. Accordingly, the clockwise rotation of the composite sheave member 24 will wind in the cable 73a and move the movable member 15a in leftward direction until the excess tension is released from the spring 76; whereupon, the force exerting means 85 and 88 will resume their balanced relationship and the movable member 15a will remain stationary. A counterclockwise rotation of the rocker arm 56 will reduce the tension in the spring 76 so that the system will be unbalanced in the opposite direction from that described in the preceding explanation, whereupon the spring 88 may act to move the member 15a rightwardly.

In the form of the invention shown in Fig. 9 I provide a means for positively clamping the closure 15 by pressure against the edge thereof, the clamping means being releasable so as to permit a free movement of the closure when it is desired to change its position. Also, in Fig. 9 I have shown many of the parts previously illustrated and described, combined with new parts so as to produce new effects. For example, the rocker arm 56, in the form of the invention shown in Fig. 9, is connected by linkage means 89 with a spiral pulley 91 which is connected through a cable 92 with the closure 15, whereby movement of the actuating handle 63 is transmitted directly through the rocker arm 56, after release of the restraining means and through the linkage 89 and the cable 92 to the closure 15, thereby producing movement of the closure 15 in a positive manner, as the result of adding or subtracting a force capable of moving the counterbalanced closure 15.

In Fig. 9 the horizontal frictional detent bar 44, actuated by a thrust rod 47, in the manner described with relation to Fig. 3, has its rightward end extended as shown at 44' where it is connected by means of a link 93 with a vertically shiftable bar 94. This bar 94 is connected to the center of a plurality of toggle members 95, the leftward ends of which are connected to the guide channel 96 which supports the rightward edge of the closure 15, the leftward edge of this closure 15 being supported by a stationary guide channel 14. The channel 96 is movably supported by several horizontal pins 97 which are slidable in openings formed in the vertical frame member 98.

The spiral pulley 91 is turnable upon a stationary shaft 100 to which the inner end of a coil spring 102 is attached, the outer end of this spring being connected at 103 to the spiral pulley 91 so as to exert a force tending to rotate the pulley 91 in clockwise direction.

The linkage 90, for connecting the rocker arm 56 to the pulley 91, comprises a lever 105 which projects from the rocker arm 56, a gear segment 106 fixed on the pulley 91, and a link 107 having one end thereof pivotally attached to the lever 105, and having a rack 108 at its opposite end engaging the gear segment 106. Also, attached to the spiral pulley 91 is a plate 109 having a circular arrangement of notches 110 adapted to be engaged by a latch 32', to lock the pulley 91 against rotation.

In the operation of the device shown in Fig. 9, the initial movement applied to the handle 63 acts, as previously described herein, to lift the member 44 through upward thrust applied to the rod 47. This upward movement of the member 44 acts through a pull rod 48 to lift the locking member 32' from engagement with a notch 110, thereby unlocking the spiral pulley 91. Also, the upward movement of the member 44 is transmitted through the links 93 to the vertically shiftable bar 94. The upward movement of this bar 94 collapses the toggles 95 so that they will act to pull the movable guide channel 96 away from the rightward edge of the closure 15 against the pressure of springs 112 disposed around the pins 97. The restraining action is thus taken from the closure member 15 so that it may freely move in response to force transmitted from the lever 63 to the rocker arm 56. The movement of the rocker arm 56 by the lever 63 results in a swinging of the lever 105 and a shifting of the link 107 so that force will be applied through the rack 108 to the gear segment 106 to rotate the gear segment 91 in desired direction. In this form of the invention the weight of the closure 15 is counterbalanced by the force of the spring 102. Movement of the closure 15 is accomplished by adding to or subtracting from this counter-

balancing effect of the spring 102 employed in conjunction with the spiral pulley 91. The transmission of movement from the lever 63 to the spiral pulley 91 is direct and proportionate in view of the employment of the linkage 90. Therefore, the closure 15 may be accurately adjusted to any desired position within its range of movement in the window.

In the mechanism diagrammatically shown in Fig. 10, the unbalancing of the forces is accomplished by rotation of an eccentric 127 which is mounted on an axle or pivot 128. A lever 129 extends from the eccentric 127 whereby this eccentric may be rotated in either direction. A composite pulley member consisting of a circular pulley 123 and a spiral pulley 122 is rotatable on the eccentric 127. A cable 121 extends from the spiral pulley 122 to a variable force exerting means shown as a spring 120, and a cable 124 extends from the circular pulley 123 over a sheave to a constant force exerting means shown as a weight 126. When the composite pulley assembly is shifted by rotation of the eccentric 127, the forces acting in opposite directions in the mechanism will be unbalanced and movement of the weight 126 will result until balance is reestablished.

I claim as my invention:

1. In an adjusting device for a movable member disposed so as to be moved in opposite directions, the combination of: means for incurring normally counterbalanced forces to hold said member stationary in all of its positions, at least one of said means comprising a spring means having a pair of spring sections joined by connecting means so that the force of one of said spring sections is transmitted to the other of said spring sections and a leverage mechanism whereby the varying force of said spring means is converted to a substantially constant counterbalancing force; means for restraining movement of said movable member in at least one of its directions of movement; an actuating member having, in response to motivating effect applied thereto, an initial movement and a succeeding movement; means operating in response to said initial movement of said actuating member to release said restraining means; and means connecting said actuating member and said connecting means operating in response to the succeeding movement of said actuating member for applying movement to said connecting means to change the force of said spring means and cause movement of said movable member.

2. In an adjusting device for a movable member disposed so as to be moved in opposite directions, the combination of: means for incurring normally counterbalanced forces to hold said member stationary in all of its positions, at least one of said means comprising a spring means having a pair of spring sections joined by connecting means so that the force of one of said spring sections is transmitted to the other of said spring sections and a leverage mechanism, whereby the varying force of said spring means is converted to a substantially constant counterbalancing force; an actuating member adapted to be moved in response to a motivating effect applied thereto; and means connecting said actuating member and said connecting means responding to movement of said actuating member for applying movement to said connecting means to change the force exerted by said spring means and cause movement of said movable member.

3. In an adjusting device for a movable member disposed so as to be moved in opposite directions, the combination of: means for incurring normally counterbalanced forces to hold said member stationary in all of its positions, at least one of said means comprising a spring, a composite sheave means including two sheave members, at least one of which is spiral, lines connecting said sheave members respectively to said spring and to said movable member, whereby the varying force of said spring is converted to a substantially constant counterbalancing force; means for restraining movement of said movable member in at least one of its directions of movement; an actuating member arranged so as to have, in response to motivating effect applied thereto, an initial movement and a succeeding movement; means operating in response to said initial movement of said actuating member to release said restraining means; and means connecting said actuating member and said spring operating in response to the succeeding movement of said actuating member to change the force of said spring and cause movement of said movable member.

4. In an adjusting device for a movable member disposed so as to be moved in opposite directions, the combination of: means for incurring normally counterbalanced forces to hold said member stationary in all of its positions, at least one of said means comprising a spring, a composite sheave means including two sheave members, at least one of which is spiral, lines connecting said sheave members respectively to said spring and to said movable member, whereby the varying force of said spring is converted to a substantially constant counterbalancing force; an actuating member adapted to be moved in response to a motivating effect applied thereto; and means connecting said actuating member and said spring responding to movement and in all positions thereof of said actuating member to change the force exerted by said spring and cause movement of said movable member.

5. In an adjusting device for a movable member disposed so as to be moved in opposite directions, the combination of: means for incurring normally counterbalanced forces to hold said member stationary in all of its positions, at least one of said means comprising a spring element, a composite sheave means including two members, at least one of which is spiral, lines connecting said sheave members respectively to said spring element and to said movable member, whereby the varying force of said spring element is converted to a substantially constant counterbalancing force; means for restraining movement of said movable member in at least one of its directions of movement; an actuating member having, in response to motivating effect applied thereto, an initial movement and a succeeding movement; means operating in response to said initial movement of said actuating member to release said restraining means; and means connecting said actuating member and said spring operating in response to the succeeding movement of said actuating member for applying movement to an intermediate portion of said spring element to change the force of said spring element and cause movement of said movable member.

6. In an adjusting device for a movable member disposed so as to be moved in opposite directions, the combination of: means for incurring normally counter-balanced forces to hold said member stationary in all of its positions, at least

one of said means comprising a spring element, a composite sheave means including two sheave members, at least one of which is spiral, lines connecting said sheave members respectively to said spring element and to said movable member, whereby the varying force of said spring element is converted to a substantially constant counterbalancing force; an actuating member adapted to be moved in response to a motivating effect applied thereto; and means connecting said actuating member and said spring responding to movement of said actuating member for applying movement to an intermediate portion of said spring element to change the force exerted by said spring element and cause movement of said movable member.

7. In an adjusting device for a movable member disposed so as to be moved in opposite directions, the combination of: means for incurring normally counterbalanced forces to hold said member stationary in all of its positions, at least one of said means comprising a spring, a composite sheave means including two sheave members, at least one of which is spiral, lines connecting said sheave members respectively to said spring and to said movable member, whereby the varying force of said spring is converted to a substantially constant counterbalancing force; means for locking said composite sheave means; an actuating member having, in response to motivating effect applied thereto, an initial movement and a succeed-movement; means operating in response to said initial movement of said actuating member to release said locking means; and means connecting said actuating member and said spring operating in response to the succeeding movement of said actuating member to change the force of said spring and cause movement of said movable member.

8. In an adjusting device for a movable member disposed so as to be moved in opposite directions, the combination of: means for incurring normally counterbalanced forces to hold said member stationary in all of its positions, at least one of said means comprising a spring means having a pair of spring sections joined by connecting means so that the force of one of said spring sections is transmitted to the other of said spring sections, a composite sheave means including two sheave members, at least one of which is spiral, lines connecting said sheave members respectively to said spring means and to said movable member, whereby the varying force of said spring element is converted to a substantially constant counterbalancing force; means for locking said composite sheave means; an actuating member having, in response to motivating effect applied thereto, an initial movement and a succeeding movement; means operating in response to said initial movement of said actuating member to release said locking means; and means connecting said actuating member and said connecting means operating in response to the succeeeding movement of said actuating member for applying movement to said connecting means to change the force of said spring means and cause movement of said movable member.

RECTOR CROW.

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