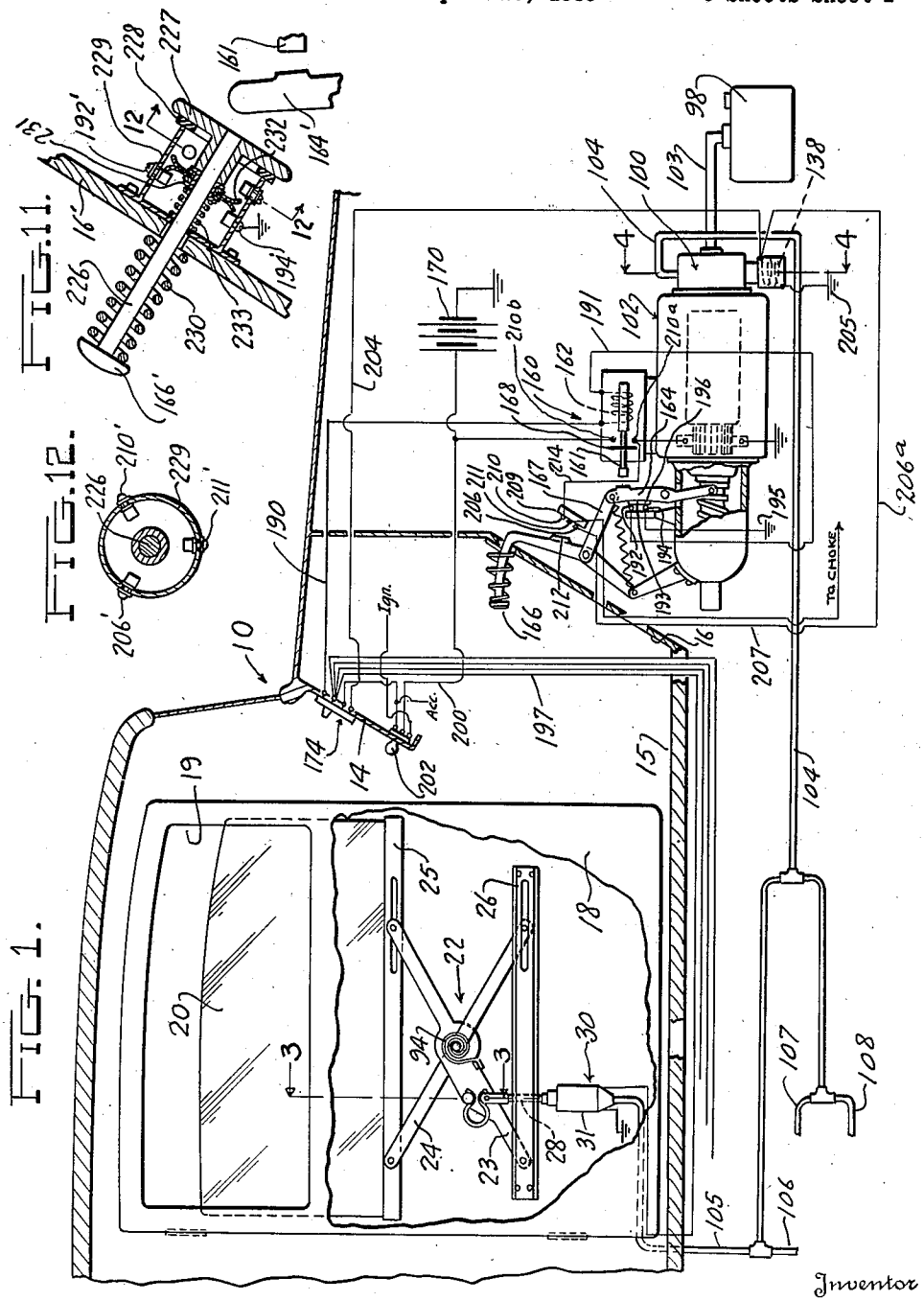
March 17, 1942. J. B. PARSONS 2,276,511

WINDOW REGULATOR

Filed April 25, 1939 3 Sheets-Sheet 1



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WINDOW REGULATOR

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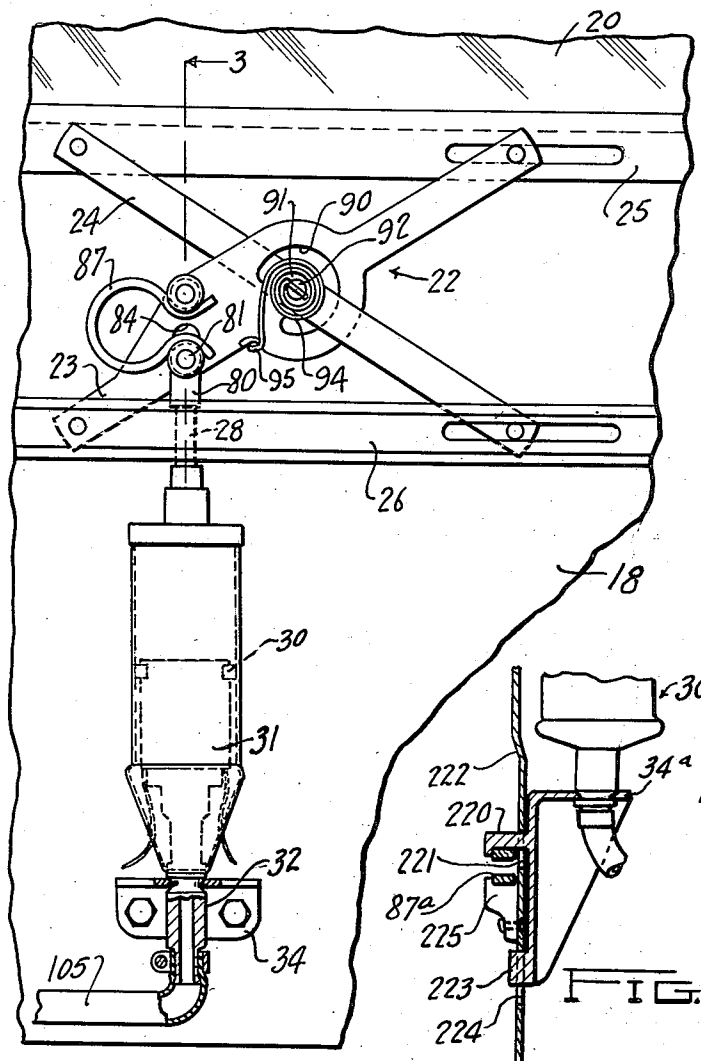


FIG. 2

FIG. 10

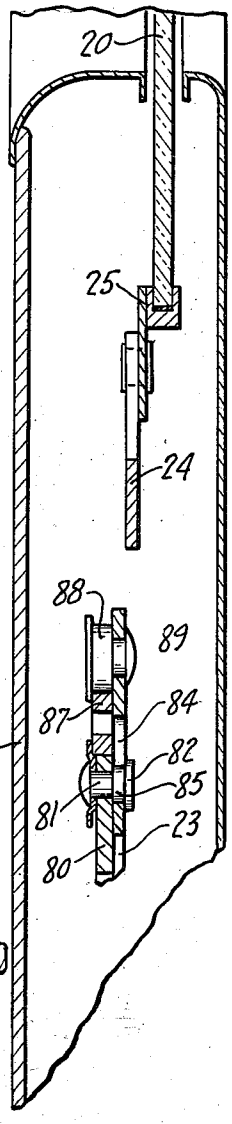


FIG. 3.

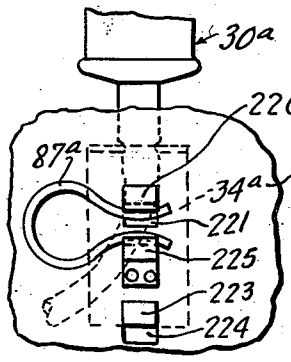


FIG. 9.

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WINDOW REGULATOR

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FIG. 4.

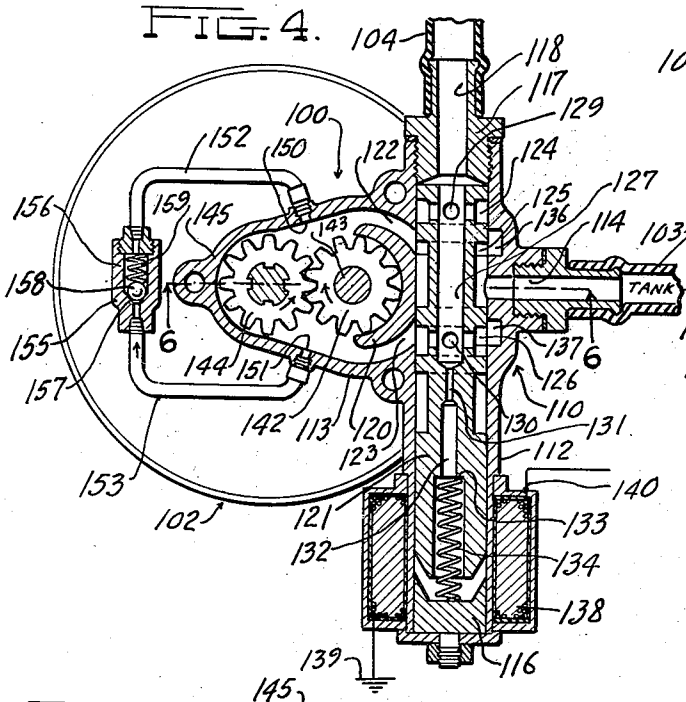


FIG. 5.

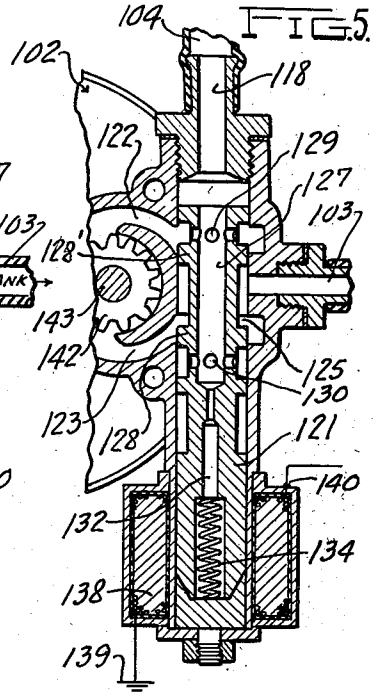


FIG. 6.

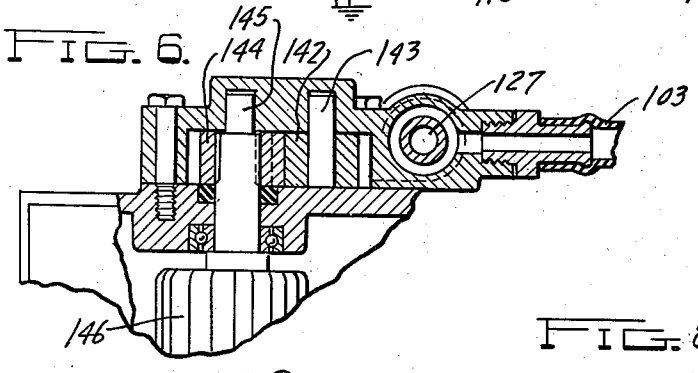
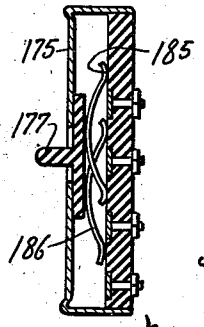


FIG. 8.



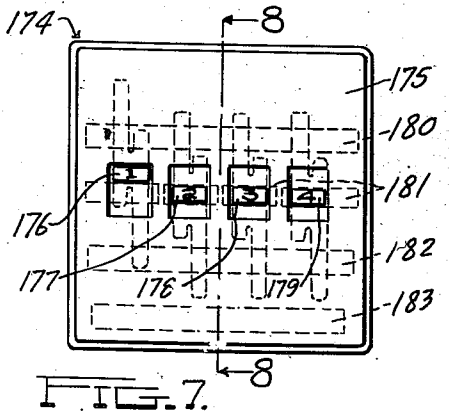


FIG. 7.

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UNITED STATES PATENT OFFICE

2,276,511

WINDOW REGULATOR

John B. Parsons, Toledo, Ohio

Application April 25, 1939, Serial No. 270,014

11 Claims. (Cl. 296—44)

This invention relates to automotive vehicle window regulators, and is particularly directed to automatic means for controlling the windows of such vehicles.

An object is to produce an automatic vehicle window regulator powered by the engine starting motor in which means is provided for militating against clashing of the gears associated with the starting motor in the event that the window regulator switch is actuated concomitantly with the starting motor switch.

Another object is to provide a fluid operated vehicle window regulator mechanism actuated by means of a pump powered by the engine starting motor with means for reducing to a minimum the load imposed by the pump upon the starting motor when the latter is employed to crank the engine.

A further object is to provide a mechanism of the above character with a safety device whereby in the event that the window encounters an obstruction requiring a force in excess of a predetermined maximum to move it, the pump or power source will be rendered ineffective.

Another object is to provide means to compensate for expansion of the fluid in the power cylinder caused by a rise in the temperature, thereby to militate against damage to the mechanism.

Further objects of the invention will appear as the description proceeds in connection with the accompanying drawings, in which:

Figure 1 is a diagrammatic view of one embodiment of the present invention, only one of the plurality of windows to be operated being illustrated;

Figure 2 is an enlarged fragmentary view of the window and operating means shown in Figure 1;

Figure 3 is a vertical sectional view taken substantially on a line 3—3 of Figure 1;

Figure 4 is a vertical sectional view taken substantially on a line 4—4 of Figure 1, illustrating the fluid pump of the invention;

Figure 5 is a fragmentary view of the structure shown in Figure 4 in another position of operation;

Figure 6 is a sectional detail view taken substantially on a line 6—6 of Figure 4;

Figure 7 is a front view of a control box which may be used with the invention;

Figure 8 is a sectional detail view taken substantially on line 8—8 of Figure 7;

Figure 9 is a fragmentary side elevation of an alternate mounting of the power cylinder showing another form of spring compensating device;

Figure 10 is a fragmentary sectional view of the spring mounting shown in Figure 9;

Figure 11 is a sectional view showing a starter button and associated switch mechanism; and

Figure 12 is a transverse section on the line 12—12 of Figure 11.

Figure 1 illustrates somewhat fragmentarily a portion of an automobile indicated generally at 10, and shown as including a dash board 14, floor 15 and toe board 16. One of the doors 18 of the vehicle is shown as including a window opening 19 adapted to be closed by means of a glass or other transparency 20. Mounted interiorly of the door 18 and below the glass 20 is a cross arm window regulator indicated generally at 22, and including a pair of arms 23 and 24 pivotally connected intermediate their ends, and each having one end pivoted respectively to a glass retainer 25 and a support 26 carried by the door. One end of each arm rides in a horizontal slot in the support and retainer, as shown. Arm 23 is connected by a link 28 for operation by a power unit, indicated generally at 30 and illustrated and described in detail in a co-pending application of John B. Parsons and Burton S. Floraday, Serial No. 275,207, filed May 23, 1939.

The power unit 30 comprises a reciprocable fluid cylinder 31 connected to the lower end of link 28, and within which is positioned a piston 32 supported by a bracket 34 fixed to the door structure 18. Within the piston 32 is a solenoid operated valve mechanism adapted to be opened to permit fluid to be supplied to or removed from the cylinder 31. The solenoid comprises a coil within which the valve is positioned and adapted to be operated in response to energization of the coil. Since the detail construction and operation of the power unit 30 forms no part of the present invention, further description and illustration is not considered necessary.

Link 28 may be of any suitable form, such as the rod shown, and is provided with a flattened end portion 80 apertured to receive a pivot element 81 for connection to the arm 23. The pivot 81 has an enlarged head 82 projectable through a vertically elongate slot 84 in the arm, and a bearing portion 85 engaging the side walls of the slot. Means in the form of a C-shaped spring 87 is provided to urge the pivot into bearing engagement with the slot, one arm of the spring 87 engaging the upper end of the link 28, and the other arm of the spring being in engagement with the under side of an enlarged bearing

portion 88 of a pin 89 affixed to the arm 23, see Figure 3.

The spring 87 compensates for the expansion of fluid in the cylinder 30, when the window is in closed position, as a result of a rise in temperature. It will be apparent that yielding of spring 87 militates against damage to the power unit and operating linkage in the event of fluid expansion. Thus, the spring serves resiliently to connect the link 28 to the arm 23 and permits slight relative movement therebetween.

The arm 23 has an arcuate slot 90 therein, through which the arm 24 extends, and is formed with a central ear 91 provided with an opening for the reception of a pin 92 carried intermediate the ends of the arm 24. One end of a spiral spring 94 is disposed in a transverse slot in the pin, the other end of the spring being in engagement with an ear or projection 95 provided at one side of the arm 23. The spring 94 serves to urge the arms in one direction of relative movement, it being noted that the spring is so mounted that during the closing movement of the window, it is placed under tension, and, consequently, assists in the opening movement of the window.

Referring again to Figure 1, means are illustrated for supplying power to the cylinder 31, as are means for controlling the supply means, and means remote therefrom for energizing or rendering effective the entire system. The power means has been shown as a hydraulic system including a reservoir 98, which need not be a separate reservoir, as the use of the vehicle's brake system reservoir or the crank case of the engine is contemplated as a source of fluid or oil for the present system.

A pump 100 of desired characteristics is an essential element of the present invention, and, although the type of fluid pump used is immaterial, certain features thereof, to be described, form an important part of this invention. As particularly shown in Figures 4, 5 and 6, a rotary pump may be preferred because of its particular adaptation to use in conjunction with the starting motor for the internal combustion engine of the vehicle which is employed to drive the pump. The pump 100 is, therefore, illustrated as operatively connected to a conventional starting motor 102, and is provided with a fluid supply duct 103 in communication with the reservoir 98, and a conduit 104, suitably branched into any desired number of branches, herein illustrated as four pipes 105, 106, 107 and 108 (Figure 1), each of which is connected to a power unit coupled to and capable of operating a window of the vehicle. As illustrated, the pipe 105 leads to the unit 30 associated with window 20 in the door 18, and it will be understood that the other pipes lead to similar units associated with three other windows of the vehicle (not shown).

A valve, indicated generally at 110 and shown in detail in Figure 4, is directly associated with and forms a part of the pump 100 for the purpose of controlling the fluid flow during operation of the latter. It will be understood that the pump and valve may be separate units suitably interconnected if desired, rather than a unitary structure. This flow control valve is illustrated as comprising a generally cylindrical casing portion 112 formed integrally with pump casing 113 mounted at the forward end of starting motor 102. Casing 112 is formed with a side port 114 providing communication with the reservoir 98 through duct 103. One end of the casing is closed by a plug 117 formed with a longitudinal bore 118 providing a second port for the casing and to which is connected the conduit 104.

At one side of the pump casing 113 and adjacent the valve casing 112 is a partition or wall 120 of generally crescent cross-section. The adjacent walls of the casing 113 and 120 provide flow passages 122 and 123 for the fluid; the direction of flow of which upon leaving the pump is controlled by means of a flow control valve or piston 121. Accordingly, the piston valve 121 is provided with a plurality of annular grooves 124, 125 and 126 and a longitudinal bore 127 of varying diameter throughout its length, the grooves providing a pair of spaced valve heads 128 and 128'. Annular grooves 124 and 126 communicate with bore 127 through ports or openings 129 and 130, respectively. The bore 127 is restricted as at 131 and is of a reduced diameter at 132 forming a shoulder at 133 against which one end of a spring 134 abuts. The other end of spring 134 engages the inner end of the plug 116, and thus serves to urge the valve 121 upwardly. The annular groove 125, which is of a greater width than the grooves 124 and 126, is always in communication with the port 114. In communication with the passages 122 and 123 are annular channels 136 and 137 respectively, formed in the wall of valve casing 112. Surrounding the lower end of the casing 112 is a solenoid coil 138, one end of which is grounded at 139 and the other end of which is provided with a tap 140 connected as will hereinafter be described.

The partition 120 is arranged so that its inner arcuate edge embraces substantially one-half of the periphery of a driven gear 142 mounted on a stub shaft 143 carried by the casing portion 113. The gear 142 is driven by a gear 144 fixed for rotation with an armature shaft 145, upon which is provided the armature 146 of the starting motor 102. From the foregoing and with particular reference to Figure 4, it will be noted that energization of the starting motor will drive the pump gears in the direction indicated by the arrows on the gears. Thus, fluid will be drawn from the conduit 103 through the groove 125 and the passage 122, around the gears 142 and 144, through the passage 123 into the groove 126 and the ports 130 to the bore 127, from which it is discharged into the duct 104 and forced to the power unit 30.

On opposite sides of casing 113 are ports 150 and 151 in communication with which is a fluid by-pass comprising conduits 152 and 153 connected to opposite sides of a ball check valve 155. The valve comprises a longitudinally bored casing 156 having a seat 157 in which is received a ball 158 urged into the seat by a spring 159. It will be noted that when the pump is being actuated to raise a window and the latter reaches its upper limit, excess fluid may be pumped through such by-pass arrangement to militate against damage to the system until such time as the pump is stopped. The valve 158 serves as a means for governing the maximum pressure exerted on the power units, and also acts as a safety device should a child's hand, for example, be caught between the window and window frame during closing of the window.

When the flow control valve 121 is in the position illustrated in Figure 5, the fluid is circulated in a reverse direction, or in other words, is drawn from the power unit 30 through the conduit 104 into the bore 127, and passes into the pump chamber through the ports 129 and the passage 122, from which it is carried around the gears

142 and 144 and forced through the passage 123, annular groove 125, and then discharged into the duct 103 and returned to the reservoir 98.

The means for controlling the position of the valve member, as well as the operation of the power units, will now be described. In Figure 1 has been illustrated an electrical circuit which includes the starting motor energizing circuit, as well as means for automatically breaking the circuit to the starting switch solenoid upon depressing the starter pedal to militate against clashing of gears when the motor is simultaneously or conjointly operated for window actuation and starting the engine. Associated with the starter motor 102 is a combined mechanical and electrical switch indicated at 160.

The switch 160 may be closed manually by depression of a spring tensioned plunger 161, or it may be closed electrically by energization of a solenoid indicated by the reference numeral 162. In the illustrated structure a lever 164 is suitably pivoted intermediate its ends and is adapted to be rocked about the pivot upon depression of a starter pedal 166 by a link 167 connected therebetween. Depression of the pedal 166 first moves a pinion on the motor shaft into mesh with a gear on the fly wheel of the engine (not shown) and then causes the lever 164 to engage the plunger 161 carrying a contact bar 168 into engagement with a pair of contact elements for completing the circuit from a battery 170 to the starting motor. Obviously, if the motor 102 is to be used to supply power to operate the windows of the vehicle, additional means are required to energize the motor so that the driving connection between the starter motor and the engine will not be established at times when it is desired to regulate the windows.

In accordance with standard automotive practice, a single wire system is used to control the organization of the present invention, all circuits leading from the battery to a suitable ground. A switch 174 is mounted for convenient manipulation by the operator of the vehicle as on the dash 14, and may be of any suitable construction, preferably provided with a plurality of spaced contacts or binding posts to which certain of the wires of the present circuit are connected. As illustrated in Figures 7 and 8, the switch mechanism may be enclosed in a suitable box 175 within which are carried four or more independently operable elements 176, 177, 178 and 179 for controlling respectively each of the four or more windows of the vehicle. Each of the switch elements is yieldingly held in a neutral position from which the switch is moved upwardly to energize a circuit to close the window and downwardly to energize a circuit to open the window. Thus, contact bars 180, 182 and 183 suitably insulated from each other are mounted in the switch box 175, and associated with each of the operating elements is a bar 181 for each window to be operated and across which contacts suitable means, such as the spring contacts 185 and 186, carried by each switch element, are bridged to energize either of the two operating circuits.

Contact bar 180 is connected by a lead 190 to one side of the solenoid 162, the other side of the solenoid being connected by lead 191 to a contact 192 suitably carried by an insulated block 193 mounted on the pinion housing of the starting motor. Another contact 194 is also carried by the block 193 and is grounded at 195. The contacts 192 and 194 are normally bridged by a contact bar 196 carried by the lever 164 to complete the solenoid circuit from switch 174 to the ground. The contact bar 181 is connected by means of a lead 197 to one side of the coil in the power unit 30, the circuit being completed by suitably grounding the other end of the coil, as will be readily understood. Contact bar 182 is connected to the battery 170 by means of a lead 200, in which circuit may, if desired, be interposed a switch 202.

In the event that the starter pedal 166 is depressed to crank the engine at the same time one or more of the windows is actuated, it is desirable to prevent clashing of the starter motor gears, which would normally take place. For this purpose the solenoid starter switch 160 circuit is grounded through lead 191, contact 192, contact plate 193 carried by the starter pedal lever 164, contact 194, and ground 195. Upon depression of the starter pedal, the contact plate 193 carried by the lever 164 is moved away from the contact points 192 and 194, thereby breaking this circuit and deenergizing the starter switch solenoid 162. As a result the contact plate 168 is moved to inoperative position and the motor 102 is consequently deenergized. Owing to the load imposed upon the starter motor 102 by the pump 100, the motor immediately decelerates. Upon continued movement of the starter pedal lever 164, the plunger 161 is moved normally to move the contact plate 168 into engagement with the contacts 210a and 210b, thereby to reestablish the circuit controlling the starter motor 102. It will thus be apparent that liability of clashing of the starter motor gears under these conditions is obviated, because the motor circuit is momentarily broken to enable the pump to decelerate the starter motor 102 sufficiently to enable proper meshing of the gears.

It is desired to reduce the current consumption caused by the load imposed by the pump on the starter motor during the time that the starter motor 102 is used to crank the engine. For this purpose the solenoid 138 controlling the flow control valve 110 is energized. As shown during the depression of the starter pedal 166, the contact plate 212 carried thereby is brought into engagement with the contacts 210 and 206. The lead from the contact 210 extends to the contact 210a, which is on the motor side of the starter switch 160 and is normally dead, and current does not pass to the contact 210a from contact 210b until the contact plate 168 carried by the plunger 161 is depressed as above explained, thereby to engage the live contact 210b. The contact 206 is connected by a lead 206a to the solenoid 138. In order to energize the solenoid 138, it is not only necessary to cause the contact plate 212 to engage the contacts 210 and 206, but also that the plunger 161 be actuated to bring the contact plate 168 into engagement with the contacts 210a and 210b. From the above description it will be understood that the solenoid 138 is energized during the cranking period so that the flow control valve 110 is drawn to the position shown in Figure 5, enabling the pump to operate against atmospheric pressure. In this manner the load imposed upon the starter motor is kept at a minimum, and, as a consequence, a lesser amount of current is required.

When the present system is used on vehicles having engines provided with accessories, such as an automatic choke for example, the contact 211 provided on block 209 is connected to the choke operating mechanism so that the choke circuit

may be energized only upon depression of the starter pedal.

Many of the present automotive vehicles are provided with an accessory switch, preferably key-controlled, so that a radio or heater may be operated when the ignition is off, as well as on, and the combination of such a switch with switch 202 is contemplated. Accordingly, the switch 202 may be connected to the battery by lead 200, and provided with a double contact arm engageable selectively with either the ignition circuit and the accessory circuit, or the accessory circuit alone. In such instance the switch 174 is included in the accessory circuit and also the ignition circuit. By such an arrangement, it will be apparent that the window operating circuit may be connected to the battery to operate the windows both when the ignition is on and off.

Although the switch 174 has been described as being located on the dash within easy access of the vehicle operator, it will be readily understood that duplicate switch or switches may be located in other convenient locations in the vehicle and connected in parallel with the switch 174 in order that the windows may be operated by other occupants of the vehicle.

Referring to Figures 9 and 10, the power cylinder 30^a is carried by a bracket 34^a in any suitable manner, and the bracket 34^a is provided with a laterally extending lug 220, which projects through a vertically elongate slot 221 in a door panel 222. The lower end of the bracket 34^a has a laterally extending guide lug 223 which projects into a vertically elongate slot 224. Secured to the panel 222 is a lug 225 arranged in opposite relation to the lug 220. The ends of a spring 87^a, similar to the spring 87 above described, engage the lugs 220 and 225 respectively. It will be apparent that upon expansion of the fluid within the power cylinder 30^a the bracket 34^a can move downwardly upon flexing of the spring 87^a and thereby militate against damage or injury to the associated mechanism. In this connection it will be obvious that the piston within the power cylinder 30^a is connected by a link, which is pivoted to one of the arms of the regulator 22, the lost motion in this instance being at the opposite end of the power cylinder instead of between the link and the regulator arm.

Figures 11 and 12 illustrate a practical form of switch mechanism associated with the starter button which is indicated at 166' and has a stem 226. At the opposite end of the stem is a disc 227 provided with a rubber sealing ring 228, which is held normally in contact with the outer end of a housing 229 by a coil spring 230. The spring 230 bears respectively against the button 166' and floor board 16'. Mounted slidingly on the stem 226 within the housing is a spool-like member 231, which carries but from which is insulated a pair of oppositely bowed metal contact discs 232, the outer edge portions of which are yieldable, and for that purpose may be formed with a series of radial slots. The spool member 231 is urged against an extension of the disc 227 by a relatively weak spring 233.

Within the housing 229 are contacts or binding posts similar to those above described, and corresponding reference numerals primed are used in this connection. Note that normally one of the contact discs 232 engage respectively the contacts 192' and 194', the latter being grounded and the former leading to the starter switch solenoid 162. Upon depressing the starter button 166', the disc 232 is first moved away from the contacts 192' and 194' and then brought into engagement with the contacts 206' for the flow control valve solenoid 138, 210' for the automatic choke, and 211' for the normally dead side of the starter solenoid. Thereafter, the disc 227 bearing against the arm 164' operatively actuates the solenoid plunger 161' of the starter solenoid.

The above mechanism is exceedingly compact, and is particularly adapted for use with certain types of automobiles. The wiping engagement between the discs 232 and contacts keeps the latter free from dust and dirt, and the spring action of the discs assists in this connection. It will be apparent that unless the starter motor is to be operated for window actuation, causing current to flow through the contact 192', disc 232 and contact 194', at the time the pedal is depressed, current does not normally pass through the contacts of this switch. This is of importance because it enables the use of a relatively inexpensive switch mechanism of the character above described. Obviously, the circuit is made or broken after the plunger 161' has been actuated or released.

From the above description it will be apparent that clashing of the gears associated with the starter motor is obviated because before the starting motor can be employed to crank the engine, its speed is decelerated sufficiently to allow the gears to mesh properly. Therefore, it is possible to actuate a switch for operating one or more of the windows and at the same time actuate the starter motor switch without producing any clashing of gears. It will also be apparent that by means of an exceedingly simple arrangement the load imposed on the starting motor by the fluid pump is reduced to a minimum, and, as a consequence, the amount of current required to operate the starter motor for cranking the engine is maintained as low as possible. Another feature of the invention resides in the compensating device for compensating for expansion of the fluid in the power cylinder associated with each of the windows which might otherwise damage or injure the associated parts. A further feature resides in the safety device whereby the fluid can be by-passed around the pump in case the window encounters an obstruction whereupon a force in excess of a predetermined maximum would be required for operating same. The entire structure and arrangement has been designed from the standpoint of simplicity of construction, and ease of operation and assembly. Although the embodiment of the invention has been described particularly in connection with the operation of automobile windows, it can be used to advantage in other places where parts are to be adjusted or moved to and fro.

Various changes and modifications may be made in the present disclosure, particularly in the auxiliary circuit for permitting the dual operation of the starting motor, without departing from the spirit of the present invention.

What I claim is:

1. The combination with a vehicle having an engine, a motor normally operable to crank the engine, a window in the vehicle, and operating linkage for controlling the window, of a fluid pump associated with said motor, power means coupled to said pump for moving said linkage, means including manual means for energizing said motor to crank the engine and drive said pump, a solenoid for operatively connecting said motor to drive said pump independently of said

manual means, and means associated with said pump to reduce the load imposed on said motor by said pump when said motor is cranking the engine.

2. The combination with a vehicle having an engine, a motor normally operable to crank the engine, a window in the vehicle, and operating linkage for controlling the window, of a fluid pump adapted to be operated when said motor is operated, power means coupled to said pump for moving said linkage, said power means including a fluid pressure operated cylinder and an electro-responsive valve controlling the flow of fluid to and from said cylinder, means for energizing said motor to crank the engine and drive said pump, and electroresponsive means for temporarily reducing the load imposed by said pump upon said motor when said motor is energized to crank the engine.

3. A regulating system of the character described comprising a movable member, an actuator for operating said member, an engine starting motor, a pump connected to be driven when said motor is operated and operatively connected to said actuator, manual means for rendering effective said starting motor, and means automatically operable upon actuation of said manual means for reducing the load imposed by said pump upon said motor.

4. A regulating system of the character described comprising a movable member, an actuator for operating said member, an engine starting motor, a pump connected to be driven by said motor and operatively connected to said actuator, a control element associated with said pump for governing the passage of fluid to or from said actuator, manual means for rendering effective said starting motor, and means operable in response to operation of said manual means for actuating said control element to such position as to reduce the load imposed by the pump on said motor.

5. A regulating system of the character described comprising a movable member, an actuator for operating said member, an engine starting motor, a pump connected to be driven by said motor and operatively connected to said actuator, a valve controlling the passage of fluid between said pump and actuator, a solenoid associated with said valve for moving the latter to such position as to allow operation of said pump against atmospheric pressure, manual means for rendering effective said starting motor, and means associated with said manual means for energizing said solenoid substantially upon operation of said manual means.

6. A window regulating system for automotive vehicles comprising a movable window, fluid responsive means for actuating said window, an engine starting motor, a pump operatively connected to said motor, an operative connection between said pump and fluid responsive device for raising or lowering the window in accordance with the direction of fluid flow, electro-responsive means for operating said motor for actuating said window, and mechanico-electrical means for energizing said motor for engine cranking purposes, said last means including means for momentarily deenergizing said motor to allow the pump to decelerate the motor sufficiently to avoid clashing of gears when same is used concomitantly to operate the window, and thereafter reenergize said motor.

7. A window regulating system for automotive vehicles comprising a window movable to and from closed position, fluid responsive means for operating said window, an engine starting motor, means providing an operative connection between said motor and fluid means, means including a switch for operating said motor to actuate said window, a movable control for rendering said motor effective for engine starting purposes, and means for disconnecting said switch thereby to deenergize said motor upon partial actuation of said control thereby to obtain deceleration of said motor, and upon continued actuation of said control to reenergize said motor.

8. In an automobile, the combination of fluid responsive means for actuating a window to and from closed position, an engine, an electric starting motor operable to crank the engine, a pump operatively connected to said motor and in communication with said fluid responsive means for actuating same, a main control switch for said motor, means including manual means operable through said main switch for energizing said motor to operate said pump thereby to actuate said fluid responsive means, means including mechanical means for operating said motor to crank the engine, and means responsive to movement of said mechanical means for momentarily disconnecting said main switch to deenergize said motor, said mechanical means being constructed and arranged to subsequently operate said control switch to energize the motor for cranking the engine.

9. In an automobile, the combination of fluid responsive means for actuating a window to and from closed position, an engine, an electric starting motor operable to crank the engine, a pump operatively connected to said motor and in communication with said fluid responsive means for actuating same, a main control switch for said motor, means including manual means operable through said main switch for energizing said motor to operate said pump thereby to actuate said fluid responsive means, a pedal operable to establish an operative connection between said motor and engine, means operable by said pedal during movement thereof for momentarily rendering said switch inoperative thereby to cause deceleration of the motor in the event same was energized for window operating purposes, and means forming a part of said switch and subsequently engageable by said pedal for reenergizing said motor for engine cranking purposes.

10. The combination with fluid responsive means for moving a window to and from closed position, a pump operatively connected to said fluid responsive means for actuating same, a valve controlling the direction of fluid flow between the pump and fluid responsive means, means for actuating said valve, and means responsive to fluid pressure in excess of a predetermined maximum to by-pass the fluid for rendering said pump ineffective.

11. The combination with fluid responsive means for moving a window to and from closed position, a gear pump operatively connected to said fluid responsive means for actuating same, a valve controlling the direction of fluid flow between the pump and fluid responsive means, means for actuating said valve, and means responsive to fluid pressure in excess of a predetermined maximum for rendering said pump ineffective, said last means comprising a by-pass from one side of the pump to the other, and a spring tensioned check valve in said by-pass.

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