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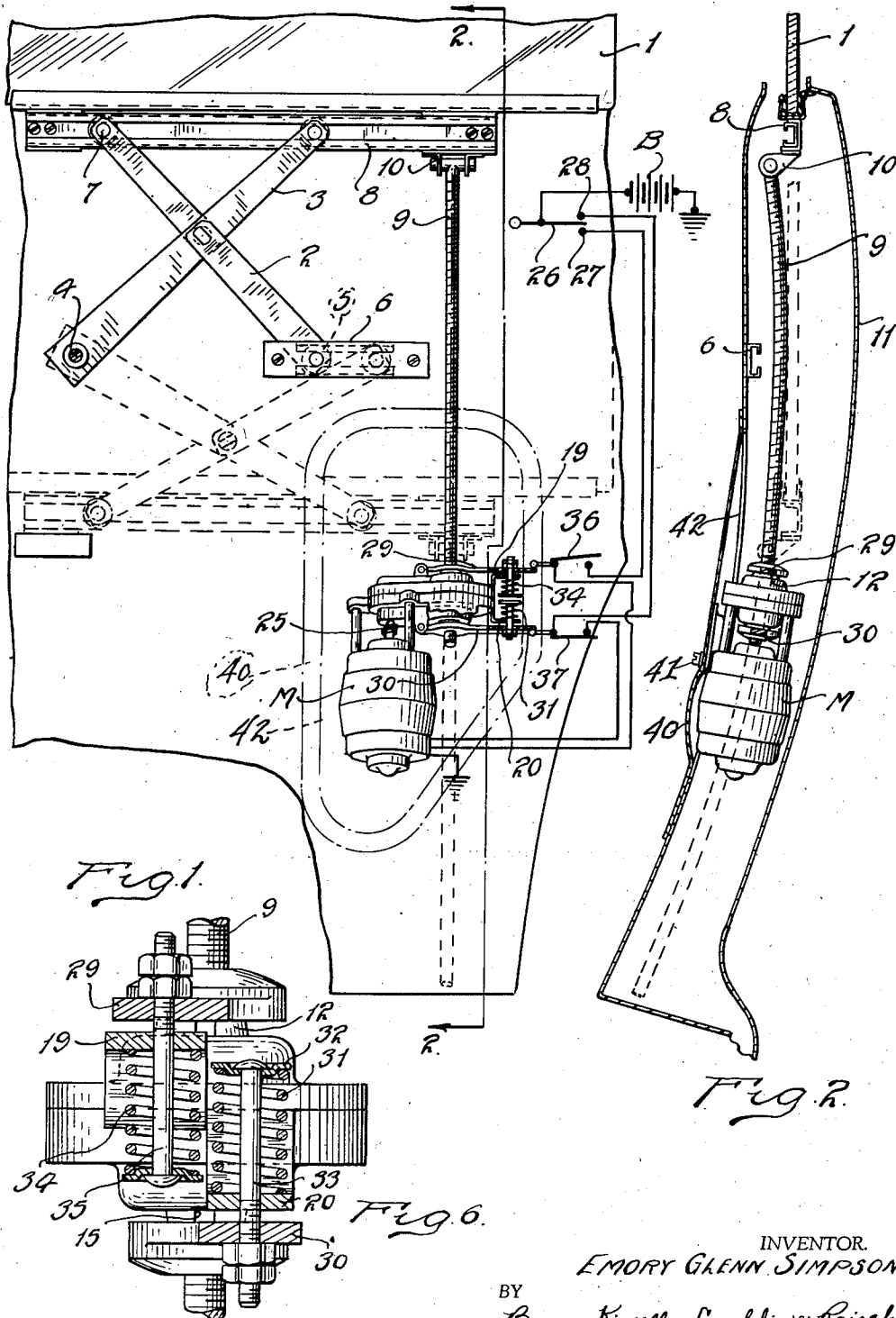
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POWER OPERATED WINDOW REGULATOR

Filed March 24, 1941

2 Sheets-Sheet 1



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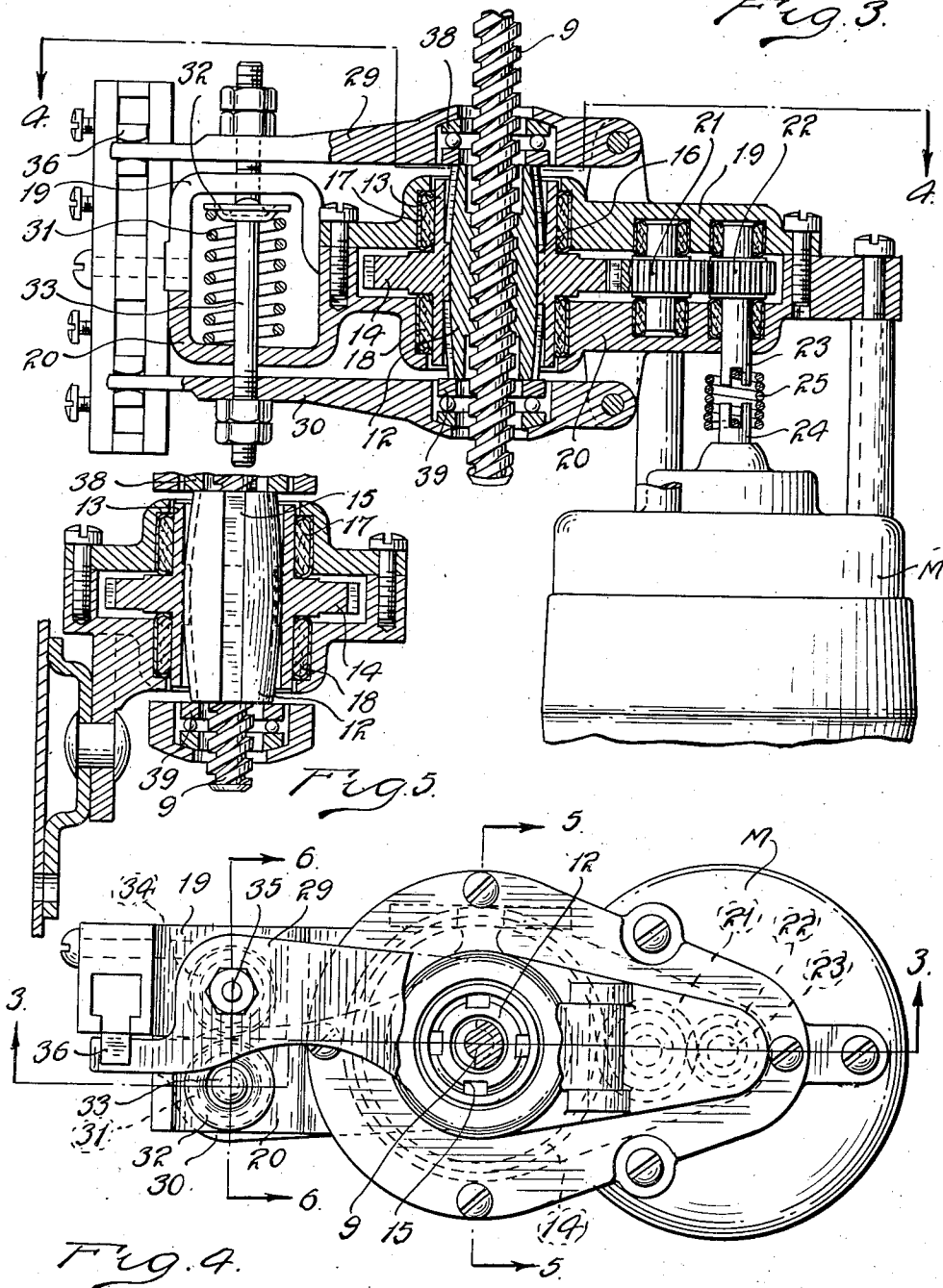
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UNITED STATES PATENT OFFICE

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POWER OPERATED WINDOW REGULATOR

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General Motors Corporation, Detroit, Mich., a
corporation of Delaware

Application March 24, 1941, Serial No. 384,784

3 Claims. (Cl. 268—124)

This invention relates to power operated window regulators. It is not uncommon to operate a window regulator with power such as air, vacuum, and electric motor. It is the object of the present invention to provide an improved power operated window regulator which is operated by electric motor operating a screw jack in which the jack stem is curved to accord with the curvature of the door or body. Instead of the limit switches being operated by the travel of the window, they operate by the travel of a nut which operates in conjunction with the jack screw. This will more fully appear hereinafter.

In the drawings:

Fig. 1 is a fragmentary elevational view of the apparatus.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a section through the operating nut and jack and associated parts.

Fig. 4 is a section taken on the line 4—4 of Fig. 3.

Fig. 5 is a section taken on the line 5—5 of Fig. 4.

Fig. 6 is a section taken on the line 6—6 of Fig. 4.

The window panel 1 is guided in vertical movement by suitable window runs not shown. Preferably a pair of X levers 2 and 3 help support, guide, and balance the window panel. Lever 2 is pivoted at 4 on a stationary pivot. The lever 3 is pivoted at 5 on a pivot slidable in the guide 6. The swinging ends of each of these levers is provided with a roller 7 engaging in the channel 8 in the bottom of the window. Operating in conjunction with these X stabilizing levers is a jack screw 9 pivoted on the bracket 10 on the bottom of channel 8. This jack screw is curved in a curvature which is substantially that of the outside panel 11 of the door. Jack screw 9 passes through nut 12 which is threaded on the screw. Nut 12 is rockingly secured in the hub 13 of driven gear 14 and also slidably secured therein. From Fig. 5 it will be seen that the outside surface of the nut is arced longitudinally. The nut is also circular in cross section. Hence when seated in the hub of the gear the nut, together with the jack shaft, can tilt with respect to the gear which is desirable and necessary in view of the curvature of the jack shaft. It will also be seen that the nut has keyways 15 in the outside of the nut, the keyways extending longitudinally thereof. In these keyways engage the keys 16 of the nut. The driven gear 14 is rotatably supported in the bearings 17 and 18 of the arms 19 and 20 which form the housing containing the nut and gear. This hous-

ing also journals the gears 21 and 22, the latter of which is supported on the drive shaft 23 which is connected with motor shaft 24 by the flexible coupling spring 25. M is the motor.

To operate the window one swings the switch 26 to close the circuit through either the terminal 27 or 28 depending upon in which direction motor M is to be rotated. This throws the electrical energy of battery B through the circuit connected with the motor, rotating pinion 22, gear 21, and driven gear 14. This rotates the nut 12. Nut 12 is held from movement in either direction by the arms 29 and 30. Note arm 30, for instance. Spring 31 bears against washer 32 on the end of the bolt 33 and also against the arm 20 of the bottom of the housing. Likewise, spring 34 (see Fig. 6) bears against washer 35 and also against the top arm 19. These two springs so operating keep the two arms 29 and 30 pulled down on the ends of the nut and keep the nut in a centralized position. In this position the limit switches 36 and 37 are closed. When the window reaches the limit of its travel the jack screw can move no further. Hence, the nut itself starts to travel along the threads of the jack screw as the gear 14 continues to rotate. The end of the nut bears against the thrust bearings 38 at the top and the thrust bearings 39 at the bottom. Hence, when the window reaches the limit of its upper movement, nut 12 will throw up the lever arm 29 and disengage the switch 36 thereby breaking the circuit and stopping the motor. Likewise, when the window reaches the limit of its downward movement, nut 12 will thrust against thrust bearing 39, throw down lever arm 30, and open the switch 37, thus stopping the motor.

There may be many variations of this work out. The essential thing is a jack screw which is, under ordinary conditions of load, caused to rise by the revolution of a nut which is driven by suitable power connections. This nut is held from axial movement under normal load conditions, but when the window reaches either limit of its movement the nut can overcome the resistance to travel and travel a slight distance thereby throwing a limit switch.

The unit, including the motor M and the operating connections, is secured to the inner panel cover plate 40 by screws 41. This cover plate 40 covers the opening 42 in the inner panel.

What I claim of my invention is:

1. A window regulator having in combination a jack screw which can be secured to the lower end of a window panel, a rotatable nut for driving the screw up and down, said nut held from up and

down movement, electrical means for driving the screw in rotation, a gear in the hub of which said nut is slidably supported, means for yieldingly holding the nut from slidable movement axially thereof under normal load conditions, and limit switches which open when the nut is caused to travel when the window panel reaches the limit of its movement and the load increases.

2. A window regulator having in combination a jack screw which can be secured to the lower end of a window panel, a rotatable nut for driving the screw up and down, said nut held from up and down movement, electrical means for driving the screw in rotation, a gear in the hub of which said nut is slidably supported, means for yieldingly holding the nut from slidable movement axially thereof under normal load conditions, limit switches which open when the nut is caused to

travel when the window panel reaches the limit of its movement and the load increases, said means for effectively holding the nut comprising a pair of spring-stressed arms bearing against the ends of the nut each of which is connected with the limit switches.

3. A window regulator having in combination a jack-screw which can be secured to the lower end of a window panel, a rotatable nut for driving the screw up and down, means for supporting the nut for axial movement, means for yieldingly holding the nut from axial movement under normal load conditions and limit switches which open when the nut is caused to travel when the window panel reaches the limit of its movement and the load increases.

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