Jan. 17, 1956 B. G. FREEMAN 2,731,260

DOOR OPERATING MECHANISM

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FIG. 1.

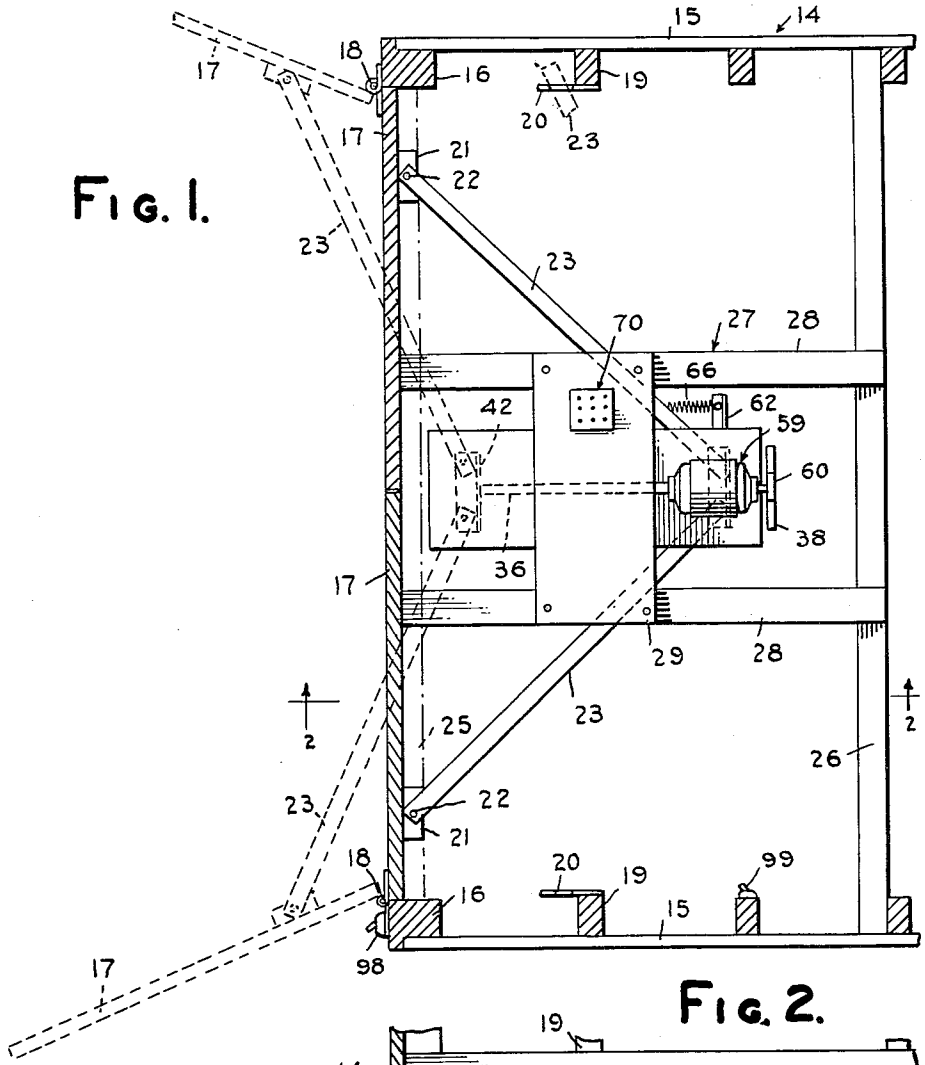


FIG. 2.

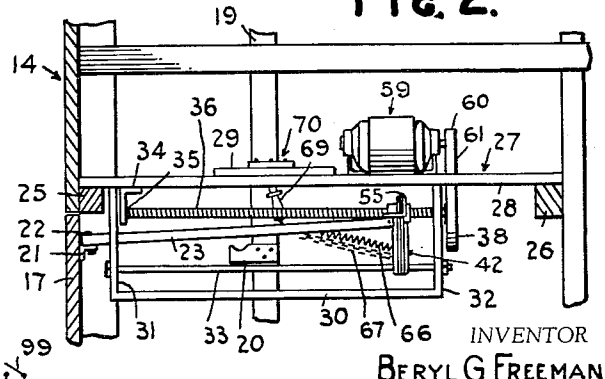
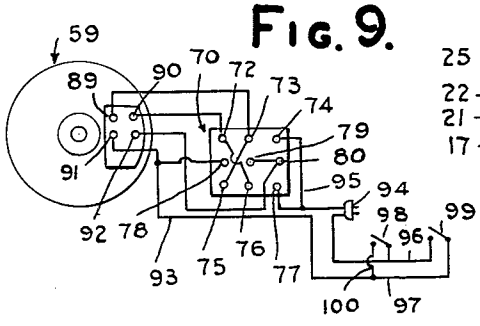


FIG. 9.



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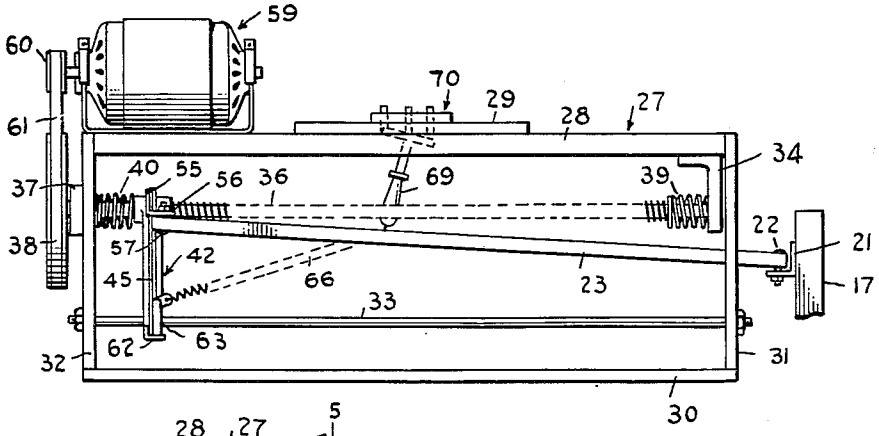
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FIG. 3.



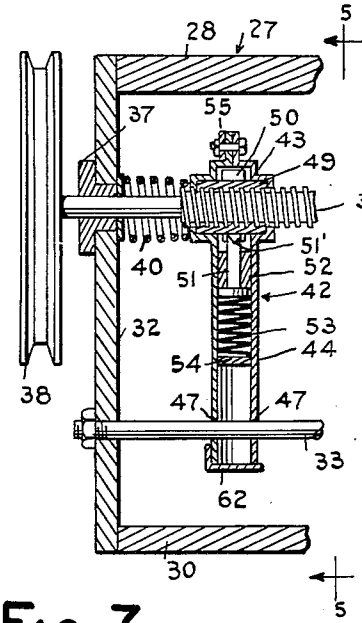


FIG. 4.

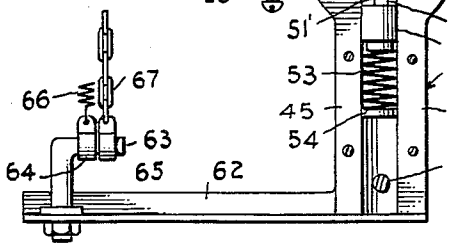


FIG. 5.

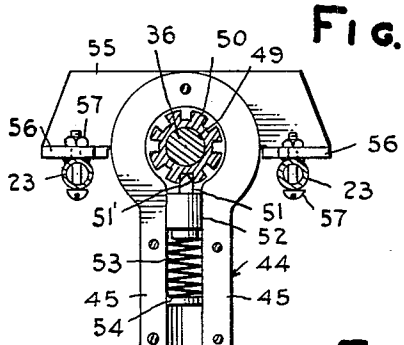


FIG. 6.

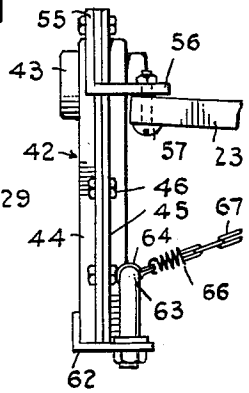


FIG. 7.

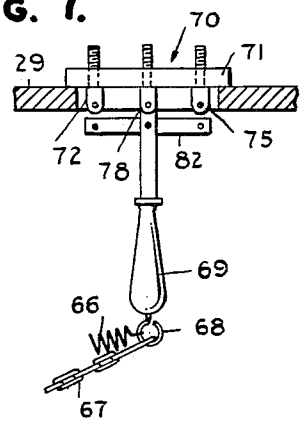
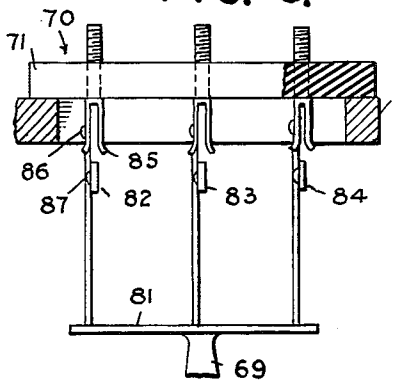


FIG. 8.



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DOOR OPERATING MECHANISM

Beryl G. Freeman, Kilgore, Tex.

Application September 23, 1952, Serial No. 311,065

1 Claim. (Cl. 268—63)

This invention relates to door operating mechanism, and more particularly to improved electrically driven door operating mechanism, the primary object of the invention being to provide a simpler, more reliable, and more efficient mechanism of this kind by means of which swinging doors can be both opened and closed and are held securely in open and closed position.

Other important objects and advantageous features of the invention will be apparent from the following description and the accompanying drawings wherein, merely for purposes of illustration, a specific form of the invention is set forth in detail.

In the drawings:

Figure 1 is a fragmentary horizontal section showing in top plan a mechanism in accordance with the present invention associated with a garage having two swinging doors, the doors being shown in closed position in full lines and in open position in dotted lines;

Figure 2 is a fragmentary vertical longitudinal section taken on the line 2—2 of Figure 1;

Figure 3 is an enlarged side elevation of the mechanism per se;

Figure 4 is a further enlarged fragmentary vertical longitudinal sectional detail of the traveler or nut assembly and associated parts;

Figure 5 is a transverse vertical section taken on the lines 5—5 of Figure 4;

Figure 6 is a side elevation of Figure 5;

Figure 7 is a side elevation of the reversing switch;

Figure 8 is an enlarged end elevation of said switch; and

Figure 9 is a wiring diagram showing the switch including the reversing switch, and the starter switches.

Referring in detail to the drawings, wherein like numerals designate like parts throughout the several views, the numeral 14 generally designates a building, such as a home garage having opposite sidewalls 15, 15 including door posts 16, 16 on which paired swinging doors 17, 17 are hinged, as indicated at 18. The sidewalls 15, 15 also have joists 19, 19 spaced rearwardly or longitudinally inwardly from the door posts 16, which have forwardly or longitudinally outwardly projecting rests or hooks 20, 20 for a purpose hereinafter explained.

Fixed on the rearward or inner sides of the doors 17, and spaced at suitable distances from the axes of the hinges 18, are brackets 21, 21 having upwardly projecting pivot bolts 22, 22 on which are removably connected the forward or outer ends of operating arms 23, 23 which are preferably in the form of rigid pipes, which decline somewhat in a direction toward the doors 17, 17, and converge in a direction away from the doors 17, 17. When it is not desired to operate the doors 17 by means of the mechanism as hereinafter described, the forward ends of the arms 23, 23 can be removed from the brackets 21, 21 by loosening the bolts 22, 22 and resting the forward ends of the arms 23, 23 on the rests or hooks 20, 20, as indicated in dotted lines in Figure 1.

Forward and rearward cross members 25 and 26, respectively, extend horizontally across the interior of the garage 14 and are secured to the sidewalls 15, 15 on a level above the tops of the doors 23, 23. A horizontal frame 27 has longitudinal laterally spaced members 28, 28 extending between and resting upon and preferably secured to the cross members 25 and 26, and a platform 29 extends between and is secured to the members 28, 28 at a point intermediate their ends. A longitudinal U-shaped sub-frame 30 depends from the main frame 27 and has forward and rearward vertical end members 31 and 32, respectively, between which extends a guide rod 33. A bracket 34 depends from the main frame 27 just rearwardly of the forward vertical end member 31, in which is journalled the reduced forward end 35 of a threaded shaft or screw 36, whose other or rearward end is journalled in a bearing 37 extending through the rear vertical end member 32, as shown in Figure 4, and has a belt pulley 38 fixed thereon. Spacedly circumposed on the screw 36 at each end thereof and secured to the facing side of the vertical end members 31 and 32 are helical springs 39 and 40, respectively, the springs being secured to the vertical end members.

A traveler or nut assembly, generally designated 42, comprises a vertically elongated hollow housing involving a cylindrical head 43 circumposed on the screw 36 and a vertically elongated cylindrical guide portion 44, composed of sections secured separably together by means of flanges 45 and bolts 46 traversing the flanges. The guide portion 44 is formed in its sidewalls with openings 47, 47 preferably loosely receiving the guide rod 33 whereby the traveler or nut assembly is prevented from rotating with or around the screw 36. The springs 39 and 40 serve as cushion bumpers to be engaged by the head 43 whereby the travel of the assembly 42 is halted without shock at the end of its travels in opposite directions.

Secured within the head 43 is a tubular nut 49 threaded on the screw 36 and having thereon a ring of squared fixed ratchet teeth 50 exposed in the upper end of the guide portion 44. A ratchet pin or dog 51 is slidably disposed in a vertical guide tube 52 secured in the upper part of the guide portion 44, and a helical spring 53 is compressed between the lower end of the pin 51 and an abutment 54 whereby the ratchet dog or pin 51 is yieldably urged in an upward direction. The upper end of the dog 51 is bevelled on two opposite sides, as indicated at 51' in Figure 5, so that the nut ratchet teeth 50 can ratchet past the dog 51 in either direction of rotation, when the traveler or nut assembly 42 reaches the end of its travel in either direction and is stopped thereat by engagement with the related one of the bumper springs 39, 40.

On the traveler assembly head 43 is fixed an L-shaped transversely extending bracket 55 which has horizontal flange portions 56, 56 at opposite sides of the head 43 having depending pivot bolts 57, 57 on which are pivoted and secured the inner or rearward ends of the arms 23.

An electric motor 59 having a pulley 60 in vertical alignment with the screw shaft pulley 38 is mounted upon the main frame 27, and a belt 61 is trained around the pulleys.

Fixed on and extending horizontally from one side of the lower end of the guide portion 44 of the traveler assembly 42 is a rigid arm 62 having an upstanding inverted L-shaped bracket on its outer end, having the horizontal member 63. Two connector sleeves 64 and 65, respectively, are journalled on the horizontal member 63. To the sleeve 64 is secured one end of an elastic member, such as a stretchable helical spring 66, and to the other sleeve 65 one end of a flexible non-stretchable member, such as a chain 67, is connected, the chain 67 being longer than the spring 66. The other ends of the spring 66, and chain 67 are connected, as by a ring 68, to the lower

end of a depending switch handle 69 of a reversing switch 70.

The reversing switch 70 is of a double-throw, triple-pole type and comprises an insulated base 71 mounted upon the platform at the same side of the mechanism as the traveler assembly arm 62, so that the spring 66 and chain 67 extend preferably parallel to the axis of the screw 36. Vertically traversing the base 71 there are binding post screws 72, 73 and 74 arranged along one side of the base 71, binding post screws 75, 76 and 77 arranged along the other side of the base 71, and binding post screws 78, 79 and 80 arranged along the middle of the base 71. The switch handle 69 is fixed to the cross member 81 of the switch blade assembly which comprises the three switch blades 82, 83 and 84 which are pivoted on the middle binding posts 78, 79 and 80, respectively, and are swingable to engage or to disengage from either the binding posts 72, 73 and 74 or the binding posts 78, 79 and 80. The outer rows of binding post screws have contacts for engagement by the switch blades which are in the form of spring forks or clevices involving fingers 85, 85 tensioned toward each other, both the contacts and the switch blades having mating depressions and projections 86 and 87, respectively, which engage to provide for considerable resistance to withdrawal of the switch blades from the contacts.

As shown in Figure 9 of the drawings, a terminal 89 of the reversible electric motor 59 is connected to the switch binding post 73 and to the binding post 75 thereof. The motor terminal 90 is connected to the binding posts 72 and 76. The motor terminal 91 is connected to the switch binding post 78 and also to a line 93 leading to one side of a connecter plug 94 adapted to be plugged into a power outlet socket (not shown). The motor terminal 92 is connected to the switch binding post 80 and to the binding post 79. The other side of the circuit is completed by a line 95 leading from the binding post 74 to the remaining side of the plug 90 and to the binding post 77. The line 93 has a loop including the two sides 96 and 97. Starting switches 98 and 99 are connected between the sides 96 and 97, the switch 98 having a shunt 100 connected across the sides 96 and 97. The switch 98 is preferably arranged on the outside of the garage 14 and the switch 99 in the inside of the garage 14.

In operation, one of the switches 98, 99 having been closed, the motor 59 starts and rotates the screw 36 so as to move the traveler assembly 42 in a corresponding direction, thereby either opening or closing the doors 17, 17. As the traveler assembly moves toward one end of the sub-frame 30 the spring 66 begins to be stretched and tensioned and further movement of the traveler assembly in the same direction tightens the chain 67 and the pull of the chain 67 dislodges the projections 87 on the switch blades 82, 83 and 84 from the depressions 86 in the related switch contacts. The projections and depressions being disengaged, the stretched spring 66 immediately acts to pull the switch blade assembly over to the reverse position.

The momentum of the traveler assembly 42 carries it along the screw 36 beyond the switch over point, and, since the motor 59 will not reverse until completely stopped, the assembly 42 engages the related one of the bumper springs 39, 40 and is thereby brought quietly to a stop, the doors 17, 17 then being in and being retained in either closed or open position. When the traveler assembly housing 44 is stopped by one of the bumper springs 39, 40, the ratchet nut 50, prevented from further endwise travel by the housing 44, overcomes the tension of ratchet spring 53, whereby the ratchet dog is displaced and the nut 50 thereby freed to rotate with the shaft 36 until the motor 59 is stopped by opening one of the starting switches 98, 99. If then the proper one of the starting switches 98, 99 be closed, the motor 59 will start and operate in a reverse direction. While this is taking place the tension of spring 53 holds ratchet dog 51 in stop engagement with the nut 50 and prevents the nut 50 from turning in the housing 44, so that the traveler assembly is caused to travel in the opposite direction.

What is claimed is:

In mechanism for opening and closing a door, a fixed support, a screw shaft mounted for axial rotation on the support, a traveler assembly mounted on the screw shaft, said assembly comprising a housing including a lateral guide portion, a nut rotatably confined in said housing and threaded on the screw shaft, an operating arm connected at one end to said housing and having another end connectible to a door to be opened and closed, said nut having circumferential teeth, a spring pressed two-way ratchet dog on said housing guide portion engaging the ratchet teeth and yieldably holding said nut against rotation relative to said housing, and a guide rod fixed on said support and engaging said housing guide portion, bumper springs on said support at the opposite ends of said screw shaft, said bumper springs being arranged to be engaged by said housing as said housing arrives at opposite ends of the screw shaft and gradually compressed whereby further travel of the housing along the screw shaft in the same direction is gradually arrested until the ratchet dog is released from teeth on the nut whereby the nut is temporarily free to rotate relative to the housing.

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