March 26, 1940. R. W. FOSTER 2,194,650

DOOR OPERATING MECHANISM

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Fig. 1.

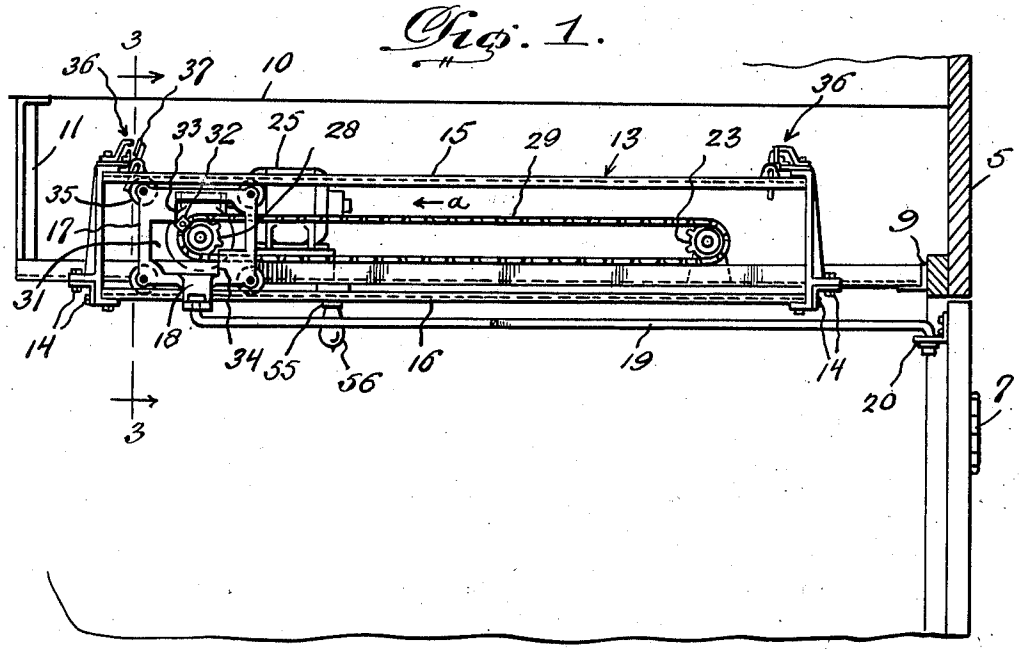


Fig. 2.

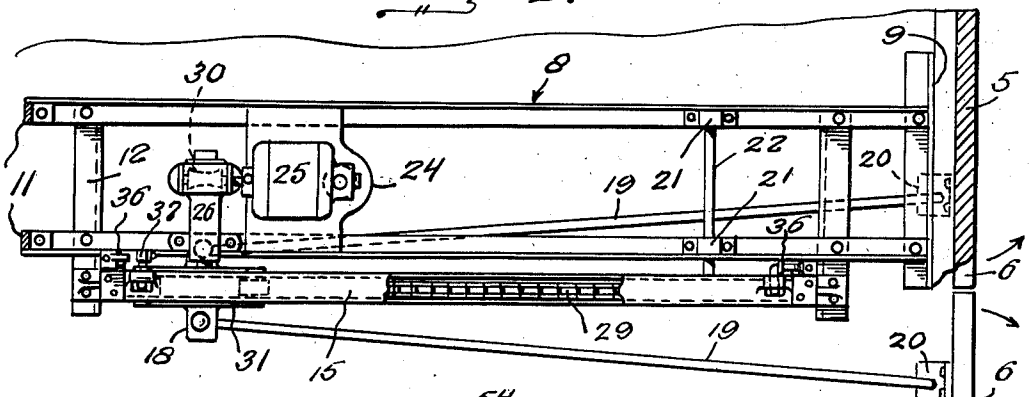
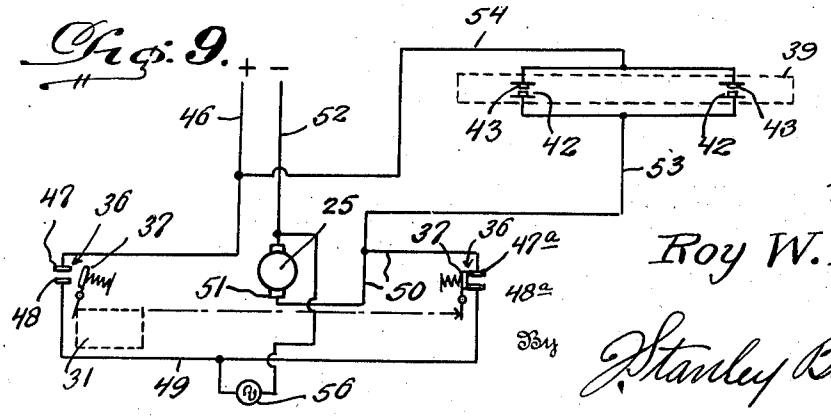


Fig. 9.



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DOOR OPERATING MECHANISM

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Fig. 3.

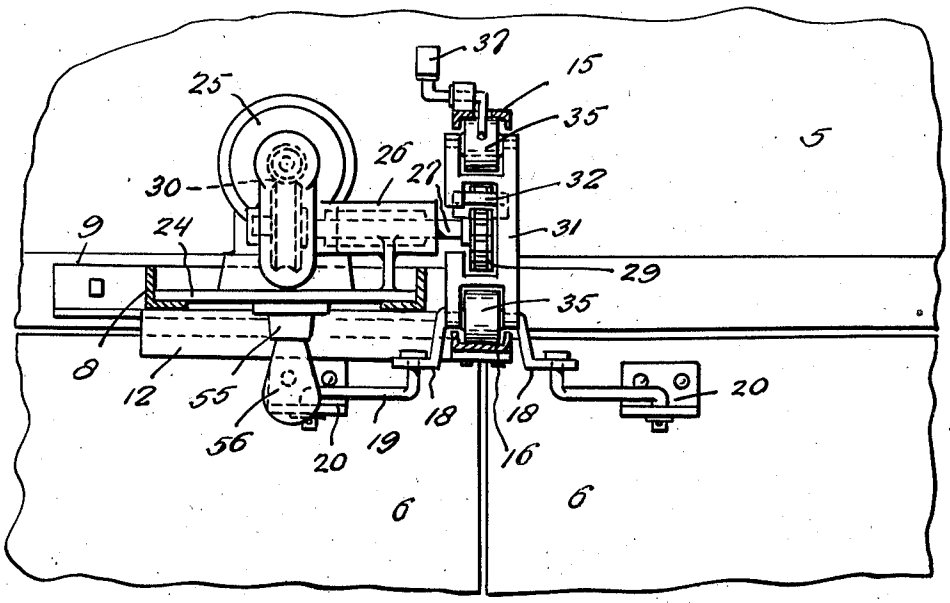


Fig. 4.

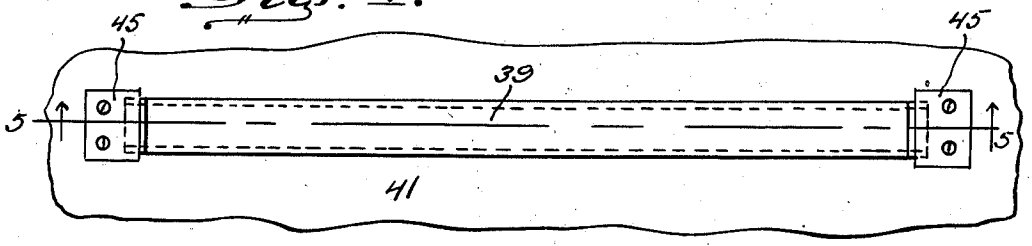


Fig. 5.

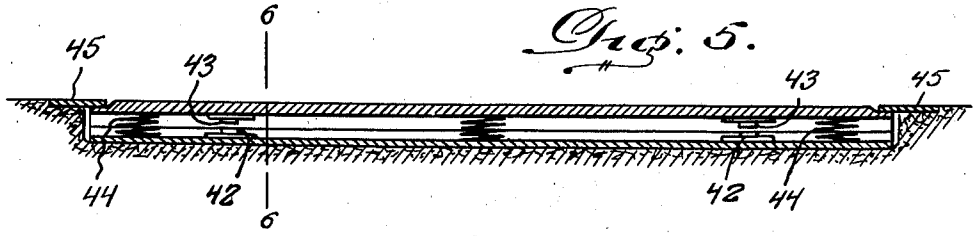
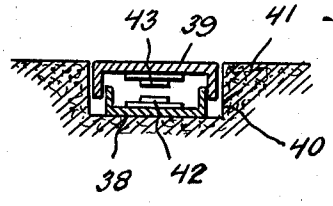


Fig. 6.



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DOOR OPERATING MECHANISM

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Fig. 7.

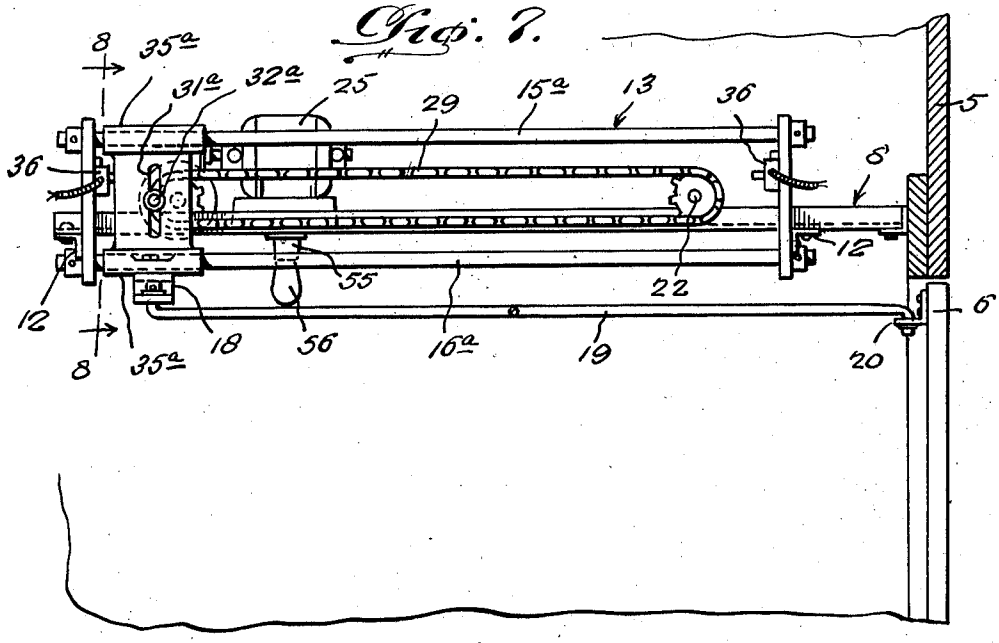
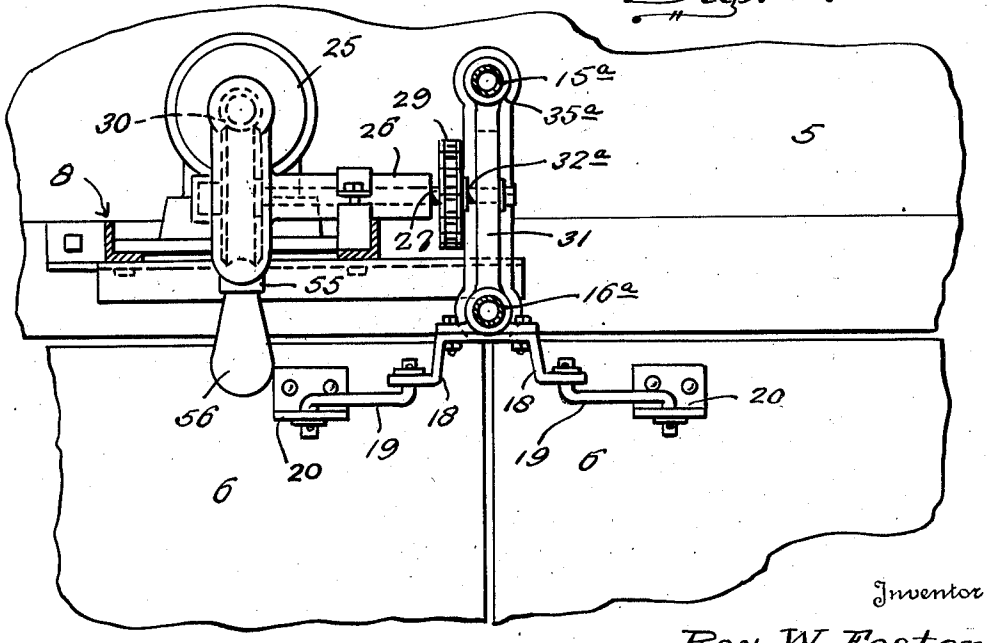


Fig. 8.



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Patented Mar. 26, 1940

2,194,650

UNITED STATES PATENT OFFICE

2,194,650

DOOR OPERATING MECHANISM

Roy W. Foster, Red Bank, Tenn.

Application June 6, 1938, Serial No. 212,103

3 Claims. (Cl. 268—33)

This invention relates to improvements in mechanisms for opening and closing garage and like doors.

More particularly, the present invention relates to an improvement in that type of door operating mechanism embodying a reciprocating carriage connected by links with the doors to be operated, and operatively connected with an endless sprocket chain driven by an electrical uni-directional motor.

The primary object of the present invention is to provide a door operating mechanism of the above type which is extremely simple and durable in construction, efficient in operation, and not likely to readily get out of working order.

The present invention also contemplates the provision of an electric lamp for illuminating the interior of the garage or other building equipped with the doors to be operated, the arrangement being such as to automatically turn the light on when the doors are opened and to automatically turn the light off when the doors are closed. In addition, it is contemplated to place the door operating mechanism under control of a treadle-operated switch located some distance from and in front of the doors to be operated and adapted to be either manually actuated or depressed by a passing automobile for placing the mechanism into operation, so as to cause closing of the doors upon departure of the automobile or person or opening of the doors upon approach of the person or automobile toward the garage.

The present invention consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and claimed.

In the drawings:

Figure 1 is a fragmentary vertical sectional view of a garage having doors equipped with an operating mechanism constructed in accordance with the present invention, said mechanism being in side elevation.

Figure 2 is a top plan view of the construction shown in Figure 1, partly broken away.

Figure 3 is an enlarged transverse section on line 3—3 of Figure 1.

Figure 4 is a plan view of the treadle-operated switch preferably employed for controlling the mechanism of Figure 1.

Figure 5 is a longitudinal vertical section on line 5—5 of Figure 4.

Figure 6 is an enlarged transverse section on line 6—6 of Figure 5.

Figure 7 is a view somewhat similar to Figure 1 illustrating a modified form of the door operating mechanism.

Figure 8 is an enlarged transverse vertical section on line 8—8 of Figure 7; and

Figure 9 is a diagram of the wiring employed in complete installation of the door operating mechanism of Figures 1 and 7.

Referring in detail to the drawings, 5 indicates the walls of a garage or other building, 6 indicates a pair of doors for an opening in one of the walls 5 hinged as at 7 for horizontal swinging movement.

The present door operating mechanism includes an open rectangular frame 8 horizontally arranged in an elevated position within the garage or like building, one end of said frame being rigidly attached at 9 to a wall 5 above the doors 6, and the other or inner end of frame 8 being suspended from an overhead support 10 by means of suitable hangers or brackets 11. The frame 8 includes cross bars 12 that project laterally beyond one side of the frame 8 and have the ends of a vertically arranged horizontally elongated guide frame 13 bolted thereto as at 14. The guide frame 13 affords upper and lower guide rails 15 and 16, and movable in this guide frame upon the rails 15 and 16 is a reciprocating carriage 17. Rigid with and projecting laterally and downwardly from opposite sides of the lower portion of carriage 17 are arms 18, and pivotally connected at one end to each arm 18 is a link 19. The other ends of links 19 are pivotally connected at 20 to the respective ones of the doors 6 at the top of the latter and near their adjacent free edges. It will be noted that the links 19 extend in forwardly diverging relation so that when the carriage 17 is moved forwardly, the doors 6 will be swung to open position, and when the carriage 17 is moved rearwardly, said doors will be swung to closed position.

Journaled in bearings 21 transversely of and upon the supporting frame 8 is a shaft 22 that projects at one end within the guide frame 13 adjacent the forward end of the latter, and upon this projecting end of shaft 22 is secured a sprocket wheel 23. A platform 24 is rigidly carried by the supporting frame 8 near its inner end, and secured upon this platform is a small uni-directional electric motor 25. At this end of frame 8, the latter carries a bearing 26 in which is journaled a transverse shaft 27 having an end projecting within the inner end portion of guide frame 13 and carrying a sprocket wheel 28. An endless sprocket chain 29 passes around the sprocket wheels 23 and 28, and the armature shaft

of motor 25 is operatively connected with transverse shaft 27 by means of a worm gearing indicated at 30. The carriage 17 is provided with an opening 31 into which projects a lug 32 carried by and movable with the sprocket chain 29, the arrangement being such that when the sprocket chain 29 is driven in one direction, the lug 32 will cause reciprocation of the carriage 17.

In the embodiment of Figures 1 to 3 inclusive, the opening 31 is relatively large and of a form to provide an internal shoulder 33 at the upper inner portion of the carriage and an internal shoulder 34 at the lower forward portion of the carriage. Thus, the carriage has moved to its extreme inward limit of movement in Figure 1 and upon further travel of chain 29 in the direction of the arrow indicated at *a*, the lug 32 will pass from the shoulder 33 and ultimately engage shoulder 34 so as to cause forward movement of carriage 17. Such forward movement of carriage 17 will of course cause opening of doors 6 through the medium of links 19. When the carriage 17 has reached its extreme forward limit of movement, the lug 32 will pass around the sprocket 23 from the shoulder 34 and then into engagement with shoulder 33, thereby returning the carriage 17 to its limit of movement as shown in Figure 1. This inward movement of carriage 17 in the guide frame 13 will of course cause closing of doors 6 through the medium of the links 19. Also, in this embodiment or form of the invention, the guide rails 15 and 16 are preferably of channel form with their flanges facing toward each other, and the carriage 17 is provided at the top and bottom with rollers 35 engaged in the guide ways formed by the guide rails 15 and 16.

In the embodiment of Figures 7 and 8, however, the carriage is in the form of a plate provided at the top and bottom with guide sleeves 35*a*, and the guide frame has its upper and lower guide rails in the form of rods 15*a* and 16*a* slidably embraced by the sleeves 35*a*. Also, the carriage in this instance has a transverse elongated slot 31*a* of uniform width from end to end, and the lateral lug 32*a* of sprocket chain 29 slidably engages in this slot 31*a*. Otherwise, the construction of both embodiments of the invention is substantially the same, and remaining parts of both embodiments which are similar are indicated by like reference characters.

Carried by each end of the guide frame 13 in the path of movement of carriage 17 is a normally closed switch 36 operable for automatically breaking the circuit of the motor 25 when the carriage 17 reaches either limit of its movement. While these switches may be of any well known or preferred type or construction, they have been shown in Figure 1 as including pivoted contacts 37 engageable by the carriage 17 for being moved to circuit-opening position. In the embodiment of Figure 7, the switches are merely shown as of a type similar to ordinary push button switches.

In using the present mechanism, a switch [illegible] for initially closing the circuit of [illegible] manually or by passage of an [illegible] Moreover. For this purpose, I prefer [illegible] treadle switch of the construction shown in Figures 4 to 6 inclusive. This switch includes telescopic channels 38 and 39 arranged within a depression or recess 40 provided in the driveway 41 leading to the garage equipped with the doors 6, the channels being provided with opposed electrical contacts 42 and 43 normally separated by elevation of the upper treadle or channel 39 through the medium of helical compression springs 44 interposed between the channels 38 and 39. Suitable means is provided for limiting the upward movement of channel 39 by the springs 44 to a position wherein said channel 39 projects slightly above the surface of the driveway 41, such as cap plates 45 suitably anchored and embedded in the driveway so as to overlie the ends of channel 39 as shown in Figures 4 and 5. In wiring the mechanism, a feed wire 46 extending from a suitable source of current is connected to one contact 47 of switch 36 at the inner end of guide frame 13, as shown in Figure 9. Another fixed contact 48 of this switch 36 is connected by wire 49 to a corresponding contact 48*a* of the switch 36 at the other or forward end of guide frame 13. The remaining fixed contact 47*a* of the switch 36 at the forward end of guide frame 13 is connected by wire 50 with the feed terminal 51 of motor 25, the return wire 52 being connected to the remaining terminal of motor 25. It will be understood that the contacts 47 and 48 of the rear or inner switch 36 are normally bridged by the movable contact 37 of the latter, and likewise with respect to the contacts 47*a* and 48*a* of the switch 36 at the outer or forward end of the frame 13. Also, the contacts 42 carried by the lower channel 38 of the treadle switch shown in Figures 4 to 6 inclusive are connected by wire 53 with the feed side of motor 25 between the latter and the forward switch 36, and contacts 43 of the upper channel or treadle 39 are connected by wire 54 with the feed wire 46 ahead of the rear switch 36. Thus, when the treadle or upper channel 39 is depressed so as to cause engagement of contacts 43 with contacts 42, current will be supplied to motor 25 by way of wires 54, 53 and 50. Assuming that the carriage 17 is at its inner limit of movement as shown in Figures 1 and 9, the rear switch 36 will be open until said carriage moves forwardly a sufficient distance to allow contact 37 to bridge contacts 47 and 48. When this occurs, the motor 25 continues to operate even though the treadle or channel 39 is released to disengage contacts 43 from contacts 42, the circuit being traced from feed wire 46 to wire 49, wire 50, motor 25 and return wire 52. Thus, the carriage 17 will continue moving forwardly until the doors are opened and the carriage 17 moves contact 37 of the forward switch 36 to break the motor circuit. The doors will then thus remain in open position until the treadle 39 is depressed again to start the motor 25. As soon as the carriage permits the movable contact 37 of the forward switch 36 to bridge the contacts 47 and 48*a*, the motor circuit will be completed even though the treadle 39 is released, and the carriage 17 will continue rearward movement until the doors are closed and the carriage 17 moves contact 37 of the rear switch 36 to circuit-opening position. When the latter occurs, the motor is again thrown out of operation and the doors remain closed. It has been previously explained how the lug 32 operatively engages the carriage 17 for reciprocating the same in this manner when the sprocket chain 29 is driven by the motor 25 through the gearing 30. As the worm gearing 30 is of a self-locking type, the doors may not be forced open or closed by application of power thereto.

Carried by the motor platform 24 is a lamp socket 55 carrying a lamp 56 and having one terminal connected to the wire 49, the other terminal of socket 56 being connected to the return

wire 52 as shown clearly in Figure 9. It will thus be seen that when the carriage 17 is moved forwardly to open the doors, the lamp 56 will be lighted and will remain lighted as long as the doors are open. On the contrary, when the carriage 17 moves inwardly to close the doors, the circuit of lamp 56 will be opened and the lamp will be turned out as soon as the contact 37 of the rear switch 36 is moved to circuit-opening position by carriage 17. Thus, the lamp 56 will remain unlighted when the doors are closed and the treadle 39 is released.

From the above description, it will be seen that the motor circuit is controlled by a switch operated manually or by the automobile, the carriage being automatically moved by the motor to open or close the doors, and the motor circuit is automatically broken whenever the doors are in full closed or open position.

What I claim as new is:

1. A device for opening and closing a door, comprising in combination with a hinged door, a horizontal open rectangular supporting frame, a vertical open rectangular guide frame fixed to said supporting frame along one side of the latter and including upper and lower guide rails, a carriage reciprocable along said guide frame and slidably engaging said rails of the latter, an electric circuit including a non-reversible motor mounted on one end of said supporting frame, a pair of shafts journaled transversely of said supporting frame and projecting into said guide frame, sprocket wheels secured on said transverse shafts, an endless sprocket chain on said sprocket wheels, means operatively connecting one of said transverse shafts with said motor, said carriage having an opening therethrough, a lug attached to said sprocket chain and projecting laterally into the opening of the carriage for reciprocating the latter when the sprocket chain is driven in one direction, a lateral arm rigid with and depending from the bottom of said carriage, a link pivotally connected at one end to said arm and at its other end to the hinged door, and means for automatically breaking the motor circuit when the carriage approaches either end of the guide frame.

2. A device for opening and closing a door, comprising in combination with a hinged door, an open rectangular supporting frame mounted in a horizontal position and including cross bars projecting laterally beyond one side of said supporting frame, a vertical open rectangular guide frame arranged along one side of said supporting frame and rigidly mounted upon the projecting portions of said cross bars, transverse shafts journaled upon said supporting frame and projecting into the guide frame, sprocket wheels on said transverse shafts, an endless sprocket chain on said sprocket wheels, a non-reversible motor mounted upon said supporting frame and operatively connected to one of said transverse shafts, a vertical carriage movable along said guide frame and operatively connected with the sprocket chain to travel therewith, a lateral arm depending from the lower portion of said carriage, a link pivotally connected at one end to said arm and at its other end to the hinged door, means for automatically breaking the circuit of said motor when the carriage approaches its limit of movement in either direction, said guide frame including upper and lower guide bars, and said carriage comprising a plate provided with a vertical elongated slot and having top and bottom guide sleeves slidably embracing said guide rods, the operative connection between the sprocket chain and said carriage including a lateral lug attached to said sprocket chain and projecting into said elongated opening of the carriage.

3. A device for opening and closing a door, comprising in combination with a hinged door, an open rectangular supporting frame mounted in a horizontal position and including cross bars projecting laterally beyond one side of said supporting frame, a vertical open rectangular guide frame arranged along one side of said supporting frame and rigidly mounted upon the projecting portions of said cross bars, transverse shafts journaled upon said supporting frame and projecting into the guide frame, sprocket wheels on said transverse shafts, an endless sprocket chain on said sprocket wheels, a non-reversible motor mounted upon said supporting frame and operatively connected to one of said transverse shafts, a vertical carriage movable along said guide frame and operatively connected with the sprocket chain to travel therewith, a lateral arm depending from the lower portion of said carriage, a link pivotally connected at one end to said arm and at its other end to the hinged door, means for automatically breaking the circuit of said motor when the carriage approaches its limit of movement in either direction, said guide frame including upper and lower guide channels, wheels on said carriage running in said guide channels, said carriage having an opening therethrough providing shoulders internally of the carriage at the rear upper and forward lower portions thereof, and a lateral lug carried by the sprocket chain alternately engageable with said shoulders for causing movement of the carriage in opposite directions.

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