Aug. 24, 1954 R. E. MAPLE 2,687,298

DOOR OPERATING MECHANISM

Filed Jan. 21, 1953 2 Sheets-Sheet 1

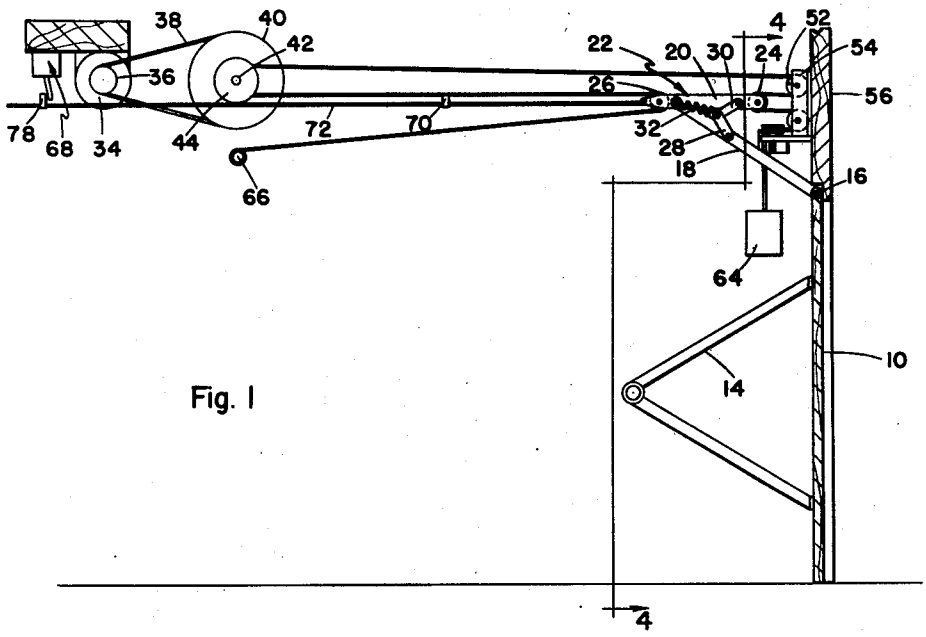


Fig. 1

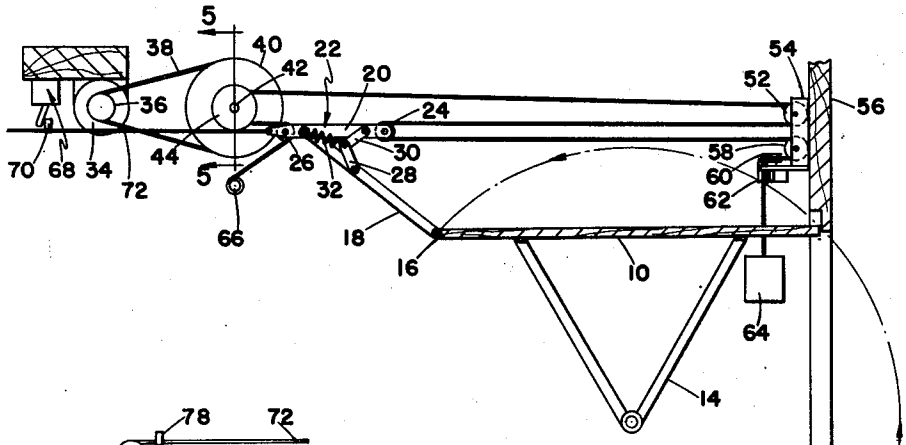


Fig. 2

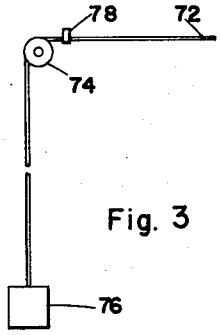


Fig. 3

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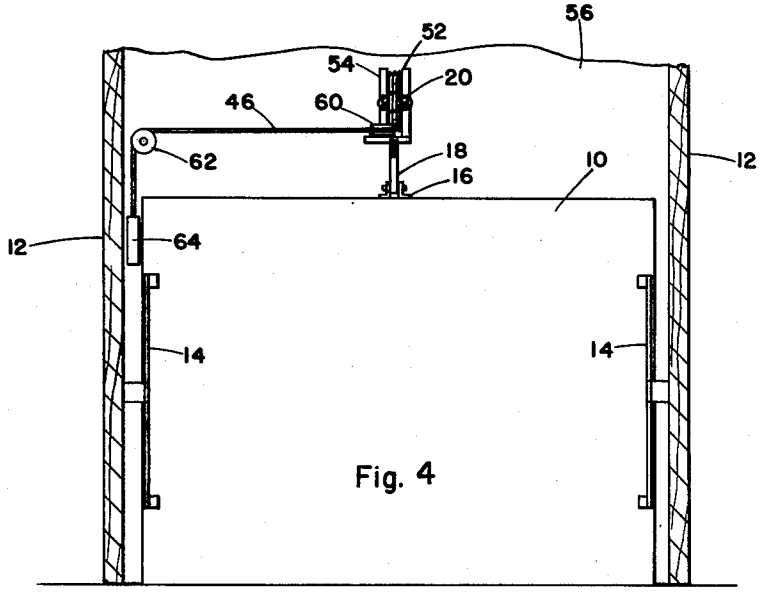


Fig. 4

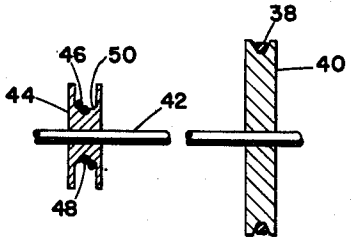


Fig. 5

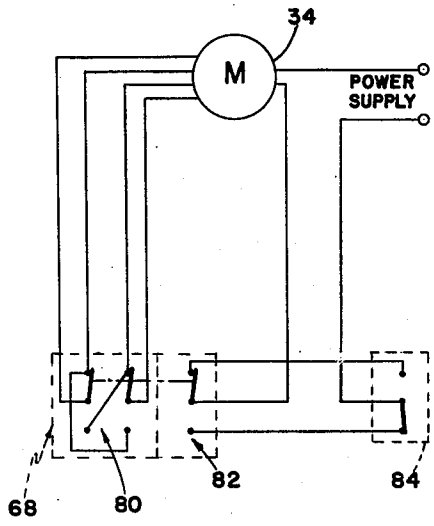


Fig. 6

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Patented Aug. 24, 1954

2,687,298

UNITED STATES PATENT OFFICE

2,687,298

DOOR OPERATING MECHANISM

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Application January 21, 1953, Serial No. 332,175

7 Claims. (Cl. 268—74)

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The present invention relates generally to a door operating mechanism and more particularly to an automatic operating mechanism suitable for garage doors or the like.

The primary object of this invention is to provide a door operating mechanism which will raise or lower the door when initiated from a remote control position.

Another object of this invention is to provide a door operating mechanism which will automatically stop at the fully open and fully closed positions.

Another object of this invention is to provide a door operating mechanism which will automatically be set for the return motion after being opened or closed.

Another object of this invention, ancillary to the preceding objects, is to teach the best known mode of implementing the principles of the invention in carrying the invention into actual practice.

Another object of this invention is to provide a door operating mechanism which is adapted for fabrication from many different materials, so that the choice of material can be according to the dictates of availability and price considerations, the exact sizes and proportions being matters easily determined to suit particular conditions and needs.

Another object of this invention is to provide a door operating mechanism which is inexpensive and practicable to manufacture.

Finally, it is an object to provide a door operating mechanism of the aforementioned character which is simple, safe and convenient to operate, and which will give generally efficient and durable service.

With these and other objects definitely in view, this invention consists in the novel construction, combination and arrangement of elements and portions, as will be hereinafter fully described in the specification, particularly pointed out in the claims, and illustrated in the drawings which form a material part of this disclosure and wherein similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawings, and in which:

Fig. 1 is a longitudinal sectional view of the mechanism installed in a garage, the door being in the closed position;

Fig. 2 is a longitudinal sectional view of the mechanism with the door in the open position;

Fig. 3 is a fragmentary view of the tensioning device for the switch operating cable and constitutes a continuation of Fig. 2;

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Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is a wiring diagram of the control mechanism.

Referring now to the drawing in detail, the mechanism is applied to a door 10 which is pivotally mounted at each side of the garage walls 12 by means of support frames 14. To the upper edge of the door 10 is fitted a bracket 16 in which is pivotally secured one end of the actuating arm 18, the other end being pivotally secured between two side plates 20. The side plates 20 comprise the side members of a pulley block 22, which includes two pulleys 24 and 26, the pulley 24 being rotatably mounted between said side plates at one end, and the pulley 26 being similarly mounted at the other end of said pulley block.

The actuating arm 18 is provided with a link 28 pivotally attached thereto, the other end of said link being pivotally attached to a further link 30 which in turn is pivotally secured to the pulley block 22. A spring 32 is secured at the junction of the links 28 and 30, the other end of said spring being fastened to the pulley block 22 so that a constant tension is maintained on the elbow formed by said links, said tension serving to raise the actuating arm 18 and subsequently the edge of the door 10 as said door commences the closing motion. This will be more clearly understood by referring to Fig. 2 where the arcuate path of the upper edge of the door 10 is shown in broken line.

The mechanism is operated by an electric motor 34 conveniently secured to the garage structure at a short distance from the door. The motor 34 is provided with a pulley 36 from which a a belt 38 drives a further pulley 40 at a reduced speed. The pulley 40 is attached to a shaft 42 on which is also secured the actuating pulley 44. The actuating pulley 44 has a groove which is shaped in a certain way to receive the cable 46, said groove consisting of a substantially semicircular channel 48 having at either side a half channel 50 as illustrated in Fig. 5. In this way, the cable 46 may be passed twice around the actuating pulley 44 to obtain increased traction, and may also ride smoothly in the channels of the pulley without binding or jamming.

The cable 46 extends from the upper portion of the actuating pulley 44 and passes around the pulley 52 which is rotatably mounted in a bracket 54 secured to the front wall 56 above the door. The cable 46 next passes around the pulley 24 in the pulley block 22 and then around the pul-

ley 58 which is also rotatably mounted in the bracket 54. From the pulley 58, the cable then passes around a horizontal pulley 60 and is carried to one side of the garage to a further pulley 62. From this point the cable 46 hangs downwardly and is provided with a weight 64 to maintain tension in said cable.

The other end of the cable 46, from the lower portion of the actuating pulley 44, is passed around the pulley 26 in the pulley block 22 and is then secured to a suitable anchor element 66.

As the motor is started in one direction, it will be seen that the cable 46 will be drawn around the actuating pulley 44 causing the upper edge of the door 10 to be pulled backwardly so that said door is raised to the open position shown in Fig. 2.

As the door 10 reaches the open position, the motor is stopped by the switch unit 68, said switch unit having a downwardly projecting toggle 69, which is actuated by means of a trip tab 70. The trip tab 70 is attached to a trip cable 72 fastened at one end to the pulley block 22, the other end of said trip cable passing over a pulley 74 at the rear of the garage, and the tension in said cable being maintained by a weight 76.

As the door 10 reaches the closed position, the motor is again stopped by the switch unit 68 which is now actuated by a further trip tab 78 secured to the trip cable 72. The trip tabs 70 and 78 may be adjustable on the trip cable 72 so that the action of the switch unit 68 may be timed correctly to stop the door at the open and closed positions.

The switch unit 68 comprises a reversing switch 80 and a stop switch 82 as illustrated in Fig. 6. Also included in the electrical circuit is a starting switch 84 which is illustrated in being open in Fig. 6, that is, the reversing switch 80 and the stop switch 82 are set to operate the motor in one direction, while the circuit remains broken at the starting switch 84. As soon as the starting switch 84 is closed, the circuit from the power supply to the motor 34 will be completed allowing said motor to operate the door 10. As the door 10 reaches the end of its travel, the switch unit 68 will be actuated so that the stop switch 82 will be opened breaking the circuit and stopping the motor. At the same time, the reversing switch 80 will be tripped to reverse the field of the motor 34, although said motor cannot operate as the circuit now completed by the switch unit 68 is once more broken by the starting switch 84 which has remained unchanged.

Assuming that the door 10 is now open, the only action necessary to close the door is to close the starting switch 84. The door 10 will now be actuated once more, and on reaching the closed position will again actuate the switch unit 68 and stop the motor 34.

Thus it will be seen that the starting switch 84 is the only means of control required to operate the door, said starting switch being installed in a convenient position such as outside the garage. A duplicate starting switch may be installed inside the garage if desired, or, the switching may be accomplished by other remote means such as pressure plates in the floor, or by radio control.

It will be obvious that the use of the mechanism is by no means restricted to the operation of garage doors, but could conceivably be used to operate other types of doors or even a small elevator.

The operation of this invention will be clearly comprehended from a consideration of the foregoing description of the mechanical details thereof, taken in connection with the drawing and the above recited objects. It will be obvious that all said objects are amply achieved by this invention.

Further description would appear to be unnecessary.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the specification and drawing are to be considered as merely illustrative rather than limiting.

I claim:

1. In combination, a supporting structure, an overhead door operatively mounted thereon, a door operating mechanism comprising an actuating arm pivotally connected to the upper edge of said door, a pulley block attached to said actuating arm, cable means engaging said pulley block, and having doubled back portions operatively engaging said pulley block and extending in opposite directions corresponding generally with the movement of said upper edge of the door during the opening and closing thereof, a motor, an actuating pulley driven by said motor, said actuating pulley engaging said cable means in driving relation, a second pulley operatively engaging said cable means, said actuating arm and second pulleys being mounted on said supporting structure in opposing relation beyond the ends of travel of said pulley block, and the ends of said cable means being secured against any substantial movement in relation to said supporting structure.

2. In combination, a door mounted for opening movement in one direction, supporting structure around said door, a door operating mechanism comprising an actuating arm pivotally connected to the upper edge of said door, a pulley block attached to said actuating arm, a pulley rotatably attached to said supporting structure above said door, a cable engaging said pulley block and having a doubled back portion extending generally in said one direction and another doubled back portion extending generally in the opposite direction, said cable passing around said pulley, a motor, an actuating pulley driven by said motor, said actuating pulley frictionally engaging said cable, and means for tensioning the cable.

3. In combination, a door mounted for opening movement in one direction, supporting structure around said door, a door operating mechanism comprising an actuating arm pivotally connected to the upper edge of said door, a pulley block attached to said actuating arm, a pulley rotatably attached to said supporting structure above said door, a cable engaging said pulley block and having a doubled back portion extending generally in said one direction and another doubled back portion extending generally in the opposite direction, said cable passing around said pulley, a motor, an actuating pulley driven by said motor, said actuating pulley frictionally engaging said cable, one end of said cable being anchored adjacent said motor, the other end of said cable having thereon a weight to maintain tension in said cable.

4. In combination with a pivotally mounted

door, supporting structure around said door, a door operating mechanism comprising an actuating arm pivotally connected to the upper edge of said door, a pulley block attached to said actuating arm, pivotally connected links attached to said pulley block and said actuating arm, a spring secured to said links at their connection, said spring tending to fold said links whereby said actuating arm is biased to a horizontal position, pulleys rotatably attached to said supporting structure above said door, a cable engaging said pulley block and passing around said pulleys, a motor, an actuating pulley driven by said motor, said actuating pulley frictionally engaging said cable, and switching means for said motor.

5. A door operating mechanism according to claim 4 wherein said switching means comprises an electrical circuit having therein a switch unit, said switch unit containing a stop switch and a co-acting reversing switch, a remote starting switch, a toggle extending from said switch unit, and actuating means for said switch unit.

6. A door operating mechanism according to claim 5 wherein said actuating means includes a cable attached to said pulley block, a pulley, said cable extending below said switch unit and passing over said pulley, a weight attached to said

cable to maintain tension therein, tabs secured to said cable, said tabs being positioned to strike said toggle as said cable passes beneath said switch unit, so that said switch unit is actuated to stop said motor as said door reaches the open or closed position.

7. A door operating mechanism according to claim 5 wherein said stop switch interrupts said electrical circuit to stop said motor, and said reversing switch simultaneously reverses the flow of current in said electrical circuit as said switch unit is actuated, so that said motor will be reversed when said electrical circuit is again completed.

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