

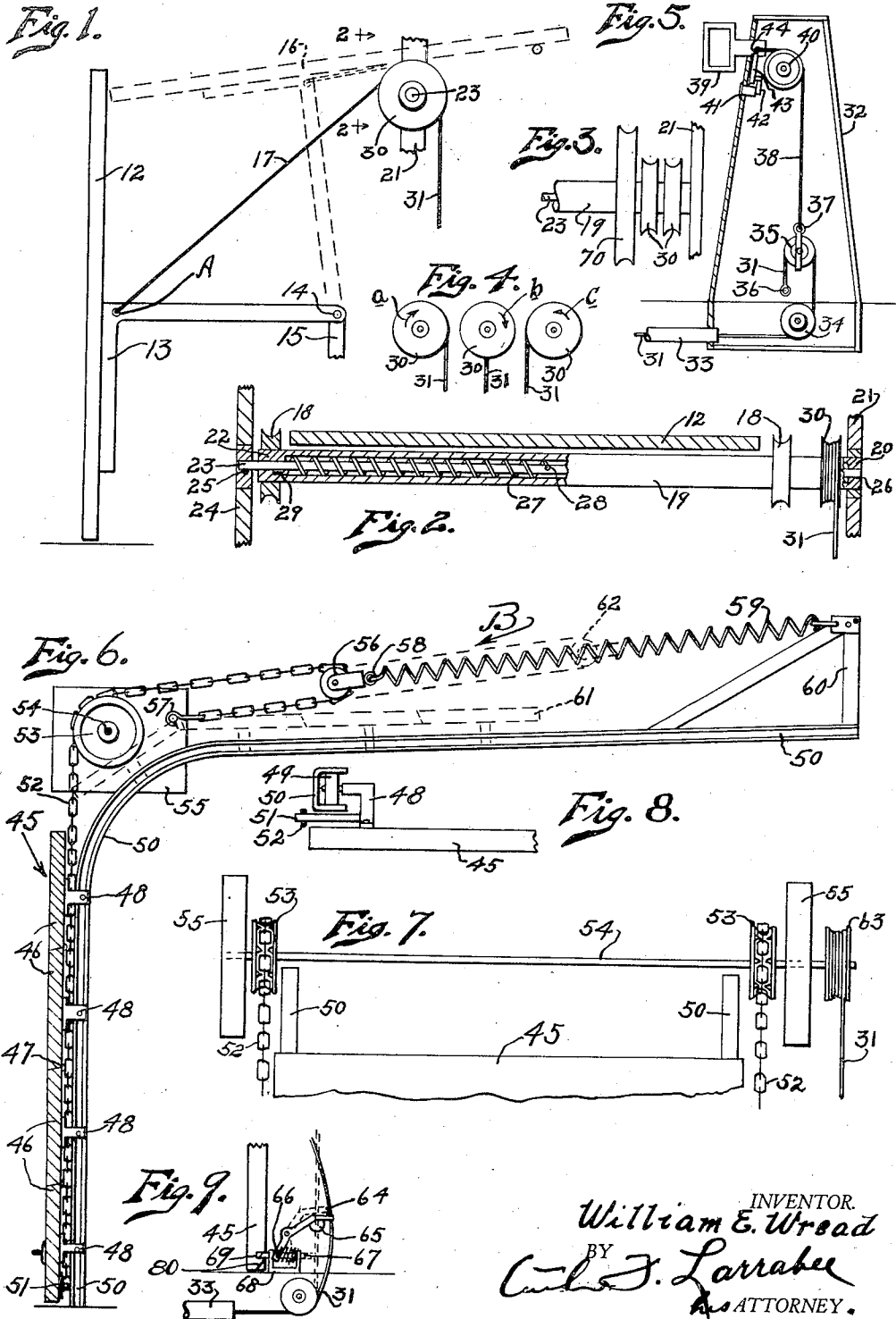
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MECHANICAL DOOR OPENER AND CLOSER FOR OVERHEAD DOORS

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MECHANICAL DOOR OPENER AND CLOSER
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This invention relates to a door opener and closer and more particularly to a door opener and closer adapted to be used in conjunction with and to operate the type of door conventionally referred to as an overhead type, regardless of whether the door is of the solid folding or accordion type door, and is particularly adapted to such types of overhead doors as are installed in automobile garages, wherein it is desired to open or close the door by the operator of an automobile while seated in the driver's seat of the automobile.

An object is to provide a novel mechanism for opening and closing a door of the overhead type from a remote point by mechanical means.

An object is to provide a novel door opener adapted to operate to an open or closed position doors of the overhead type, wherein the door may be opened by a mechanical operation from a remote point relative to the door, and to close the door by a similar mechanical operation from the same point.

An object is to provide a novel door opener and closer of the manually operable type which can be readily adapted for use with an overhead type door now in common use, whether the same be a track door having broken sections, an accordion door composed of hinged sections which fold together when raised, or the centrally pivoted door adapted to swing to an overhead position when opened, or any conventional rising door.

Another object is to provide a novel door opener and closer adapted to open or close any of the above recited doors, utilizing the balance mechanism of such doors to complete the opening or closing operation initiated by my novel door opener and closer.

Another object is to provide a door opening and closing mechanism of such character that the completion of the door opening or closing operation, positions the mechanism to an initial starting position for the next succeeding door opening or closing operation.

Another object is to provide a novel door opening and closing mechanism wherein the door opening or closing operation will control the opening or closing of the door, either as a stop, a door balance, and a brake, as well as to provide a rewind device for the positioning of the cable in position to reverse the operation of the door or closure member.

A still further object is to provide a novel door opening and closing mechanism which may be adapted to be used in conjunction with doors of varied or different sizes and weights, by the sim-

ple substitution of pulleys of different sizes thereby varying the ratio of leverage between the manual operating means and the door.

The invention resides in the parts and the combination of parts more particularly hereinafter referred to and pointed out in the specification and defined in the claims.

With the above and other objects in view, the invention consists in the novel and useful provision, formation, construction, association and interrelation of parts, members and features, all as shown in a certain embodiment in the accompanying drawing, described generally, and more particularly pointed out in the claims.

The accompanying drawing illustrates my invention as applied to several types of overhead doors, and in which

Figure 1 is a diagrammatic side elevation of an overhead pivoted door adapted to be raised to an overhead position illustrated in broken lines.

Fig. 2 is a fragmentary front view, partly in section, of the door opening mechanism used in connection with the door shown in Fig. 1, taken approximately on line 2—2, Fig. 1, and showing the door in raised or elevated position.

Fig. 3 discloses a modified arrangement of the pulley connections disclosed in Fig. 2, for the operating mechanism.

Fig. 4 discloses in group the different positions the cable assumes during operation of the device, i. e., the open, intermediate, and closed positions.

Fig. 5 is a side view, partly in section of the manual operating means for operation of the device, and which is adapted to be located at a distance from the door.

Fig. 6 is a transverse sectional view of the elements of a roller type door comprised of hinged members and its track, and counterbalancing means. Broken lines indicate the door in raised or elevated position.

Fig. 7 is a fragmental front elevation illustrating more or less diagrammatically the operating means for the door shown in Fig. 6.

Fig. 8 is a detail view looking down on the lowest roller of the door and the chain connection to the door.

Fig. 9 is a detail view of a locking means for the door. Broken lines indicate the lock releasing position of the latch.

Referring to Fig. 1, a pivoted overhead type door 12 is shown in full line in a closed position, being supported by an L-shaped bracket 13 which is pivoted at 14 to a supporting member 15, which may be a suitable part of a garage structure and

upon which it rocks to the open overhead position illustrated by the broken lined figure 16; the door 12 is raised directly by means of cables 17 suitably connected or attached to pulleys 18 (see Fig. 2) that are mounted on and in fixed relation to a transverse sleeve shaft 19, thus permitting the cables 17 to be arranged at either side of the door 12 and attached to the brackets 13 at a point indicated at A.

Referring to Fig. 2, it will be seen that the sleeve shaft 19 has an end 20 rotatably mounted in a supporting member 21 at the right end of the figure, and at the left end of the figure the sleeve shaft 19 is shown as shaped to form a second bearing 22 adapted to rotate on the stationary shaft 23 which is fixedly secured to the supporting member 24 by any suitable means such as the pin 25, and the opposite end at the right of the figure rests in the bore 26 formed within the end of the sleeve shaft 19. A spring 27 is shown encircling the shaft 23 within the sleeve shaft 19, having one end secured to the stationary shaft 23 at 28, and the opposite end connected to the sleeve shaft 19 at 29, thus providing a spring connection between the stationary shaft 23 and the rotatable sleeve shaft 19.

This spring 27 is provided as a spring counterweight for the door, and is under the greatest tension when the door is down in a closed position; as the door raises the spring tension is lessened, until at the upper point there is only sufficient tension to retain the door in the slightly off center, or over-balanced position it assumes when at its highest point; when it is desired to lower the door, the tension is released on the spring and the door starts down by gravity, and as the spring tension increases due to the winding up of the spring by the action of the door, the momentum of the lowering door is checked and it completes its downward travel under the control of the spring 27.

The sleeve shaft 19, as recited, has secured to it the pulleys 18, and in addition at one end has secured thereto a driving pulley 30, to which is secured one end of a cable 31, which is adapted to be extended to manual operating means such as is disclosed in Fig. 5, hereinafter to be described.

Fig. 5 shows a box post 32 enclosing a pulley arrangement and adapted to be located at a convenient position adjacent a driveway leading to a garage, within easy reach of the driver in a tonneau of an automobile, and at a remote point from the door to be operated, and comprises the recited extended end of the cable 31 shown passing through a conduit 33, and passing around a pulley 34 and up and over a riding pulley 35 and then having its end secured by any suitable means, such as pin 36, to the stationary supporting means such as post 32; the riding pulley 35 is provided with a ring or yoke 37 to which is secured one end of a short length of cable 38, having its other end secured to a handle 39 that has one end projecting through the box 32. The cable 38 passes over a guide pulley 40 pivoted to the supporting post. A lock is provided for locking the apparatus against unauthorized operation by means of a conventional tumbler lock 41, which by means of an attached lever 42 operates a bolt 43 in and out of a notch 44 in the handle 39.

Referring to Fig. 6, it will be seen that a door 45 is shown in closed position, said door 45 being composed of sections 46 attached to each other by means of hinges 47, each section 46 being provided with brackets 48 at either side and to which are

attached rollers 49 adapted to operate in the U-shaped track 50, see Fig. 8. The lower section 46 of the door 45 is provided at either side with a second bracket 51 at the lowest point of the door, to which are fastened chains 52 for the purpose of lifting the door. The chains 52 are continued upward to pass over pulleys 53 which are secured to a rotatable shaft 54 extending across and beyond the width of the door to supporting members 55.

The chains 52 extend beyond the pulleys 53 to form part of a counterbalancing unit B, and pass over a riding pulley 56, and are secured to a stationary support 57. The riding pulley 56 is provided with a ring 58 to which is connected one end of a spring 59, the other end of which is secured to a stationary supporting means 60 that may be any suitable portion of the garage structure. The open position of the door 45 is indicated in its overhead position by broken lines 61, and the consequent movement of the chains 52, the riding pulley 56 and the spring 59 are indicated by broken lines 62.

To one end of shaft 54 is secured a driving pulley 63, best illustrated in Fig. 7, to which is secured one end of the cable 31, which is hereby adapted to drive the mechanism shown in Figs. 6 and 7 from the same manual operating means disclosed by Fig. 5 wherein the extended end of cable 31 is shown connected to the handle 39.

Fig. 9 discloses a locking mechanism for a door, such as the door 45, and is adapted to automatically operate with an overhead door. This locking mechanism is designed to be operated automatically by the tension and the slack of the cable 31, and comprises a rocking lever 64 rockably mounted on any convenient support and weighted at one end by a weight 65 and having a bifurcated opening at its upper end to engage the cable 31, and provided at its lower end with a slotted opening in which rides pin 66 secured in bolt 67, this bolt 67 slides in a support 68 and is adapted to be inserted in locking position in an opening 69 in a door.

This locking mechanism as disclosed is intended to be used at both the bottom of the door to lock the door when closed, and at the top of the door when opened to prevent premature closing; such a lock is desirable as a lock for locking the door open when used in conjunction with the accordion type of door, and may readily be adapted to this use by one skilled in the art.

Fig. 3 discloses the sleeve shaft 19 provided with a substitute pulley 70, one of a pair to replace the disclosed pulleys 18 in Fig. 2, and is provided for the purpose of shortening the necessary travel of the cable 31, and may be of a diameter suitably greater than the diameter of the driving pulley 30 as would be required to operate the connected mechanism.

There are shown two pulleys 30 in Fig. 3, adapting this particular modification for use with the accordion type of door, wherein it is necessary to provide a continuous pull of the cable 31 throughout the entire lift of the door, and to that purpose two drive pulleys 30 are provided that two cables instead of the single cable 31 may be provided to the post and two handles 39 provided; thus one cable would be wound upon one of the pulleys 30 in a clockwise direction, and, for example, with the door closed, the other cable would be unwound from the second pulley 30; upon the first cable 31 being operated to open the door, the second cable wound upon the second pulley 30 in an anti-clock-wise direction, and would therefore

be in position for the closing operation, and when it was operated, the tension of spring 27, which has been sustaining the weight of the door would be released sufficiently that the door would drop of its own weight, and against the increasing tension of the spring.

In operation when it is desired to open the closure member 12 from the closed position shown in full lines in Fig. 1, to the dotted line position shown in Fig. 1, the operator, after first unlocking the lock mechanism 41, 42, 43, will grasp the handle 39, and pull upwardly thereon, which raises pulley 35 through the medium of cable 38, and the raising of pulley 35 causes the cable 31 to be moved so as to be unwound from pulley 30 and transmit a rotary motion to the sleeve shaft 19 after which tension of spring 27 will continue to impart a rotary movement to sleeve shaft 19 so that the elevating cables 17 will be wound upon pulleys 18 fixed to sleeve shaft 19, and the closure member 12 moves about its pivot 14 to an overhead and open position.

The pulleys 40, 35, 34, and particularly the pulley 30, are of such diameter that the pull stroke applied to handle 39 will be sufficient to rotate sleeve shaft 19 to such an extent, and the cable 31 is connected to pulley 30 at such point that when the closure member 12 is in open position a subsequent pull on handle 39 will start the closure member to its closed position. This is more particularly illustrated in Fig. 4 in which the left hand pulley 30 with cable 31 attached thereto is in position to start the door on its upward movement from closed to open position, and when the door 12 has moved about its pivot 14 to a point approximately half-way between the closed and open positions, then the cable 31 will be completely unwound from pulley 30 and will assume a position shown in the central pulley in Fig. 4. Then as the door continues on its upward movement the cable 31 will have wound about pulley 30 in a reverse direction so that subsequent operation of handle 39 by pulling outwardly thereon will cause the sleeve shaft 19 to rotate in a reverse direction. The arrows a, b, c, shown on pulley 30 in Fig. 4, indicate the direction of rotation just described.

From the foregoing description of the operation, the spring 27 may be of such proportions as to counterbalance the door 12 without the aid of additional counterbalancing means.

My invention may be easily and quickly adapted to the type of overhead door shown in Fig. 6, as has been heretofore pointed out. In opening and closing the type of door shown in Fig. 6, the cable 31 is connected to a box post 32, which may be located at any convenient remote point from door 35 and on operation of handle 39 cable 31 is unwound from pulley 63 so as to start rotation of shaft 54 which rotates pulleys 53 to wind chain or cable 52 thereover and open the door.

In present types of balanced overhead doors the balance means are usually of such capacity for strength that after the operator has started the door in either its upward or downward path of travel, the balance means, or the weight of the door, continues the raising or lowering operations and usually the door stops at the ends of its travel with a considerable jar, due to the momentum obtained in the raising and lowering operations. As, for example, when the door 45 is started on its upward movement, to open the door, and as soon as the dead weight of the door is removed by the attendant starting the same in its upward travel, the spring 59 immediately

assists the elevating operation, and as the door sections 46 enter the overhead portion of the trackway 50, the weight of the door is lowered so that the spring 59 exerts a more powerful pull on the sections 46 remaining in the vertical portion of track 50; when the door is lowered the attendant starts the door in its downward movement and the weight of the door is increased as the sections 46 enter the vertical portion of the track 50 and such increasing weight causes the door to "slam" at the end of its downward travel.

With my device and invention associated with the counterbalance means, I am able to control the door in its upward or downward travel by using the cable 31 as a braking means, and this is accomplished by exerting a sufficient resistive pull on handle 39 after the cable 31 has been completely unwound from its associated terminal pulley and commences its re-winding operation, or by merely pulling outwardly on handle 39 to the desired degree and with the rapidity which the operator predetermines in controlling the initial opening of the door.

As shown in Fig. 5, and explained in the foregoing description the preferred construction has only one operating handle, which is pulled outwardly from the post 32 to both open and close the door with which it is associated. However, two operating handles may be provided and two cables from the operating handle to the overhead shafts as shown in Fig. 3, and in that event one handle member will always be extended from the post 32 when the door is completely opened or closed.

From the foregoing, it will be seen that only a slight pull will be required on cable 31 in order to start the door in its travel after which the counterbalance means completes the raising or lowering operation.

The spring 27 is normally coiled, when the door 40 is down, to a tension slightly below an equivalent of the weight of the door, and when the cable 31 is operated to raise the door 12, a sufficient lift is thereby given to the door, that added to the tension pull of the spring 27 starts the door to rise without the necessity of requiring the operator to lift the entire weight of the door through the cable 31; at the completion of the upward travel of the door, there is sufficient tension remaining in the spring 27 to maintain the door in that position as the counterbalance means is in a slightly off-balance position.

The lock disclosed in Fig. 9 is installed for the purpose of automatically locking the door when it closes, and if at the same time the lock 41 on the post in the driveway is locked, the garage door will remain securely locked. The lock bolt 67 is operated by means of the tension of the cable 31, when the cable slacks up the weight 65 causes the bolt 67 to be inserted into notch 69 in the door, and when the cable 31 is drawn tight the tension taking up the slack causes the bolt 67 to be withdrawn from the notch 69 and frees the door.

The door 45 in its downward movement engages bolt 67 at the tapered point 80 so as to cause retraction of bolt 67, permit the same to enter opening 69.

Many modifications of the showing of this invention may present themselves to one skilled in the art, and in adapting the invention to use in conjunction with the varied forms of overhead counterbalanced doors now in use, and to the varied forms of structure by which the doors are separated, but such modifications may well be

made without departing from the spirit of my invention, as hereinbefore pointed out and defined in the appended claims.

I claim:

- 5 1. A mechanical operator for overhead closure members comprising in combination a closure member, counterbalance means for said member; means to initially start said member to open or closed positions, said means including a pulley and a cable connected thereto and being so
10 related to each other and to said counterbalance means that when the closure member is in closed position, unwinding of the cable from said pulley will start the member to its open position and
15 when said member is in fully open position said cable will be rewound upon said pulley by the momentum of said pulley so that unwinding of said cable will start said member toward its closed position.
- 20 2. A door opener comprising a pivoted door, a stationary shaft, a sleeve shaft rotatably mounted thereon, counterbalancing means connecting the said shafts, pulleys on said sleeve shaft, flexible means connected to said door and to said pulleys
25 and adapted to be wound thereon, and operating

means comprising a pulley and a flexible member adapted to be wound thereon at the completion of a rotary operation of said sleeve shaft, said flexible member being adapted to be manually actuated to unwind and impart an initial rotary movement to said sleeve shaft, and rewind in a reverse direction through the momentum of the said sleeve shaft. 5

3. A door opener comprising in combination a door, a rotatable shaft, pulleys mounted on and
10 rotatable with said shaft, a support for said shaft, flexible members secured to said door and to said support and said pulleys, springs secured to said support, idler wheels attached to said spring, said flexible members passing around said idler
15 wheels, and means to operate said door including a pulley on said shaft, a flexible member connected to said last named pulley adapted to be manually unwound therefrom to impart rotary movement to said shaft and rewind on said
20 pulley in the reverse direction upon a continuation of the rotary movement initiated necessary to the complete travel of the said door.

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