Dec. 10, 1929. C. R. TRIMBLE 1,738,741

AUTOMATIC DOOR OPERATING AND LOCKING DEVICE

Filed Dec. 13, 1928

Fig. 1

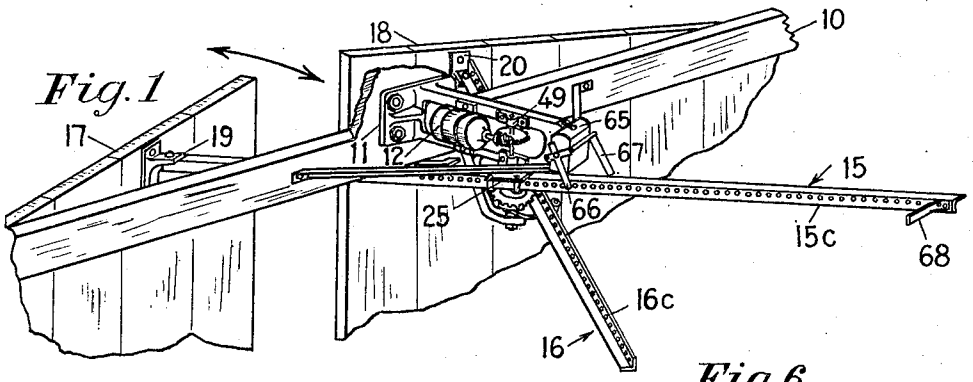


Fig. 6

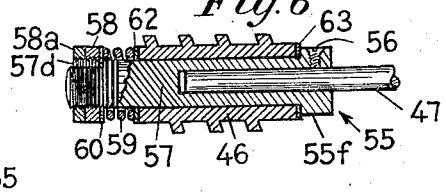


Fig. 2

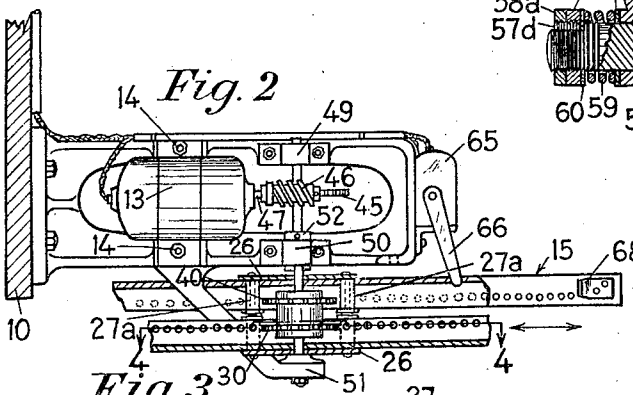


Fig. 7

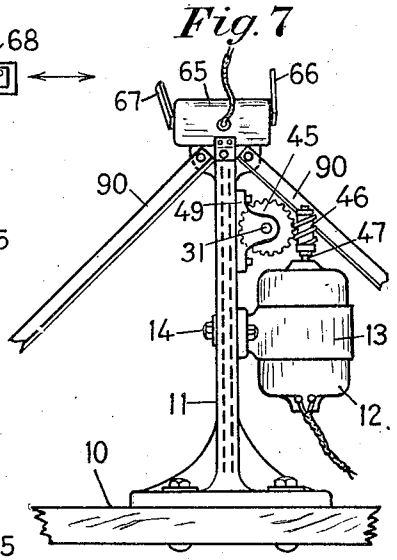


Fig. 3

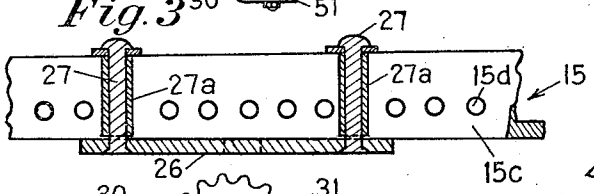


Fig. 4

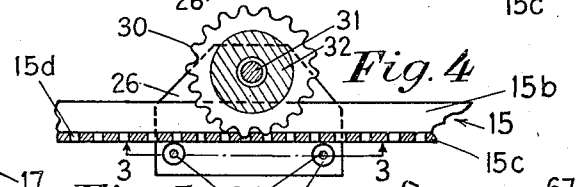


Fig. 5

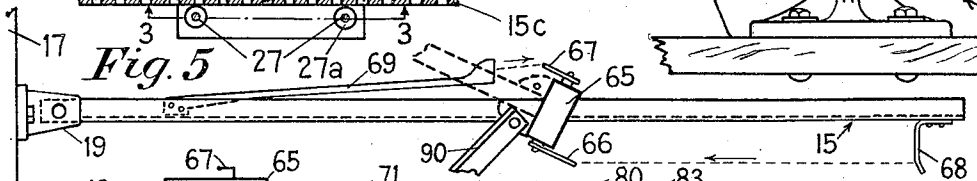
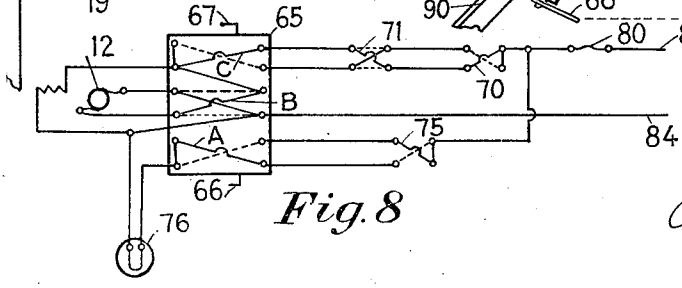


Fig. 8



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AUTOMATIC DOOR OPERATING AND LOCKING DEVICE

Application filed December 13, 1928. Serial No. 325,705.

This invention relates to an automatic door-operating and locking device adapted to be applied to garage doors of various designs, to cellar doors, to basement doors, to bank vault doors, and possibly to other kinds of doors.

Among the objects of the invention are to provide an automatic door-operating device which will be an improvement upon other devices of its class with respect to simplicity of construction, efficiency of operation and lowered cost of manufacture.

A further object of the invention is to provide for the device a superior safety device to guard against applying excessive force to the door when the path of movement of the door becomes accidentally obstructed by reason of an automobile or other object being inadvertently placed or allowed to remain in such a position that ample clearance is not provided for the operation of the door.

A still further object of the invention is to provide superior means for both manually and automatically controlling the operation of the electric switches which govern the movements of the device in the preferred embodiment of the invention.

Other objects and advantages may hereinafter appear.

Referring in detail to the accompanying drawings, which illustrate what is at present deemed a preferred embodiment of the invention,

Figure 1 is a perspective view of the complete device showing the same applied to a double door suitable for a garage.

Fig. 2 is a side elevation of the device shown in Fig. 1, parts being broken away and sectioned at the point of cleavage to show more clearly underlying parts.

Fig. 3 is a vertical section of a portion of the operating means taken on line 3—3 of Fig. 4.

Fig. 4 is a transverse section of a portion of one of the door-operating rails and means for actuating the same taken on line 4—4 of Figure 2.

Fig. 5 is a plan view showing one of the door operating rails complete, and showing also a fragment of the operating means and of the other door-operating rail.

Fig. 6 is a vertical mid-section of a portion of the operating means showing a safety device applied thereto.

Fig. 7 is a plan view of the preferred means for supporting the motor, the motor and adjacent parts being also shown in this view.

Fig. 8 is a wiring diagram.

Referring in detail to the drawings, to the door lintel or cross-piece 10 is bolted or otherwise secured a horizontal outwardly extending main supporting bracket 11 which supports a motor 12 desirably by means of a band 13 which extends around the casing of said motor and is secured to said bracket by means of bolts 14. This motor, as will presently be described, is operatively connected with two cooperating door-operating arms 15 and 16 which are pivotally secured respectively to the cooperating doors 17 and 18 by means of brackets 19 and 20.

Each of said door-operating arms have their movements controlled by a guide frame, 25 designating the guide frame adjacent the arm 15. Said guide frame 25 desirably consists of two corresponding plates 26 which are placed parallel in vertically spaced relation to each other, being held in such spaced relation partly by pins 27 and sleeves 27^a.

The guide rails 15 and 16 are each composed of an angle iron shape and are substantially identical in construction. Describing the arm 15, well shown in Figs. 3 and 4, said arm comprises the horizontal or base flange 15^b and a vertical flange 15^c, the latter flange having punched therethrough a series of equally spaced apertures 15^d to perform the function of rack teeth. With the rack thus formed cooperates the sprocket gear 30 which is mounted upon shaft 31, and which has a hub portion 32.

Through the tapered ends of plates 26 extends the shaft 31 upon which the hub portion 32, which is common to sprocket wheels 30 and 40, is mounted to rotate thereabout. Said shaft 31 cooperates with sleeves 27^a already referred to which are positioned to maintain gears 30 and 40 in mesh respectively with racks 15^c and 16^c, while at the same time

allowing said racks and guide frame to oscillate about the shaft 31 to the extent required in opening and closing the doors 17 and 18.

The sprocket gear 30 together with its hub portion is fixed to shaft 31, and there is also fixed to said hub portion 32 a gear 40, the latter gear being in mesh with the other door-operating arm 16. Said shaft 31 has fixed thereto a driving worm gear 45 which, in turn, is driven by a worm 46 fixed to the motor shaft 47. Said shaft 31 is provided with an upper bearing 49, an intermediate bearing 50 and a lower bearing 51. To said shaft 31 is fixed a bearing collar 52 which rests rotatably upon bearing 50 to keep said shaft 31 from dropping below its operating position.

In order to safeguard against excessive force being applied to the door-operating arms in case the movement of the door becomes accidentally obstructed, a yielding operating connection is provided between the motor and the door-operating arms.

In Fig. 6 this connection is shown as comprising a bearing sleeve 55 having around one end a flange 55^f and secured to the motor shaft 47 by means of a set screw 56. Said sleeve 55 comprises a reduced portion 57 upon which is mounted the worm 46 which has already been referred to, said worm consisting of an externally toothed sleeve. One end of said worm sleeve abuts against said flange 55^f, and the other end of said sleeve abuts against a spring 59 which is coiled around the body portion 57 of bearing sleeve 55.

In the threaded portion of sleeve body 57 is provided a depressed face 57^d over which is fitted a lock washer 60 having a segmental opening therethrough to provide a slidable but non-rotatable fit of said washer thereon. Said lock washer 60 acts as a follower, under the action of an adjusting nut 58, to compress spring 59 against fiber washer 62 which, in turn, applies an amount of friction to the end of worm sleeve 46 normally sufficient to enable said worm sleeve to transmit power sufficient to open and close the doors. But when excessive pressure is encountered worm sleeve 46 will not be forced to rotate and therefore will not move the doors 17 and 18.

Lock nut 58^a is provided to bear against adjusting nut 58 to hold the latter nut in its adjusted position.

The main bracket 11 may be braced against lateral or other strains in any preferred manner. In the drawings angle-iron braces 90 are shown extending diagonally from the free end of said bracket to the lintel 10.

In order to control automatically the operation of the motor 12, its wiring circuit is provided with a three-gang switch box 65 upon which are pivotally mounted the switch arms 66 and 67.

The door-operating arm 15 carries near its outer end a trip arm 68 positioned to trip the switch arm 66 and thus automatically stop the motor when the doors reach the fully open position. Said door-operating arm 15 also carries, near its inner end, another trip arm 69, said arm 69 being positioned to move the switch arm 67 to stop the motor automatically when the door reaches fully closed position.

In addition to the automatically operable switches which have just been described a manually operable switch 70 is provided at the garage or other out-building where the apparatus is located, while another manually operable switch 71 may be provided to afford operation from a remote point.

A manually operable switch 75 is also provided in order to make it possible to turn off the light 76 without affecting the motor 12.

An auxiliary safety device is provided by inserting a thermo-fuse plug 80 which will automatically break the circuit when more than a predetermined maximum current passes through the apparatus for too long a time as might occur in case the opening or closing of the doors was accidentally obstructed.

When trip arm 68 operates switch lever 66 it does three things i. e. it snaps three switches A, B, and C. A turns light 76 on and off as the three-way switch is operated. B reverses the rotation of the motor for each successive operation, this operation being the opening or closing of the doors. C opens the circuit to the motor. When switch 70 is manually operated to close the doors, the circuit to the motor is closed as indicated by the dotted lines, thus starting the closing movement of the doors which movement continues until interrupted automatically by contact of lever 69 with switch arm 67.

Operation.—Assuming that the doors are in the closed position, the operator closes switch 70 as indicated in the full lines in the wiring diagram, thus starting the motor. The motor, through the agency of the worm sleeve 46, worm wheel 45, and shaft 31 rotates hub 32 together with the sprocket wheels 30 and 40 secured to said hub. Said sprocket wheels, in turn, move racks 15 and 16 longitudinally through a predetermined distance until trip arm 68 engages with switch lever 66. By thus tripping lever 66 the three switches A, B, and C are operated, switch A causing lamp 76 to be energized, switch B placing the circuit in readiness for reverse rotation of the motor, and switch C breaks the motor circuit stopping the motor.

In order to close the doors from the position to which they were brought by the operation just described, switch 71 is again operated thus completing the circuit through the motor again starting the motor, this time in the reverse direction of rotation and hence movement transmitting parts enumerated in the previous paragraphs are operated in the

reverse direction until trip arm 69 actuates switch lever 67 restoring the parts to their original position.

In this specification, and the accompanying drawing, I have described and shown a preferred form of my invention and specifically mentioned certain of its more important objects. I do not limit myself to the forms disclosed, since various changes and adaptations may be made therein, without departing from the essence of my invention as hereinafter claimed; and objects and advantages, other than those specifically mentioned, are included within its scope.

I claim:

1. In a device of the class described, in combination, a door, an arm attached to said door to open and close it, a rotary element engaging said arm to reciprocate it longitudinally, a second rotary element operatively related to the first recited rotary element, a core upon which said second rotary element is mounted with sufficient frictional tightness to rotate normally therewith, means to adjust such frictional tightness, and means to rotate said core to open and close said door.

2. In a device of the class described, a sprocket wheel, a door-operating arm meshing with said sprocket wheel for longitudinal reciprocation thereby, a door to which said arm is pivotally connected, a swinging guide frame to support said arm and allow it both to reciprocate lengthwise and to swing, a shaft to which said sprocket wheel is fixed, said shaft being located at the center of oscillation of said guide frame, anti-friction rollers mounted on said guide frame to hold said arm in mesh with said sprocket wheel, and means to rotate said shaft.

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