Feb. 25, 1930. P. R. FORMAN 1,748,509

DOOR MOTOR DEVICE

Filed Aug. 6, 1926 3 Sheets-Sheet 1

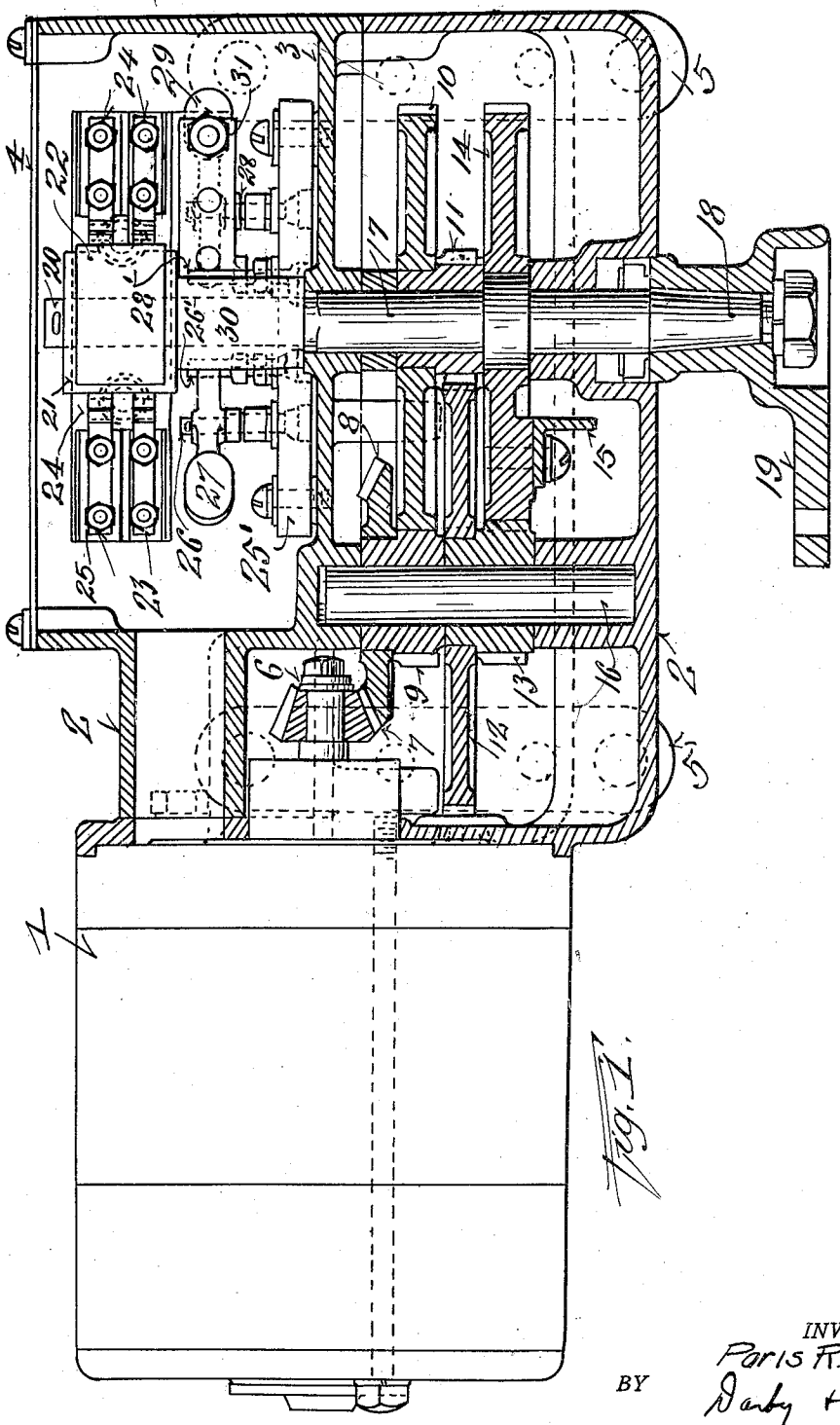


Fig. 1.

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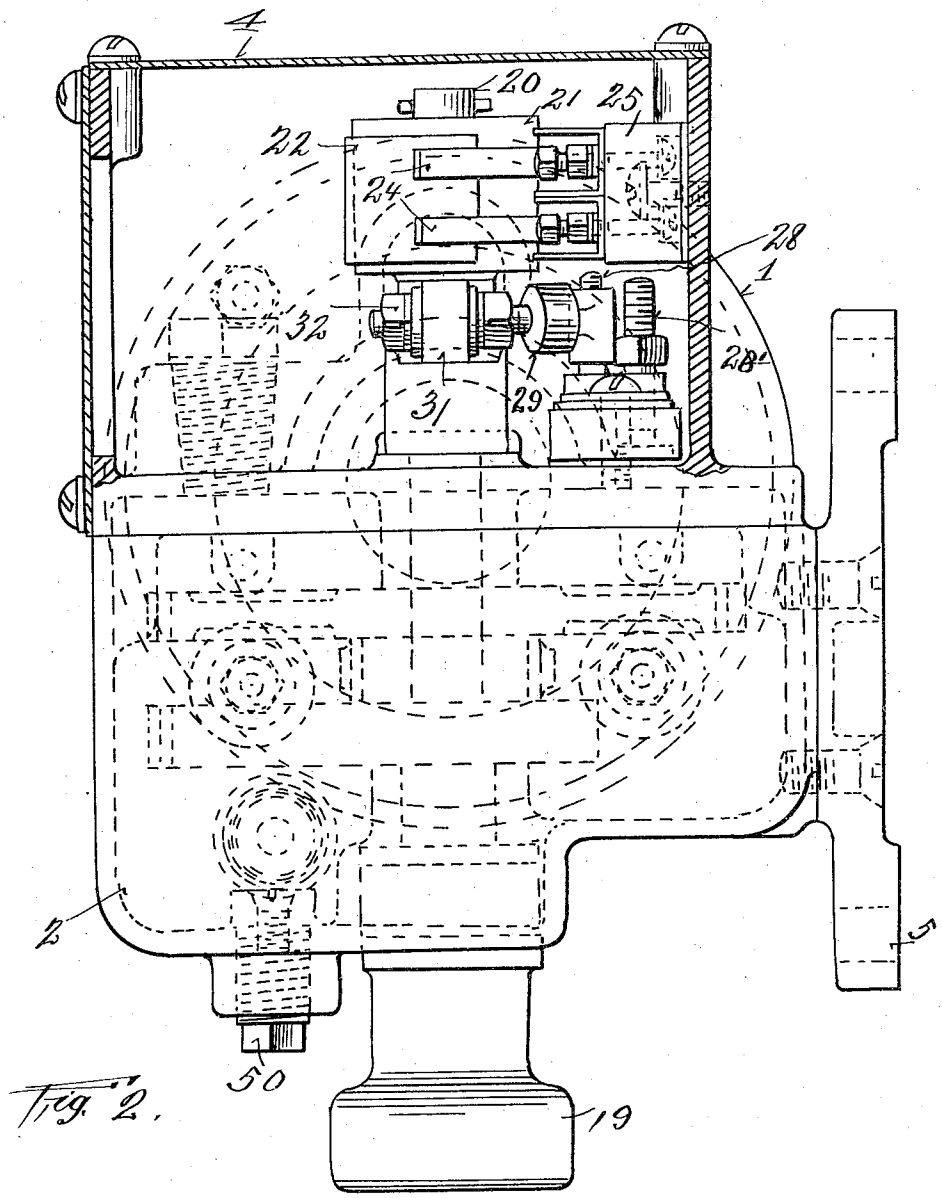


Fig. 2.

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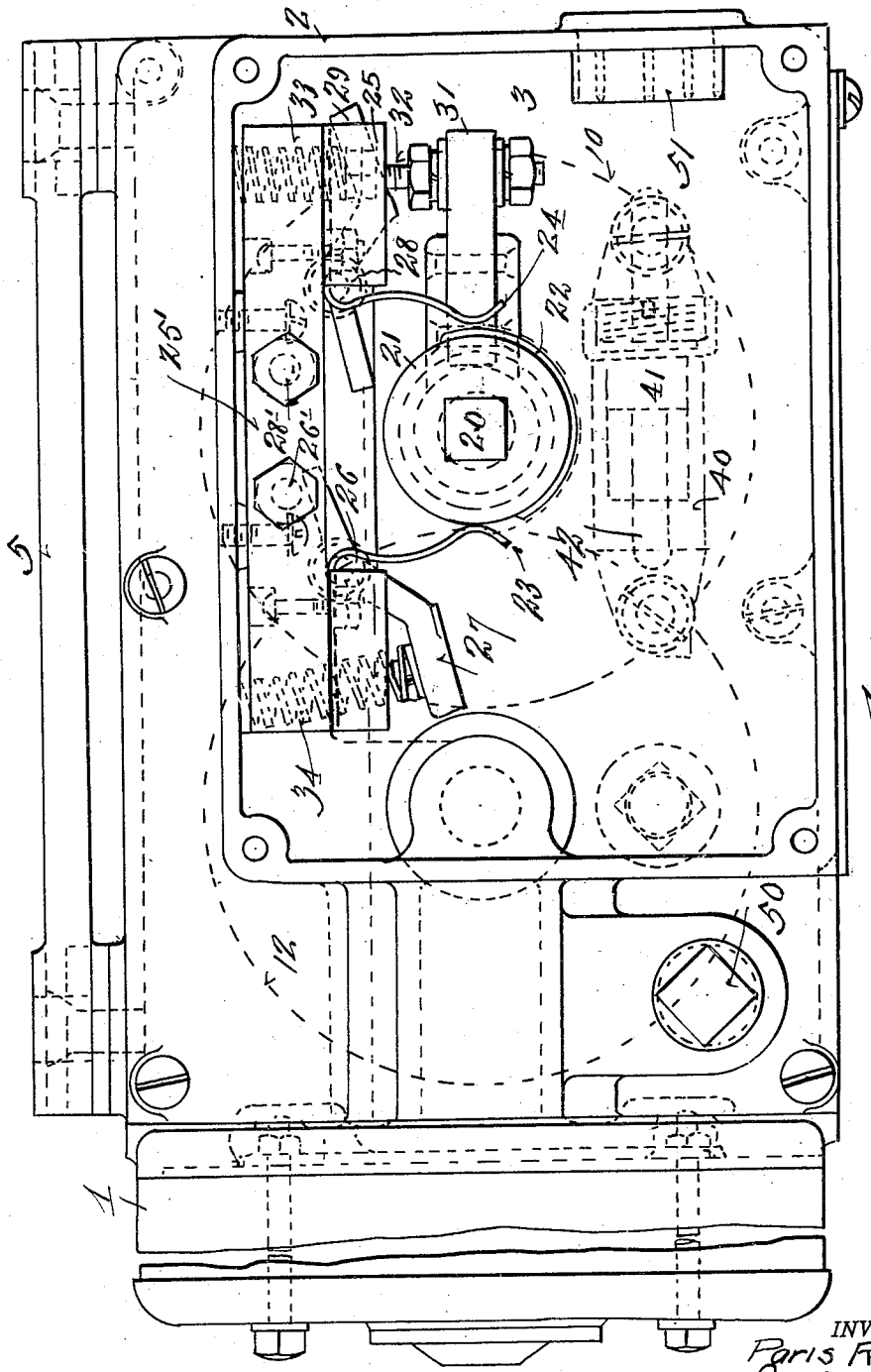


Fig. 3.

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Patented Feb. 25, 1930 1,748,509

UNITED STATES PATENT OFFICE

PARIS R. FORMAN, OF RAHWAY, NEW JERSEY, ASSIGNOR TO NATIONAL PNEUMATIC COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA

DOOR MOTOR DEVICE

Application filed August 6, 1926. Serial No. 127,512.

This invention relates to an improved form of operating motor for doors and the like.

This invention relates to an electric motor which is adapted to operate doors in passageways, and comprises means for reducing the speed of the motor to a speed suitable for the operation of doors and the like.

This invention further relates to means for absorbing the strain or shock on the gears when the doors reach their fully opened or closed position.

This invention further comprises means operated by the movement of the motor to signal the full opening or full closing of the doors.

A further object of this invention is to provide switches operated by the movement of the door driving mechanism which will break the circuit to the motor when the doors are completely open or closed.

These and many other objects are sought and obtained by the invention disclosed hereinafter, as will become apparent in the following description.

This invention resides substantially in the combination, construction, arrangement and relative location of parts, as will be fully described in the following specification, and claimed in the appended claims.

Referring to the drawings, in which the same reference numerals will be used in the several views to indicate the same or similar parts,

Fig. 1 represents a plan view, partly in section, taken on a horizontal plane, showing the features of my invention.

Fig. 2 represents an end view of my device, with the switch casing in cross-section.

Fig. 3 is a side elevational view, with the switch casing cover removed.

The particular objects sought and obtained by this invention comprise the utilization of a revolving electric motor for operating doors in passageways, especially of the type comprising two or more hinged sections mounted on a revolvable shaft. As a particular application of this motor device, reference is made to my application Serial No. 126,858 filed August 3, 1926.

It is, of course, evident that ordinary electrical motors revolve at a speed which is too great for the ready adaptation to the use of operating doors and the like. I have therefore provided in a very compact form, a novel gear train for reducing the speed of the driven element to that suitable for door operation. Since the parts must be brought to a rest at the end of the door opening or closing operation, I have found it necessary to provide suitable shock absorbing means to prevent too great a strain on the gear train during the decelerating operation. It is also evident that some means must be provided for breaking the feed current to the driving motor when the doors are completely open or closed, and I have therefore provided a suitable switching arrangement to be operated by the movement of the gear train. In order to signal an attendant where desirable when the doors are open or closed, I have also provided a novel switching device for operating suitable signals for this purpose. All of this structure has been combined in a small compact device which may be readily supported over the door jamb without requiring very much space.

Referring to the drawings, the electric motor is indicated at 1, attached by any suitable means to the casing 2, which has a transversely extending wall 3 therein. One end of the casing is open, and is provided with a removable cover 4, and the whole structure is suitably supported by means of feet or brackets 5.

The motor shaft 6 has keyed thereto a mitre gear 7, which meshes with the mitre gear 8, which, in turn, is mounted for rotation with the small spur gear 9. The large gear wheel 10 is driven by means of the spur gear 9, and has attached integral therewith another spur gear 11 which drives the large gear wheel 12. The gear 12 is mounted for rotation with the spur gear 13, which drives the large gear wheel 14 attached to the shaft 17. The short shaft 16 mounted in the casing 2, provides a rotatable support for the mitre gear 7 and spur gear 9, and the gears 12 and 13, which are freely mounted on this shaft. Gears 10 and 11, which rotate together, are freely mounted on the shaft 17. One end of the

shaft 18 is tapered to receive the crank arm 19, which is intended to be attached to the door operating shafts in the usual and well-known manner.

The other end of the shaft 17 is square in cross-section, and has securely mounted thereon the insulating drum 21 which provides a support for the conducting metallic strip 22. Two sets of fingers 23 and 24, supported on the block of insulating material 25, are arranged adjacent the strip 22, so that when the drum 21 is in suitable position, the fingers of either group are bridged thereby. Also supported within the casing is the block of insulating material 25′, on which are mounted the metallic studs 26 and 28, which support respectively the rocker switch arms 27 and 29. Studs 26′ and 28′ are also supported on the insulating block 25, and form the other terminal of a circuit against which the arms 27 and 29 may be forced by means of the springs 34 and 33 respectively. Supported on the square portion of the shaft 17, and between the casing 3 and drum 21, is a collar 30, which has formed integrally therewith the projecting arm 31. A threaded adjustable pin 32 is secured to the outer end of the arm 31, and is adapted to contact with either rocker arm 27 or 29, to cause their free ends to move out of contact with the terminals 28′ or 26′ respectively, depending upon the position of the arm 31. It will be noted that this arm is adapted to be rotated through 180°.

A short extension is bolted to the gear 14 (Fig. 1), and is adapted to engage with the small piston rod 42, on which is mounted the piston 41, adapted to move within the cylinder 40. This dash-pot construction is intended to aid in the deceleration of the gears as the door approaches the end of its opening or closing stroke.

The screw-threaded block 50 provides a suitable opening through which grease may be introduced to the casing so that the gear train may operate smoothly. 51 represents the point of entry for the wires to the switch box.

The operation of this device is readily apparent from the foregoing description, but it may be gone over briefly at this time. The motor 1 operates the crank arm 19 through the gear train, as is apparent from Fig. 1. The crank arm 19 need only rotate through 180° to complete the door opening or closing operation, and a considerable reduction in speed is therefore necessary where an electric motor of the revolving type is used. At the end of the opening and closing stroke, the projection 15 engages with the piston rod 42 of the dash-pot, which aids in decelerating the moving parts without subjecting them to a sudden shock. Suitable electric circuits may be connected to the sets of contact fingers 23 and 24 to provide visible or audible signaling devices to indicate when the doors are open or closed. To protect the electric motor, the switches 27 and 29 are connected in the feed circuit thereto, so that when the door is completely open or closed, the arm 31 will operate the switches 27 or 29, depending upon its position, to move them out of contact with the terminals 26′ or 28′, respectively, to de-energize the motor.

I am, of course, aware that many changes in the details of construction and relative arrangement of parts will readily suggest themselves to those skilled in the art, and I do not, therefore, desire to be limited to the particular construction disclosed by way of illustration, but rather to the spirit and scope of my invention. Thus, any form of electric motor may be used, and any suitable gear drive could be utilized, without departing from the spirit of the invention. I therefore desire to be limited only by the appended claims.

What I seek to secure by United States Letters Patent, is:—

1. In a motor structure for door actuation, the combination with an electric motor, of a speed reducing gear train, one of the gears in said train having a projection thereon, a resilient pneumatic stop adapted to engage said projection to prevent jamming of the gears, and a crank driven by said gears adapted at its outer end to actuate doors, together with a drum switch and a drum switch arm adapted to rotate with said gear train.

2. In a motor structure, the combination with an electric motor of a speed reducing gear train, one of the gears in said train having a stop thereon and a dash-pot adapted to be engaged by said stop when rotated in either direction to prevent injury to the gear train, together with means carried by said gear train for door opening and closing, and switch means carried also by said gear train for ultimately controlling in a predetermined fashion said first means by controlling said motor.

3. In a device of the class described, the combination with a casing and a motor attached thereto, of a train of gears in said casing and a dash pot in said casing for co-operating with said gears to cushion the end of their movement, which is limited in its scope by the opening of switch means carried by said gear train and interposed in the electrical circuit of said motor together with further switch means for signalling the condition of the first switch means.

4. In a device of the class described, for operating doors and the like, the combination with a casing and a motor secured thereto, of a train of gears therein connected to said motor, and a drum switch operated by the movement of said gears for closing a signaling circuit, together with an arm adapted to exert pressure on a plurality of spring

closed switches to open said switches against said springs for controlling said motor when said doors are fully open or closed.

5. In a device of the class described, for operating doors and the like, the combination with a casing and a motor secured thereto, of a train of gears therein connected to said motor, a drum switch operated by said gears to signal the position of the doors, and means for resiliently retarding the gear train when the doors are nearly opened or closed, and further means operated through an arm carried by said gear train for controlling said motor.

6. In a device of the class described, for operating doors and the like, the combination with a casing and a motor secured thereto, of a train of gears therein connected to said motor, a drum switch and an arm operated by said gears and a plurality of switches connected in the circuit to said motor and adapted to be operated by said arm to break the motor circuit when the doors are at the end of their movement, while said drum switch operated by said train of gears operates to signal when the doors are at the end of their movement.

7. In a device of the class described, for operating doors and the like, the combination with a casing and a motor secured thereto, of a train of gears therein connected to said motor, an arm attached to the shaft driven by said gears, switches adapted to normally remain closed, and to be opened by said arm at the end of its stroke, and a drum switch operated by said gears and adapted to close a signal circuit to indicate the position of the doors, together with a crank arm operated by said train adapted at its outer end to actuate doors.

8. In a device of the class described, for operating doors, the combination of a casing and a motor supported thereby, of a train of gears journaled in said casing and driven by said motor, a crank arm driven by said gears to be connected to the doors, and dash pot means in said casing and cooperating with said gears for cushioning the gear train at the time the doors are fully opened or closed, together with means for opening the circuit to said motor and further means for signalling such door condition when the doors are fully opened or closed.

9. In a device of the class described, for operating doors, the combination of a casing and a motor supported thereby, of a train of gears journaled in said casing and driven by said motor, a crank arm driven by said gears to be connected to the doors, means in said casing and cooperating with said gears for cushioning the gear train at the time the doors are fully opened or closed, a drum switch operated by said gears to control a signal to indicate when the doors are open or closed, and a plurality of normally closed switches operated by said gears to break the motor circuit when the doors are opened or closed.

10. In a device of the class described for operating doors and the like, the combination with a casing and a motor secured thereto of a train of gears therein connected to said motor, means operated by said train for energizing a signal circuit to indicate when the doors are fully opened or closed, an arm carried by said gear train, spring closed switches adapted for actuation by said arm to open the circuit of said motor when the doors are fully opened or closed.

In testimony whereof I have hereunto set my hand on this 28th day of July, A. D. 1926.

PARIS R. FORMAN.