Jan. 6, 1931. W. B. CROWELL ET AL 1,787,935

DOOR OPERATING MECHANISM

Original Filed Jan. 12, 1928 2 Sheets-Sheet 1

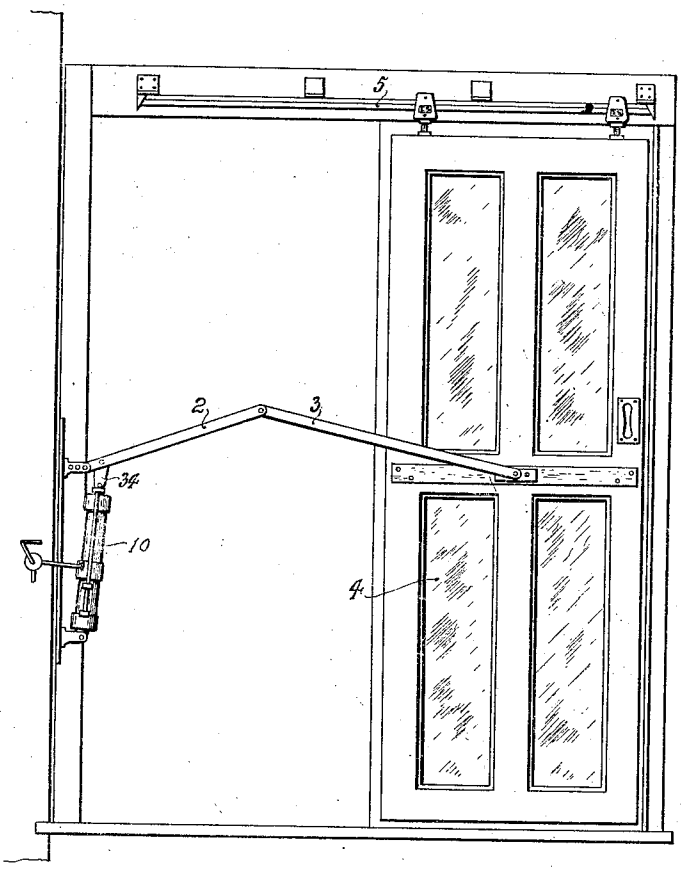


FIG. 1

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FIG. 3

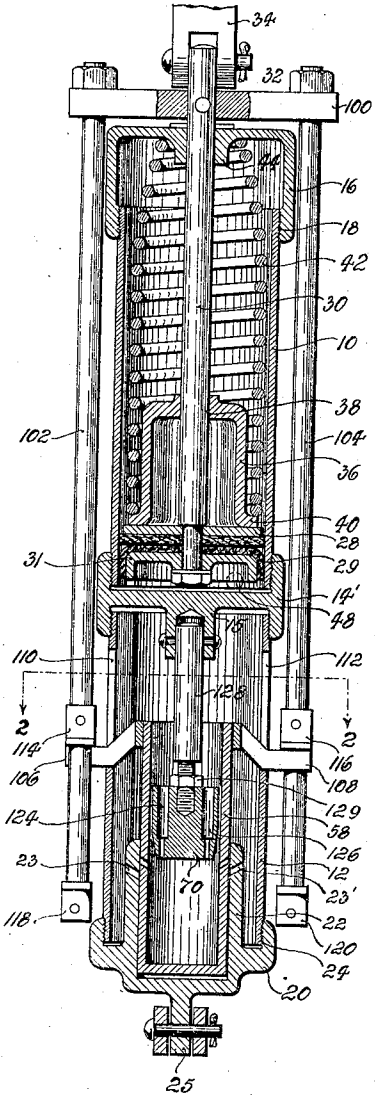
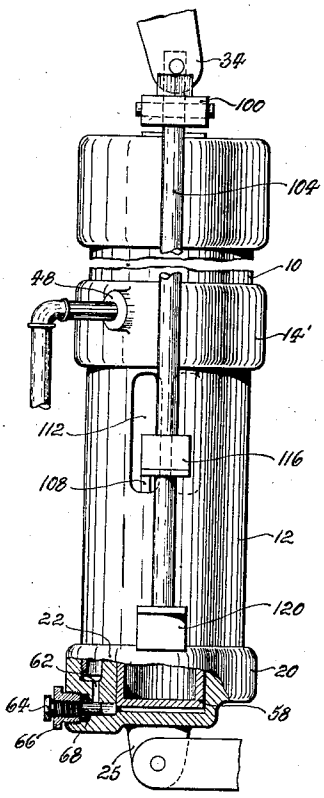


FIG. 4



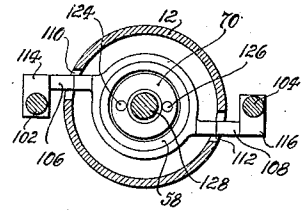


FIG. 2

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UNITED STATES PATENT OFFICE

WILLIAM B. CROWELL, OF NEW YORK, N. Y., AND CYRUS W. BASSETT, OF MONTCLAIR, NEW JERSEY, ASSIGNORS TO ELEVATOR SUPPLIES COMPANY, INC., OF HOBOKEN, NEW JERSEY, A CORPORATION OF NEW JERSEY

DOOR-OPERATING MECHANISM

Original application filed June 21, 1923, Serial No. 646,781. Divided and application filed January 12, 1928, Serial No. 246,249. Divided and this application filed October 10, 1928. Serial No. 311,593.

This invention relates to a door-operating mechanism, and more particularly to a fluid pressure actuated device adapted for operating the toggle levers of elevator doors and other mechanisms.

A general object of the present invention is to provide an improved and simplified power-actuated mechanism for operating elevator doors and similar devices.

Another object of the invention is to provide an improved means for operating doors and the like by means of fluid pressure, in which cushioning action shall be attained in both the opening and closing movements of the device, and which shall be adapted to be manually operated in case of failure of power or other contingency.

Another object of the invention is to provide a door operating mechanism in which the speed of operation of the device may be regulated during portions of the forward and return movements of the parts operated.

Another object of the invention is to provide a power-operated mechanism having cushioning means which may be regulated to attain any desired amount of cushioning during predetermined positions of the actuated mechanism.

This application, which is a division of our copending application Serial No. 246,249, filed Jan. 12, 1928, which latter application is a division of application No. 646,781, filed June 21, 1923, is directed to the species shown in Figs. 3, 4 and 5 of the said co-pending application; the claims to this species occurring therein having been canceled for re-presentation herein, in accordance with the election of the species of Fig. 2 of the co-pending application as the preferred form so far as the claims in said application are concerned. The claims of the present application, therefore, are directed to the species not claimed, although disclosed, in the aforesaid co-pending application.

With these objects in view, the invention comprises the various features hereinafter described and particularly defined in the claims.

The various features of the invention will be described in connection with the accompanying drawings, in which—

Fig. 1 is a view showing the invention applied to the toggle levers of an elevator door.

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 3.

Fig. 3 is a vertical sectional view of the device.

Fig. 4 is a profile view, partly in section, showing the cushioning regulating means employed.

In Fig. 1 of the drawings, a device embodying the invention, designated by numeral 10, is shown as applied in operative position to the toggle levers 2, 3 of an elevator door 4, which is mounted in the usual manner on rollers operating on an overhead track 5. By the admission of fluid pressure to the operating cylinder 10, the toggle levers 2, 3 are forced upwardly causing a sliding movement of the door to the open position, whereas by permitting the exhaust of the pressure fluid from the cylinder 10, the door will return to its closed position. The invention is here shown in operative position to an elevator door for purposes of illustration only, and may obviously be applied to other mechanisms.

The species of power-operated mechanism shown herein is of slightly different construction although similar in operation to the preferred form of the invention disclosed in Fig. 2 of the aforesaid co-pending application Serial No. 246,249. This form of the invention comprises a two-compartment cylinder casing having an upper and a lower casing joined together by means of a coupling member 14′. The cylindrical compartments are closed by means of adjustable heads or caps, and joined thereto preferably by means of screw-threaded connections. In

the upper compartment, within the casing 10, is a piston to which is attached a piston rod which passes through an opening in the upper head, and is connected to the lever or mechanism to be operated. Surrounding the piston rod is a helical spring which serves to return the door mechanism to closed position after operation of the piston by fluid pressure. Connected to the upper part of the piston rod 30 and external to the casing 10 is a crosshead 100 forming a yoke with the side rods 102, 104, adapted to move up and down with the movements of the piston and piston rod. In the lower casing 12 is a cup plunger 58 to which are rigidly attached side arms or extension arms 106, 108 which extend outwardly through slots 110 and 112 in the lower cylinder casing 12 and slidably engage the rods 102 and 104 respectively. Positioned upon the reciprocatory rods are two sets of adjustable stops or engagement blocks, the upper set 114, 116 serving to contact with the extension arms 106, 108 during the downward stroke of the piston and side rods, and the lower set 118, 120 serving to contact therewith during the upward movement of the piston and rods. During the opening movement of the door, the piston, piston rod and side rods move upwardly and the side arms 106, 108 at first slide upon the rods 102, 104 leaving the cup plunger in its lower position until toward the end of the stroke the stops 118, 120 engage the extension arms 106, 108. The cup plunger is then lifted upwardly by means of the stops and in cooperation with a stationary plunger 70 serves to attain cushioning action. During the closing movement of the door the piston, piston rod and side rods move downwardly and the extension arms 106, 108 slide upon the side rods 102, 104 during the first part of the stroke, and toward the end of the stroke the stops 114, 116 engage the side arms, forcing the cup plunger downwardly into a cylindrical cup containing oil or other liquid, by means of which checking or cushioning action is attained at the end of the door-closing movement.

In the lower compartment of the device, within the casing 12, are members which provide cushioning or checking action. A stationary plunger 70 having passages 124, 126 therein is attached to the partition 15 by means of a plunger rod 128 upon which the plunger is adjustably attached by means of screw-threaded connections. A lock nut 129 is positioned upon the threaded portion of the plunger rod 128 and serves to hold the plunger in any desired position. In the lower portion of the casing 12 is a cylindrical cup 22 which is adapted for receiving the cup plunger. The lower cylinder 12 is filled with oil or other liquid to a level somewhat above the edge of the cup 22 for the most satisfactory action, or the level of the liquid may be slightly higher if desired, so long as it is not sufficiently high to permit escape through the openings 110 and 112. At the lower portion of the cup 22 is a passage shown more particularly in Fig. 4 of the drawings, through which the passage of liquid is controlled. In the side walls of the cup 22 are passages 23, 23′ through which oil will flow when the cup plunger first passes into the cup, thus preventing a sudden cushioning action. In order also to prevent sudden cushioning action, the side walls of the outer cylindrical cup may be flared outwardly near the upper portion thereof. In the walls of the movable cup plunger are orifices or passages at a height somewhat above the passages in the outer cup, and preferably at a level corresponding to the flared portion in the outer cup, when the cup plunger is in its lowermost position.

In the operation of the power-operating mechanism, cushioning effect may be made to take place at substantially any desired portion of the stroke by positioning the lugs or blocks at suitable positions on the vertical rods 102, 104 or by using a plunger of the proper length to give the desired effect at the end of the upward stroke, and by varying the position of the cup 22 by suitably adjusting the position of the loser head 20, or by employing a cup 22 of a height to attain the desired effect. Cushioning action may therefore be made to take place at any desired point of the forward or return stroke of the plunger, and by suitably regulating the passage of liquid through the liquid passageways the speed of the cushioning action is also controlled. By suitably regulating the pressure applied to the piston, any desired speed of action of the mechanism, together with cushioning at any predetermined part of the forward and return strokes of the plunger, may be attained.

It is to be understood that various changes or modifications may be made in the device described, as will be apparent to those skilled in the art, without departing from the spirit or scope of the invention.

The cushioning effect may be entirely controlled for example, by means of a cup plunger having its lower exterior portion tapered, so that in passing into the cup 22 the movement of the plunger will be gradually checked. The upper edge of the cup 22 may also be flared to attain any desired amount of cushioning action in the plunger stroke. The lower portion of the plunger 70 is also preferably beveled or tapered, and the corresponding interior wall of the cup plunger 58 is flared so as to attain the desired checking action in the movements of the cup plunger and the parts operatively connected therewith. By properly designing the cup and plungers with beveled edges the desired cushioning action could be at-

tained without the use of liquid passages, but it is preferable to employ the flared and beveled members in combination with the liquid passages having regulating means in order that the cushioning speed may be regulated to attain the desired speed of action in the cushioning movements.

Claims:

1. In a device of the class described, a cylinder, a piston therein, means for operatively connecting one of said parts to a mechanism to be operated, means for admitting pressure fluid to operate the piston in one direction, spring means for operating the piston in the other direction, a cylinder having longitudinal slots therein, a cup plunger in the said cylinder having arms extending through said slots, side rods operatively connected to said piston and adapted to cooperate with said arms to permit a sliding movement therein, stops on the rods to limit the sliding movement of the arms thereon and to cause operation of the said cup plunger, and means operating with the plunger to cause cushioning action during the movements of the said plunger.

2. In a device of the class described, a cylinder, a piston therein, means for connecting one of said parts to a mechanism to be operated, side rods operatively connected to said piston, a cup plunger, means slidably connecting the said plunger to said rods, means operatively connected to the rods to limit the sliding movement of the said arms thereon, a stationary plunger operating with said cup plunger to attain cushioning action in the movement of the plunger in one direction, and a cup operating with said cup plunger to attain cushioning action in the movement of the plunger in the other direction, and means for maintaining a liquid between the cushioning parts.

3. In a device of the class described, a cylinder, a piston therein, a piston rod connecting said piston to the door to be operated, retarding means comprising a plunger distinct from the piston, and a yoke mechanism connecting said plunger with said piston, said yoke mechanism comprising a pair of side rods having their ends attached to said piston rod for movement therewith.

4. In a device of the class described, a cylinder, a piston therein, a piston rod connecting said piston to the door, a retarding plunger, distinct from said piston, means for applying power to said piston and piston rod to open the door, means for transmitting the movement of said piston to said retarding plunger comprising a pair of side rods forming a yoke extending from said piston rod to said plunger, and spring means for returning said piston and side rods to their normal positions.

5. In a device of the class described, a cylinder, a piston therein, a piston rod connecting said piston to the door, a retarding device distinct from said piston, means for applying power to said piston and piston rod to open the door, means for transmitting the movement of said piston to said retarding device comprising a pair of side rods forming a yoke extending from said piston rod to said device, and means for returning said piston and side rods to their normal positions.

Signed at Hoboken in the county of Hudson and State of New Jersey this 9th day of October A. D. 1928.

WILLIAM B. CROWELL.
CYRUS W. BASSETT.