March 31, 1925. 1,531,626

H. ROWNTREE

DOOR OPERATING MECHANISM

Filed Oct. 24, 1921 2 Sheets-Sheet 1

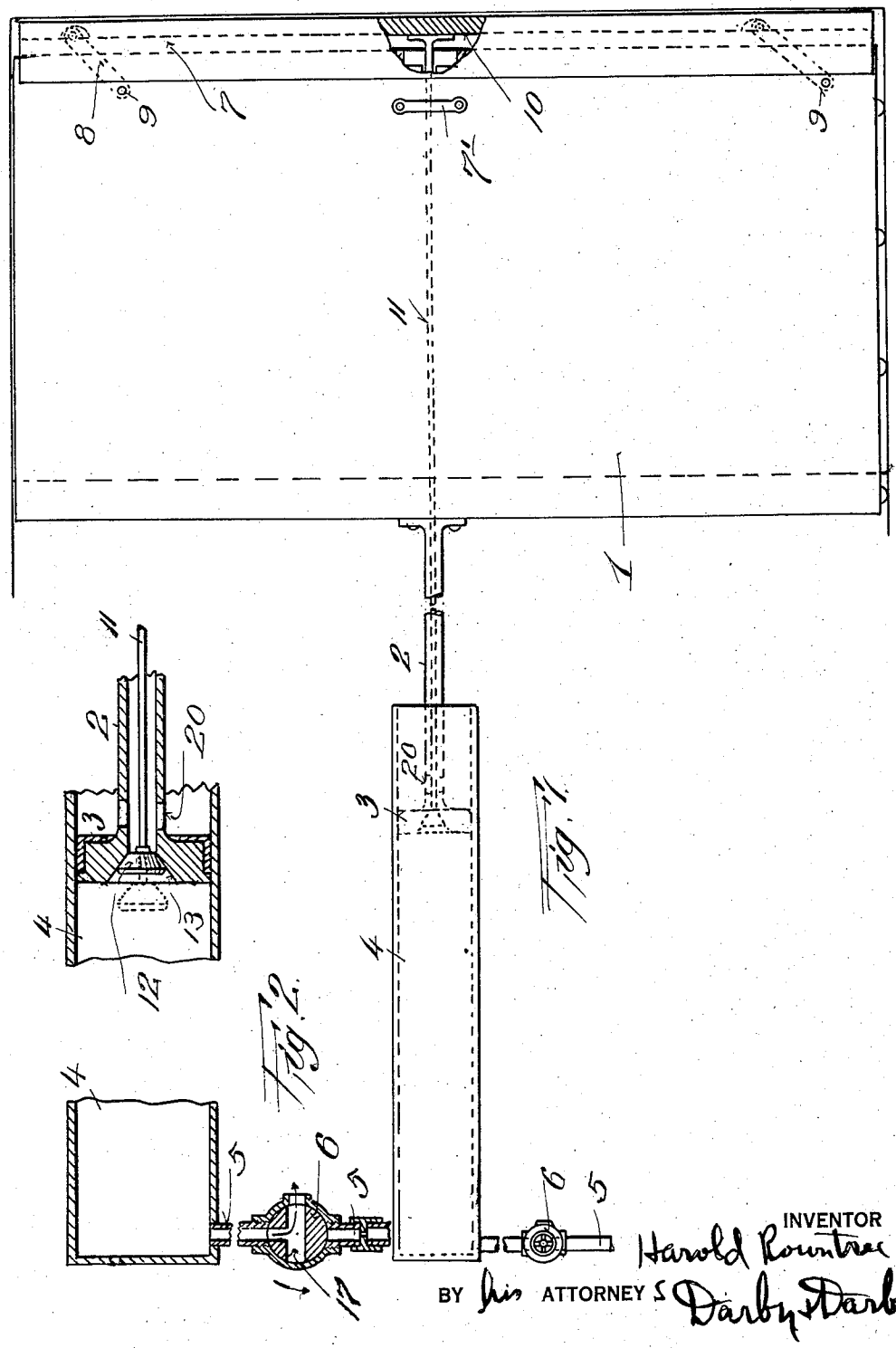


Fig. 1.

Fig. 2.

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Fig. 3.

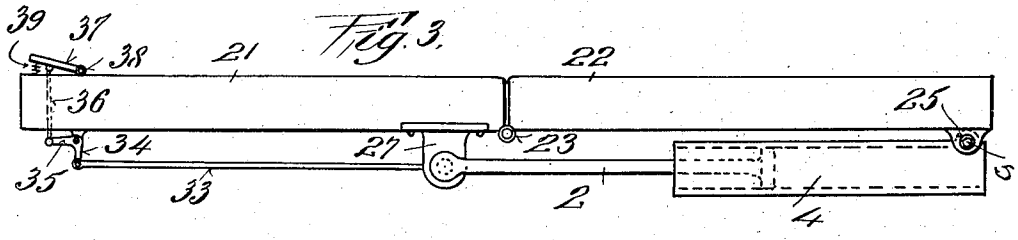


Fig. 4.

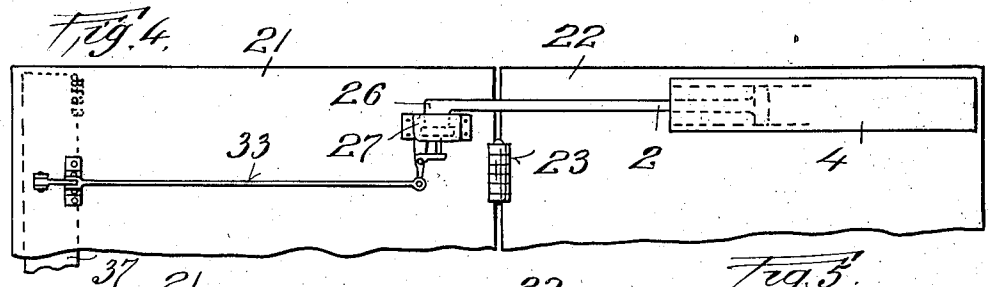


Fig. 5.

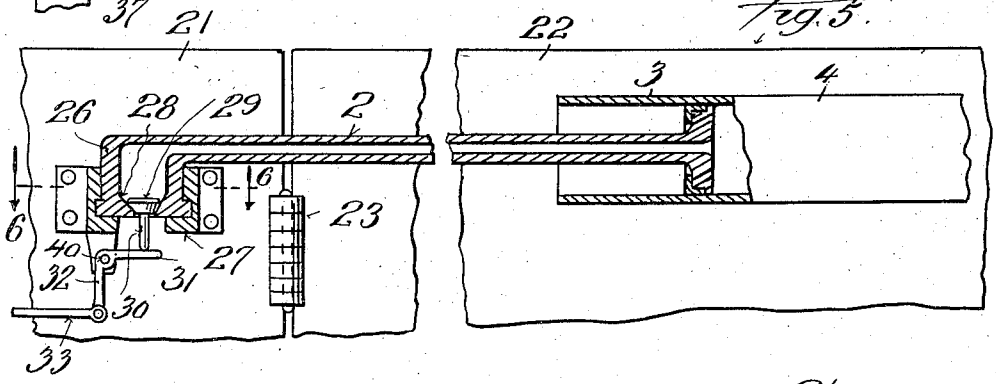
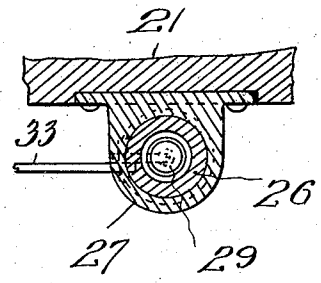


Fig. 6.



INVENTOR

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Patented Mar. 31, 1925. 1,531,626

UNITED STATES PATENT OFFICE.

HAROLD ROWNTREE, OF PASS CHRISTIAN, MISSISSIPPI, ASSIGNOR TO NATIONAL PNEUMATIC COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA.

DOOR-OPERATING MECHANISM.

Application filed October 24, 1921. Serial No. 509,779.

To all whom it may concern:

Be it known that I, HAROLD ROWNTREE, a citizen of the United States, residing at Pass Christian, county of Harrison, and State of Mississippi, have made a certain new and useful Invention in Door-Operating Mechanism, of which the following is a specification.

This invention relates to door operating mechanism, and has for its object the provision of an exceedingly simple means for operating doors, wherein means are provided for insuring safety to the passengers when passing through the doorway through which the door is controlled to prevent injury to passengers should the door be closing during their entrance.

A further object of the invention is to provide power mechanism for effecting the closure of the doors while permitting the doors to be manually opened either by a guard or by a passenger desiring to enter or to leave the car, and wherein means are provided to prevent the door when closing under power from hurting a passenger during its closing movement should a passenger be caught between the door and the jamb.

A further object of the invention is to provide a structure embodying the foregoing features capable for use on either the swinging or the sliding type of door.

Further objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination and relative location of parts all as will be more fully hereinafter set forth, as shown in the accompanying drawing and finally pointed out in the appended claims.

Referring to the drawings,—

Fig. 1 is a view in elevation, largely diagrammatic and partly in section, showing a door and its operating mechanism embodying my invention;

Fig. 2 is a sectional view of the power motor for effecting the door operation embodying my invention;

Fig. 3 is a top plan view showing my invention applied to a door of the swinging type;

Fig. 4 is a front elevation of the same;

Fig. 5 is a view similar to Fig. 4, slightly enlarged, and showing the door motor pressure in section;

Fig. 6 is a sectional view taken on the line 6—6, Fig. 5, looking in the direction of the arrows.

The same part is designated by the same reference character wherever it occurs throughout the several views.

In accordance with my invention as applied first to the sliding door, referring particularly to Fig. 1, the door illustrated at 1 is adapted to slide into its opened and closed position. Secured to the back edge of the door is a rod 2, provided with a piston 3 at the end thereof, operating in the power cylinder 4. The end of the power cylinder 4 is provided with a port communicating with a pipe line 5, which is controlled by a suitable valve, or the like, which in turn is controlled by the motorman or conductor of the car, or the train, as desired. The door is provided with any suitable means, if deemed necessary, for example, a handle 7, to permit the door to be readily opened by a passenger who desires to alight from or board the car. When, however, pressure is supplied through the pipe line 5 and valve 6, into the cylinder 4 behind the piston 3, it will readily be apparent that the door is forced to its closed position under power. The closing movement is prevented from attaining undesirable speed by a restricted port for the entrance of fluid pressure, such as compressed air, to the motor cylinder so that the pressure builds up in the cylinder somewhat gradually and not instantaneously, and as soon as the pressure is sufficient to overcome the inertia and friction of the door the door commences to close, and thereafter until it is fully closed, the motion of the piston in the cylinder enlarges the space available for the fluid pressure so that the pressure upon the piston does not become higher, and the door closes smoothly and without slamming. Should, however, the door be obstructed, for example by a passenger entering or leaving the car, and the obstruction be later removed, the pressure that meanwhile would have built up in the cylinder would slam the door closed, and I have devised a very simple arrangement to overcome this difficulty.

I will now describe the safety mechanism employed in accordance with my invention, to prevent injury to a passenger due to being caught between the door and its jamb when the door is being closed under power. In the form selected for illustration, I provide

the front edge of the door with a shoe 7 which is pivotally suspended therefrom by links 8, whereby the shoe 7 is collapsed relating to the door by the fixed pivot 9 of links 8, when pressure is exerted thereon. Touching the front 10 of the collapsible shoe is a rod 11, which extends through a hollow piston rod 2 (see Figs. 1 and 2) and which is provided at its end with a valve 12, which seats on valve seat 13, formed in the piston 3. The end of the power cylinder 4 nearest the door is open to atmosphere, whereas the opposite end thereof is completely closed, as in Fig. 2. So it will readily be apparent that if the valve 6 is turned in the direction of the arrow, Fig. 2, so that the passage 17 connects the pipe line 5, fluid pressure flows into the cylinder 4 behind the piston 3, forcing the door under power towards its closed position. Now, if during its closing movement the door encounters an obstruction, so that the shoe 7 is collapsed, the rod 11 is forced backwardly, unseating the valve 12 from its seat 13, thereby permitting the fluid pressure, which is admitted into the cylinder 4 through a comparatively small port, to escape through a comparatively larger hollow piston rod 2, and orifices 20 therein, to open atmosphere, so that it will readily be apparent that the fluid pressure is allowed to escape faster than it is admitted to the power cylinder, with the result that the door not only stops its closing movement, but permits of being opened to a still further opened position. However, as soon as pressure on the shoe 7 is removed, so that by gravity, aided by springs, if desired, and necessary, in any well known manner, it assumes its extended position again, the valve 12 will seat on the valve seat 13, thereby shutting off the exhausted fluid pressure from the cylinder 4, whereby the piston again becomes operative due to the pressure admitted to the cylinder 4.

In Figs. 3 to 6, inclusive, I have shown my invention as applied to a door of the swinging type, and more specifically where the door swings outwardly relative to the car body. In this arrangement the door 21 is hinged to the car body 22 in any suitable manner, for example, by means of hinges 23. The power cylinder 4 in this instance, though of similar construction, is hinged at its end as at 25 to the car body 22, and the hollow piston rod 2 is provided with a head 26, rotatively journaled in a bracket 27, carried by the door 21. The head 26 of the hollow piston rod 2 is provided with an interior valve seat 28, on which a valve 29 seats, which valve is provided with a stem 30, depending out of the head 26 of the hollow piston rod. The stem 30 of the valve 29 normally rests against one arm 31 of a bell crank lever, the other arm 32 of which is pivotally connected to the rod 33, which is connected to one arm 34 of the bell crank lever, the other arm 35 of which is pivotally connected with the rod 36, extending through the door and connected to a compressible plate or strip 37 carried at one side edge thereof as at 38, and normally maintained in extended position, for example, by means of a spring 39. The bell crank lever 31, 32, is pivotally mounted as at 40 on the bracket 27. With this arrangement it will be seen that when the door has been opened to its opened position, if fluid pressure is admitted through the pipe 5 to the cylinder 4, the pressure will maintain the valve 29 seated on its seat, and will bear against the piston 3, forcing the door to its closed position. If, however, during its closing movement, it should encounter an obstruction, whereby the strip 37 is pressed to thereby actuate the rod 36, bell crank levers 35, 34 rod 37, bell crank levers 32, 31, the valve 29 will be lifted from its seat against the action of the pressure within the cylinder 4 permitting the fluid pressure in the cylinder 4 to escape through the hollow piston and connecting rod to atmosphere, and as this escape is of larger size than the inlet port or pipe, the pressure is allowed to escape faster than it is being supplied, with the results substantially identical as above outlined in the connections in Figs. 1 and 2. It will be apparent that when the strip 37 is allowed to assume its extended position due to the removal of the obstruction, the valve 29 will be forced to its seat again by the pressure on the cylinder 4, whereby the pressure will again become effective on the piston 3 to move the same out of the cylinder 4 to close the door to its completely closed position.

It will readily be understood that with but slight modification, consisting entirely of re-positioning the parts, the principle herein involved may readily be applied to the swinging doors which open inwardly relative to the car.

It also will readily be apparent that any type of valve for controlling the flow of fluid pressure to the cylinder 4 may be employed. In Fig. 1 I have shown a simple two-way valve arrangement wherein with the valve open in the position of Fig. 2, the cylinder 4 is open to exhaust which permits the rapid opening of the door manually. When the valve is turned in the direction of the arrow, so that the piston 17 extends between the pipes 5, the communication to exhaust is shut off, and communication is obtained between the pipes 5.

It will also be apparent that each door may be separately controlled, or two or more doors, or all of the doors on a car may be controlled simultaneously, or the doors on two or more cars or on all of the cars of the train may be controlled simultaneously

so that all controlled doors that are open will start to close when the control valve is moved to closing position, but only the closing of any particular door obstructed is eased up, and as soon as the obstruction is removed the closing movement of the door is completed. It is manifest also that if desired any of the well known forms of locks or signals can be used in conjunction with my invention whereby the passengers can be prevented from opening the door until the train stops or until the guard liberates them by a suitable lock, or whereby the closing or locking shut of the door will be signaled to the motorman.

Many modifications and changes in detail will readily occur to those skilled in the art without departing from the spirit and scope of my invention, but having now set forth the objects and nature of my invention, and having shown and described structures embodying the principles thereof, what I claim as new and useful and of my own invention and desire to secure by Letters Patent is:

1. In a door operating mechanism, and in combination with a door, means for permitting the manual opening of the door, and power means for closing the door and means actuated by the door encountering an obstruction during its closing movement for rendering said power means inoperative to further close the door without shutting off the power medium to said power means.

2. In a door operating mechanism, and in combination with a door, means for permitting the manual opening of the door, and a pneumatic motor for closing the door, and means actuated by the door encountering an obstruction during its closing movement for rendering said motor inoperative to further close the door without shutting off the supply of fluid pressure to said motor.

3. In a door operating mechanism, and in combination with a door, means for permitting the manual opening of the door, and a pneumatic motor for closing the door, a port for supplying fluid pressure to said motor to actuate the same to close the door, an exhaust opening from the motor of a size larger than said supply port, and means actuated by the door encountering an obstruction during its closing movement for controlling said exhaust opening.

4. In a door operating mechanism, and in combination with a door, means for permitting the manual opening of the door, and a pneumatic motor for closing the door, a port for supplying fluid pressure to said motor to actuate the same to close the door, an exhaust opening from the motor of a size larger than said supply port, and means actuated by the door encountering an obstruction during its closing movement for opening said exhaust opening.

5. In a door operating mechanism, and in combination with a door, means for permitting the manual opening of the door, and a pneumatic motor for closing the door, a port for supplying fluid pressure to said motor to actuate the same to close the door, an exhaust opening from the motor of a size larger than said supply port, and means actuated by the door encountering an obstruction during its closing movement for opening said exhaust opening, and means actuated by the removal of the obstruction to the door for closing said exhaust opening and thereby again rendering said motor operative to continue the closing of the door.

6. The combination with a door, a power cylinder open at one end and closed at the other, a piston operating in said cylinder and having a piston rod extending through the open end of said cylinder and connected to the door, a supply port at the closed end of the cylinder for supplying fluid pressure thereto, and an exhaust opening through said piston, a valve for controlling said opening, and means controlled by the door encountering an obstruction during its closing movements for controlling said valve.

7. The combination with a door, a power cylinder open at one end and closed at the other, a piston operating in said cylinder and having a piston rod extending through the open end of said cylinder and connected to the door, a supply port at the closed end of the cylinder for supplying fluid pressure thereto, and an exhaust opening through said piston, a valve for controlling said opening, and means controlled by the door encountering an obstruction during its closing movements for opening said valve, and means actuated upon the removal of the obstruction for closing said valve.

8. The combination with a door, a power cylinder open at one end and closed at the other, a piston operating in said cylinder and having a piston rod extending through the open end of said cylinder and connected to the door, a supply port at the closed end of the cylinder for supplying fluid pressure thereto, and an exhaust opening through said piston of a size larger than said supply port, a valve for controlling said opening, and means controlled by the door encountering an obstruction during its closing movements for controlling said valve.

9. The combination with a door, a power cylinder open at one end, and closed at the other, a piston operating in said cylinder and having a hollow piston rod extending from said piston and the open end of said cylinder and connected to said door, a supply port at the closed end of the cylinder, and an exhaust opening communicating with the interior of said hollow piston rod, a valve for controlling the passage of pressure from said cylinder through said piston

rod to exhaust, and means controlled by the door encountering an obstruction during its closing movement for controlling said valve.

10. The combination with a door, a power cylinder open at one end and closed at the other, a piston operating in said cylinder and having a hollow piston rod extending from said piston and the open end of said cylinder and connected to said door, a supply port at the closed end of the cylinder, and an exhaust opening communicating with the interior of said hollow piston rod, a valve in said piston for controlling the passage between said cylinder and said hollow piston rod, a collapsible shoe carried by the front edge of the door, and a rod secured at one end to said shoe, and extending through said hollow piston and secured at its other end to said valve.

11. In a door operating mechanism, and in combination with a door, means for permitting the manual opening of the door, power means for closing the door, and means actuated by the door encountering an obstruction during its closing movement for reducing the closing pressure of said power means.

12. In a door operating mechanism, and in combination with a door, means for permitting the manual opening of the door, a pneumatic motor for closing the door, and means actuated by the door encountering an obstruction during its closing movement for reducing the closing pressure of said power means.

13. In a door operating mechanism, and in combination with a door, means for permitting the manual opening of the door, a pneumatic motor for closing the door a port for supplying fluid pressure to said motor to actuate the same and close the door, an exhaust opening from the motor, and means actuated by the door encountering an obstruction for controlling the said exhaust opening.

14. In a door operating mechanism, and in combination with a door, means for permitting the manual opening of the door, a pneumatic motor for closing the door, a port for supplying fluid pressure to said motor to actuate the same to close the door, an exhaust opening from the motor, and means actuated by the door encountering an obstruction during its closing movement for opening said exhaust opening.

15. The combination with a door, a power cylinder open at one end and closed at the other, a piston operating in said cylinder and having a hollow piston rod extending from said piston and the open end of said cylinder and connected to said door, a supply port at the closed end of the cylinder, an exhaust opening communicating with the interior of said hollow piston rod, a valve for controlling the passage of fluid pressure from said cylinder through said piston rod to exhaust, a collapsible shoe carried at the front edge of the door, and means operated by the depression of the shoe for opening said exhaust valve.

In testimony whereof I have hereunto set my hand on this 22nd day of October, A. D., 1921.

HAROLD ROWNTREE.