

May 26, 1931.

A. T. DUPONT

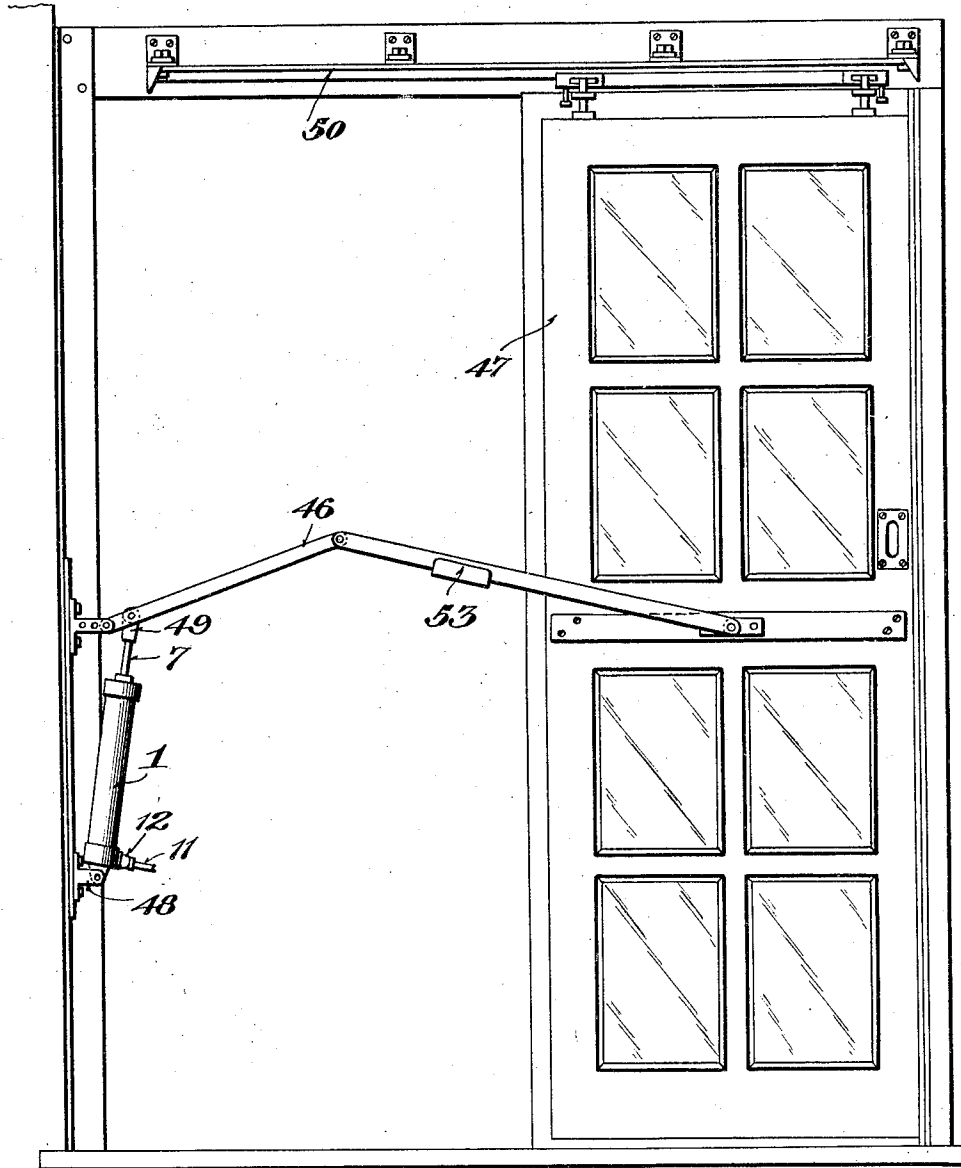
1,807,284

CHECKING MEANS FOR DOOR OPERATING MECHANISM

Filed May 16, 1929

2 Sheets-Sheet 1

Fig.1.



INVENTOR

Andrew T. Dupont

May 26, 1931.

A. T. DUPONT

1,807,284

CHECKING MEANS FOR DOOR OPERATING MECHANISM

Filed May 16, 1929

2 Sheets-Sheet 2

Fig. 2

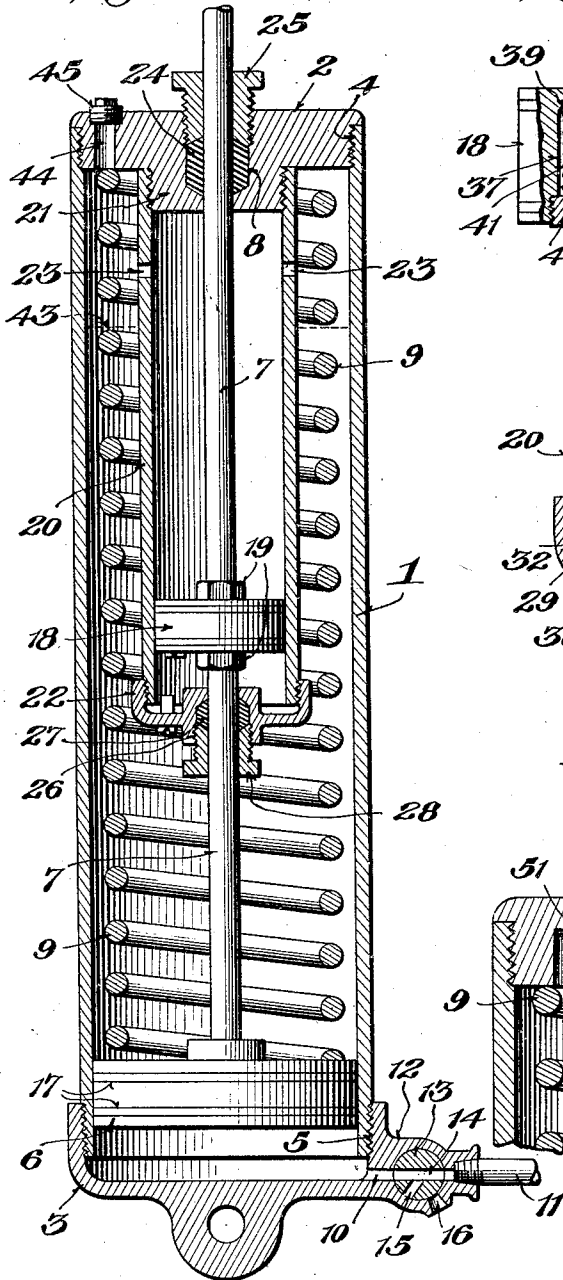


Fig. 3.

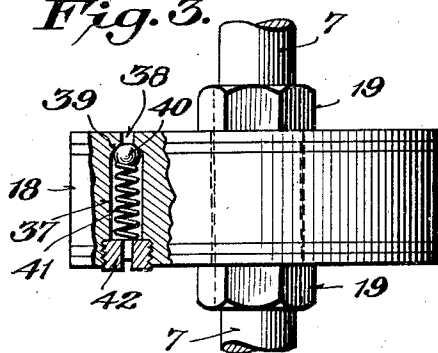


Fig. 4.

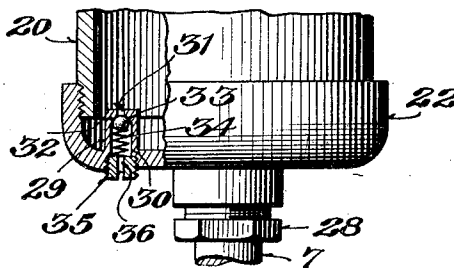
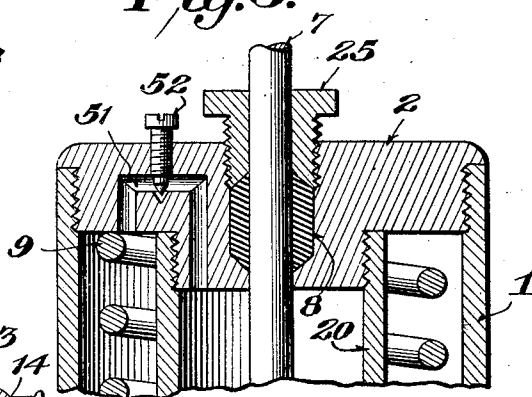


Fig. 5.



INVENTOR

Andrew T. Dupont

UNITED STATES PATENT OFFICE

ANDREW T. DUPONT, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO ELEVATOR SUPPLIES CO., INC., OF HOBOKEN, NEW JERSEY, A CORPORATION OF NEW JERSEY

CHECKING MEANS FOR DOOR OPERATING MECHANISM

Application filed May 16, 1929. Serial No. 363,674.

The present invention relates to a door operating mechanism, and more particularly to mechanism in which cushioning action is attained during the movements thereof.

5 In the operation of doors, it is essential that the closing movement of the door be accomplished with a yieldable force and with a speed such that the momentum attained by the door will not be sufficient to close 10 the door against persons or objects in its path. In the opening of the door, however, there is little danger in a rapid initial movement of the door and it is only necessary to cushion the last portion of the opening 15 movement in order to prevent slamming of the door and injury to the door operating mechanism.

20 The present invention aims to provide yieldable cushioning means operative during the whole duration of the closing movement of doors and the like, which means will also permit a quick opening movement of the doors but will substantially retard the last portion of the opening movement.

25 Another object of the present invention is to provide a door operating mechanism having cushioning means operating with a liquid for the opening and closing movement of the door.

30 A further object of the invention is to provide a mechanism for operating doors and similar devices which shall be simple in operation and in which the parts of the mechanism are readily accessible to be easily 35 regulated, and which may be maintained in operating condition with a minimum of care and attention.

40 With these and various other objects in view, the invention comprises the various features hereinafter claimed and fully described in connection with the accompanying drawings, in which:

45 Figure 1 is a view of the device embodying the invention showing the manner of at-

tachment in operative position to the toggle lever of an elevator door mechanism;

Figure 2 is a section of the device embodying the features of the invention;

Figures 3 and 4 are sections of some of 50 the parts constituting the invention;

Figure 5 is a partial section showing a modification of the invention.

One form of my invention comprises a cylindrical casing 1, having an upper head 55 2 and a lower head 3, which may be attached to the casing by screw threaded connections 4 and 5. Within the casing 1 is a piston 6 to which a piston rod 7 is connected and which passes upwardly through an opening 60 8 in the upper cylinder head 2. Surrounding the piston rod 7 and between the piston 6 and the cylinder head 2 is a helical spring 9. This spring is adjusted in position so as to be under tension and serves to return 65 the piston to the lower end of the cylinder after operation of the piston by means of pressure fluid. Means are provided for admitting compressed fluid below the piston 6 through a port 10 in the cylinder head 3, 70 the pressure fluid being admitted from a pipe 11 attached to the cylinder head 3, through a valve casing 12 which may be formed integral, if desired, with the cylinder head 3. In the valve casing 12 is a 75 valve 13 having a passageway or port 14 therein for admission of pressure fluid. When the valve 13 is turned so that the port 14 registers with the pipe 11 and with the 80 port 10, pressure fluid is admitted to the cylinder. In the valve 13 is a second passageway or port 15 which is preferably smaller than the port or passageway 14 and which leads from the central portion of the 85 passageway 14 radially outwardly to the periphery of the valve. At a suitable point in the valve casing 12 is a port opening 16 with which the passage 14 registers when the valve is turned so that the passage 15 90

registers with the port 10 to permit exhaust from the cylinder.

Any suitable means may be employed for operating the valve 13, either manually or automatically, upon the arrival of the elevator at the landing. For a fuller illustration of automatic, electric, pneumatic and electro-magnetic means for producing such operation of the valve automatically upon the arrival of the elevator at the landing, reference may be had to Patent No. 1,565,143, granted to Harold J. Fear, December 8, 1925, and to other patents in the elevator art. Such devices have not been illustrated in the drawings accompanying this application, but it is to be understood that the parts illustrated are intended to be used in connection with one or more of such devices.

The piston 6 is provided with suitable packing rings 17 so as to prevent passage of fluid or liquid from one face thereof to the opposite face.

In order to provide for cushioning action during both strokes of the piston 6 corresponding to the opening and closing of the door, I make use of an additional piston or plunger operating with a liquid to check the movements of the main piston 6 in both directions. The cushioning means comprises the auxiliary piston 18 mounted on an enlarged threaded portion of the piston rod 7 and securely held thereon by means of the nuts 19. Cooperating with piston 18 is a cylinder 20, threadedly attached at its upper end to a screw threaded boss 21 integral with and depending from the upper cylinder head 2, and provided at its lower end with a lever closing head 22, threaded thereon. Cylinder 20 is provided with a series of circularly disposed openings 23, for a purpose to be explained later.

In order to prevent leakage of the checking fluid around the rod 7 where the latter extends into the cylinder 20, suitable packing means is provided. For this purpose suitable packing material 24 is placed in the opening 8, around rod 7 and a threaded gland 25 permits the pressure on the packing to be varied. The cylinder head 22 has a hollowed out portion 26 in which compressible packing material 27 is placed, and the threaded gland 28, similar to gland 25, keeps the packing tightly against the rod 7.

The lower closing head 22 for the inner cylinder 20, is provided with one or more bosses 29, shown in Figure 4, having a differential bore therethrough. The larger bore is shown at 30 while the smaller bore is indicated at 31. The junction of these bores forms a conical seat 32 for a ball valve 33 held thereagainst by means of a spring 34 resting on an externally threaded nut 35, threaded into the cylinder head 22. The pressure of spring 34 against the ball valve 33 may be varied by means of the threaded

nut 35. This nut 35 is provided with an axial passage 36 by means of which the hollow bores of the bosses 29 may be placed in communication with the atmosphere.

The piston 18, Figure 3, is also provided with one or more differential bores 37, 38, forming a seat 39 for a ball valve 40, pressed thereon by means of a spring 41 resting on a threaded plug 42 threaded into the under side of the piston 18.

In order to attain proper cushioning action in the movements of the piston 6 and the parts operatively connected thereto, a liquid, such as oil or glycerine, is maintained in the cylinder 1 above piston 6 to a level indicated at 43, such that a suitable distance separates the oil level from the openings 23 in cylinder 20 when the piston is at the bottom of the door closing stroke. This position is shown in Figure 1.

Any suitable means may be provided for placing liquid in the cylinder 1, such, for example, as the opening 44 in the upper cylinder head 2, normally closed by a threaded filling plug 45.

In the operation of the device, as applied, for example, to the usual hand operated levers 46 of an elevator door 47, the device may be supported by means of a suitable bracket 48 attached to the elevator hatchway, and may be connected to the toggle lever through a lug 49 attached to the piston rod 7 and to the said lever. The elevator door is supported, as shown in the drawings, on an overhead track 50 in the ordinary manner.

The operation of the device is as follows:

When it is desired to open the elevator door, pressure fluid is admitted to the cylinder 1 by turning the valve 13 in position for admission, as shown in Figure 2 of the drawings. Pressure fluid enters the cylinder 1 through the port 10 and forces the piston 6 upwardly against the tension of the spring 9. The auxiliary piston 18 attached to the piston rod 7 moves upwardly in cylinder 20 with the movement of piston 6. The oil or other liquid within cylinder 1 is gradually forced upward until its level reaches the ports 23 in the wall of cylinder 20 at which time it is forced inside of the cylinder 20, above piston 18. The joint movement of pistons 6 and 18 will be free and unimpeded until the oil fills completely the space between piston 6 and head 2 and that between piston 18 and boss 21. From this time on the only escape for the oil in cylinder 1 is through openings 23, cylinder chamber 20, and bores 38 and 37 in piston 18, to the under side of the said piston. The pressure of the oil as the pistons 6 and 18 continue to ascend forces the ball valves to move away from their seat, allowing a restricted flow of oil therearound and slowing up the stroke of the pistons considerably

until completion of the door opening movement. The oil by passed from the upper side of piston 18 to the under side thereof fills up the space between the piston 18 and the cylinder head 22.

As long as the pressure fluid is operating upon the piston 6, the elevator door remains in open position. When it is desired to close the door, the valve 13 is turned so that the port or passage 15 registers with the port 10 and the passageway 14 registers with the exhaust opening 16. In this position exhaust takes place from the cylinder 1 through the port 10, passage 15, passage 14 and opening 16 to the atmosphere. During the return movements of pistons 6 and 18, the oil trapped in cylinder 20 between piston 18 and cylinder head 22, forces the valve or valves 40 tightly on their seat and causes the opening of valve or valves 33, so that a restricted passage is provided for the oil from cylinder 20 into cylinder 1 through the passages 31 and 30. The complete return or closing stroke of the door is thereby considerably slowed up and cushioned so that ample time will be provided for the removal of persons or objects from the door's path, avoiding injury to the same. In addition, slamming of the door is also avoided.

It will be noted that the ball valves 33 in cylinder head 22 not only cause a restricted flow of the checking fluid while pistons 6 and 18 are moving downwardly, but they also prevent direct passage of the checking fluid from cylinder 1 to cylinder 20 when the pistons 6 and 18 move upwardly, by being forced tightly on their seat at this particular time.

Instead of providing openings 23 through the wall of cylinder 20 to allow passage of the oil from cylinder 1 to cylinder 20, a channel or channels 51 may be cut into the upper cylinder head 2, as shown in Figure 5, for the purpose of placing the cylinders in communication. If desired, a needle valve 52 may be placed into such channel or channels for the purpose of controlling the size of the passage so that a further control on the degree of cushioning may be obtained for the opening movement of the door.

It will be understood that the sizes of the cylinders 1 and 20, as well as the location of ports 23 and the volume of the checking fluid employed, are judiciously chosen so that a suitable performance of the device will be had, and that various changes and modifications may be made in the device without departing from the spirit or scope of the invention as defined in the claims.

For instance, the actuation of piston 6 by means of pressure fluid may be wholly dispensed with, in which case the valve 13 is turned in the above described position for

placing the space below piston 6 in connection with the atmosphere, and the door toggle 46 is directly operated by the elevator attendant by means of a suitable handle 53. In this event, the device above described operates entirely as a door cushioning means.

Having thus described the invention, what is claimed as new is:

1. In a mechanism for controlling the movements of a door, a door, a member connected to the door, means for varying the rate of movement of said member while the door moves in one direction, and means controlled by said member for impeding the movement of said member while the door moves in the opposite direction.

2. In a mechanism for controlling the movements of a door, a door, a member connected to said door, means for causing an initial free movement of said member and a final impeded movement of said member while the door moves in one direction, and means controlled by said member for retarding the movement of said member when the door moves in the opposite direction.

3. In a mechanism for controlling the movements of a door, a door, a member connected to the door, means for varying the rate of movement of said member while the door moves in one direction, and means controlled by said member for impeding the entire movement of said member while the door moves in the opposite direction.

4. In a mechanism for controlling the movements of a door, a door, a member connected to said door, means for causing an initial free movement and a final impeded movement of said member while the door moves in one direction, and means controlled by said member for retarding the entire movement of said member when the door moves in the opposite direction.

5. In a mechanism for controlling the movements of a door, a door, a member connected to the door and movable therewith in two opposite directions, and liquid check means operative to retard the last portion only of the movement of said member in one direction and to retard the entire movement of said member in the opposite direction.

6. In a door check, a plurality of cylinders, a piston in each of said cylinders, a checking fluid in one of said cylinders, means for admitting the checking fluid from said cylinder to the other, and means for enforcing the return of the checking fluid to the first cylinder along a constrained path.

7. In a door check, a plurality of cylinders, a piston in each of said cylinders, a checking fluid in one of said cylinders, means providing a path for the checking fluid from the last mentioned cylinder to

the other cylinder and from the latter back to the first, and means to cause the flow of the fluid through said path always in the same direction.

5 8. In a door check, a plurality of cylinders, a piston in each cylinder, a checking fluid in one of said cylinders, and means for establishing a path for the checking fluid from the last mentioned cylinder to the
10 other cylinder on one side of the piston therein, and from the other side of said piston to the cylinder containing the checking fluid.

9. In a door check, as set forth in claim 8,
15 means for insuring the flow of the checking fluid in one direction only.

10. In a door check, coaxial cylinders and pistons therein, a common rod for said pistons, checking fluid in one of said cylinders,
20 and means for by passing the checking fluid from one of said cylinders to the other and back to the first cylinder.

11. In a door check, as set forth in claim 10, means for causing the flow of checking
25 fluid in one direction only.

12. In a door check, a cylinder, a second cylinder wholly within said first cylinder, differential pistons in said cylinders having a common piston rod, means for allowing
30 free initial movement of said pistons in one direction, means for retarding the last portion of said movement, and means for retarding the movement of said pistons in the opposite direction.

13. In a mechanism for controlling the movements of a door, a main cylinder, a
35 main piston therein, an auxiliary cylinder in said main cylinder, an auxiliary piston therein, a common rod for both pistons,
40 means for connecting the piston rod to the door, a checking fluid in the main cylinder, means for forcing the fluid from the main cylinder to the auxiliary cylinder when the pistons make an outward stroke, means for
45 impeding the flow of the checking fluid as the pistons near the end of their outward stroke, means for by passing the checking fluid from the auxiliary cylinder to the
50 main cylinder when the pistons accomplish their inward stroke, and means for impeding the flow of the checking fluid during the whole of the inward stroke.

14. In a mechanism for controlling the movements of a door, a member connected
55 to the door, means for moving said member at a relatively high speed to open the door, means for moving said member in the reverse direction to close the door, and
60 means controlled by said member for preventing said member attaining as high a speed at any point in the closing movement as is attainable in the opening movement.

15. A mechanism for controlling the
65 movements of a door as set forth in claim

14, wherein the preventing means include a liquid dashpot.

16. In a mechanism for controlling the movements of a door, a door, hollow casing, a member connected to the door, means for
70 varying the rate of movement of said member while the door moves in one direction and means for impeding the movement of said member while the door moves in the
75 opposite direction, all of the above mentioned means being enclosed within said casing.

In testimony whereof I affix my signature.
ANDREW T. DUPONT.

80

85

90

95

100

105

110

115

120

125

130