

June 19, 1934.

H. ZARAFU

1,963,430

ELEVATOR DOOR CONTROL

Filed April 14, 1930

2 Sheets-Sheet 1

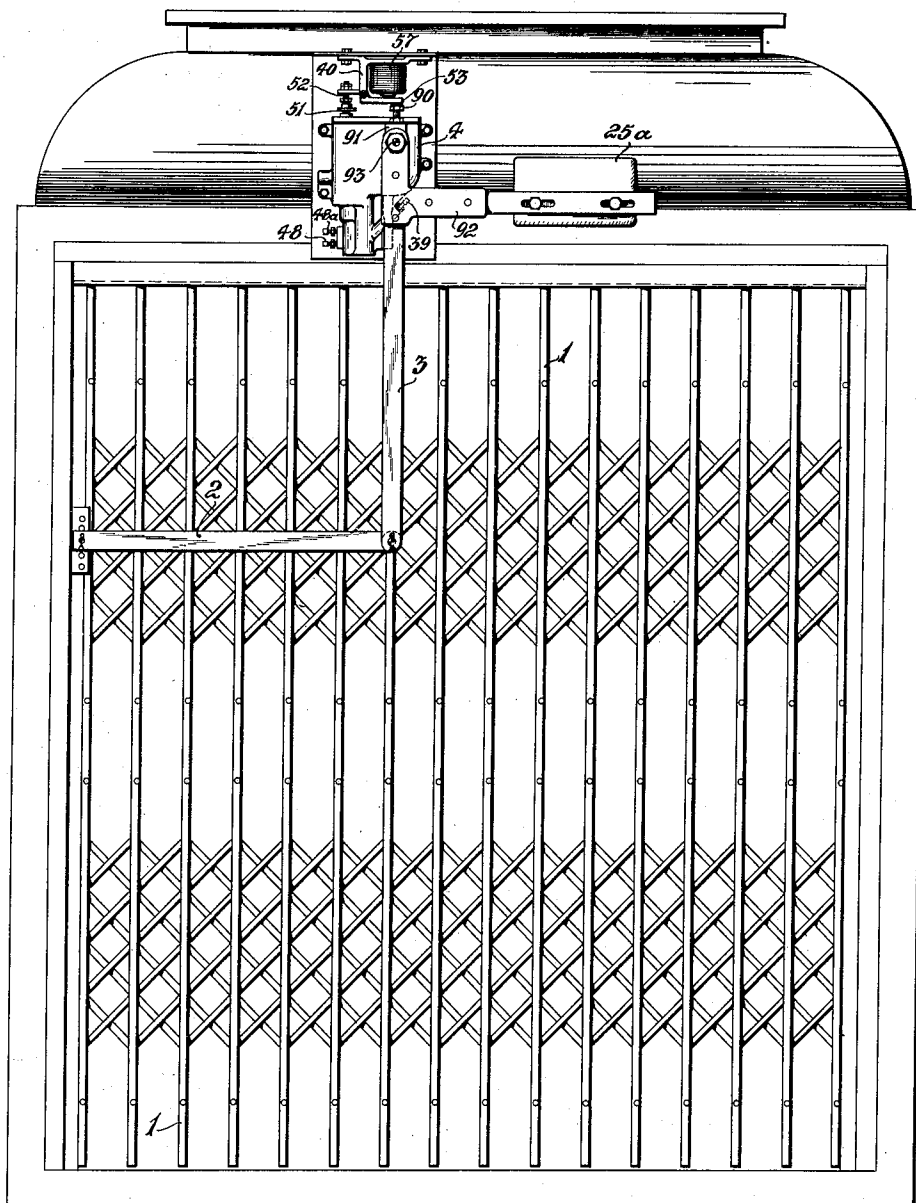


FIG. 1

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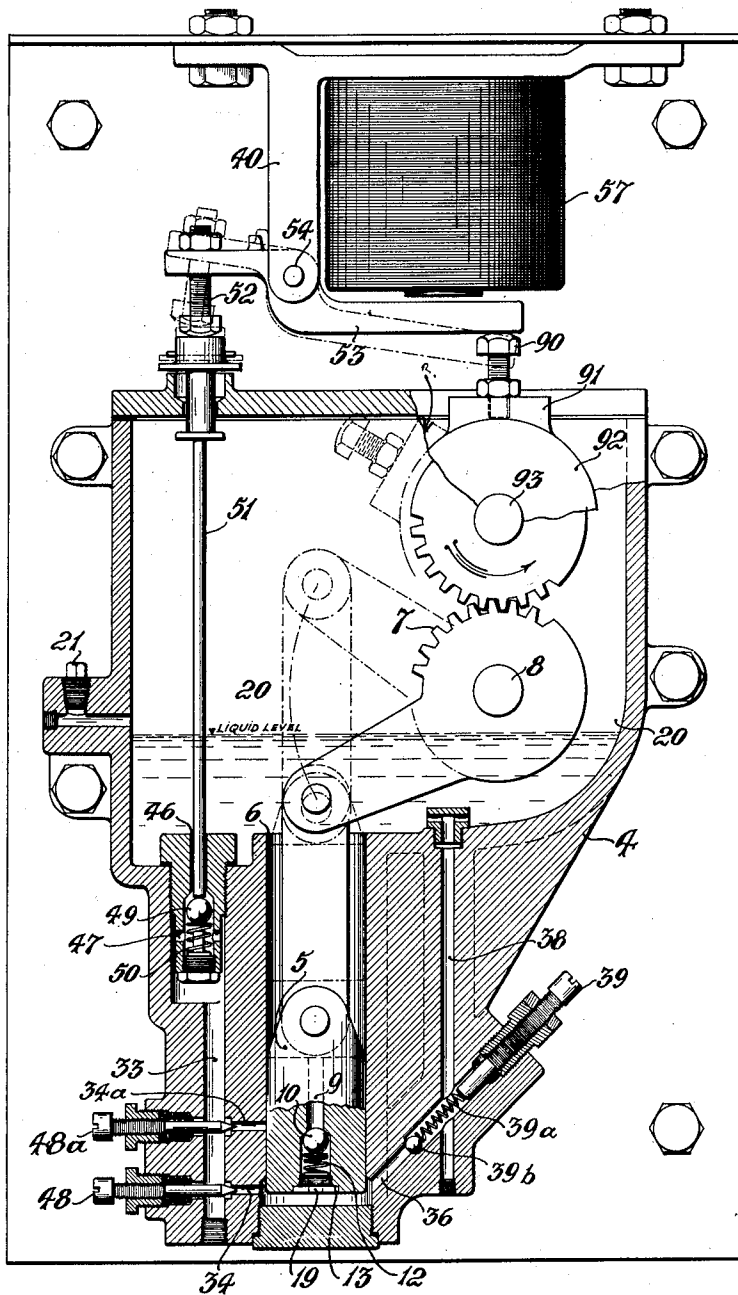
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2 Sheets-Sheet 2



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1,963,430

ELEVATOR DOOR CONTROL

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Application April 14, 1930, Serial No. 444,044

7 Claims. (Cl. 16—82)

This invention relates to elevator door closing and controlling means and particularly to elevator doors or gates provided with auxiliary means for either retarding the closing movement of the door or positively preventing a closing movement of the door, either for a definite or indefinite length of time.

Such devices, as illustrated in the United States Letters Patents of Cyrus W. Bassett, Nos. 1,709,301 and 1,849,417, usually comprise in combination with a self-operating door closer and check unit, improved means for preventing the closing of the associated door or doors through the operation of said door closer and check until such time as it is desired to permit a closing movement of the door.

Such means may take the form of a restraining device constituting an auxiliary checking unit which is capable of preventing the regular functioning of the door closer and check through the instrumentality of exercising a restraint on the movement of the body of fluid provided for the main checking unit.

The invention herein disclosed constitutes an improvement upon previous devices of this kind, providing a single self-contained unit which greatly simplifies the construction without in any way decreasing the efficiency obtained by the use of the former devices of this character.

A further feature of the present invention is the provision of a simplified checking device which is extremely positive in its action and which will continue to operate uniformly with practically no attention for long periods of time.

Other objects and advantages lie in the improved construction of the parts entering into such apparatus and will be apparent from the following description of the preferred embodiment, illustration of which is presented in the accompanying drawings, wherein like reference characters refer to like parts throughout the several views.

By way of illustration of the application of the novel apparatus I have shown the same as it appears when installed for operation of a sliding door, or gate, such as an elevator gate, but it is to be understood that the apparatus is equally capable of application to the operation of other types of doors or closures, including swinging doors, hatch closures and the like.

Referring to the drawings—

Figure 1 is an elevational view of the apparatus of this invention as it appears when associated with a sliding gate.

Figure 2 is a vertical view, partly in section,

showing the novel parts of the apparatus of Figure 1.

In the drawings reference character 1 designates a sliding gate of the collapsible type often used on elevators, but also used for other purposes. As shown, the gate is provided with a pair of operating arms 2 and 3 connecting the gate with a closing and checking unit designated generally by reference character 4 and preferably comprising, as shown best in Figure 2, the plunger 5 reciprocable in the bore 6 of the unit 4 and operatively connecting with a gear 7 mounted on a shaft 8 and having suitable provisions thereon for rigid connection to the gate operating arm 3.

As shown best in Figure 2, the plunger 5 is preferably provided with an axial passage 9 extending through its entire length and having an enlarged bore at the lower end serving for the retention of a ball valve 10. The downward movement of the ball valve 10 is limited by the provision of the spring 12 adjustably held in place by the threaded plug 13.

In the upper portion of the unit 4, there is a chamber 20 serving as a housing for the gears 7 and the associated parts and also serving for the retention of suitable cushioning fluid, such as oil or glycerine. In the preferred embodiment the chamber 20 is normally filled with this cushioning fluid to a point just below the filling plug 21.

Means are provided for suitably controlling the movement of the cushioning fluid from the path of the plunger 5 as it moves in either direction. As shown, this means comprises a pair of longitudinal passages 38 and 33 adapted to connect with the lower end of the bore 6 of the unit. The escape of cushioning fluid through the passage 35 is controlled preferably by the provision of a regulating screw 39, by means of which the stress on spring 39a is adjusted, this adjustment determining the liquid pressure necessary to unseat ball 39b and thereby permit a forced movement of the plunger 5 and consequently of the gate 1.

In addition to providing for a forced movement of the gate 1, the means just described operates to prevent any closing movement of the gate from any point between nearly closed and full open position until such time as the occasion warrants permitting the closing movement of the gate. This condition is brought about by tightening the adjusting screw 39 to such an extent that the stress placed upon the spring 39a tends to hold the ball 39b firmly upon its seat notwithstanding the pressure brought to bear through the medium of the cushioning fluid by the door closing weight 25a. In fact, the differ-

ence of pressure in favor of the spring 39a is preferably great enough to necessitate the expenditure of considerable muscular effort by the person desiring to force the gate 1 to its closed position although not so great as to make such a method of closing the door too difficult for accomplishment by the average person.

With the spring 39a so adjusted, the gate 1 may be moved from its open position to closed position by the expenditure of the muscular effort required in cases where a person seeking to close the door is unaware of the simpler means provided for such purpose and involving the electro-magnet 57, the method of control of which remains to be described. When the person seeking to close the gate has applied sufficient muscular energy to the task, the additional pressure thus brought to bear through the medium of the cushioning fluid upon the undersurface of the ball 39b will cause a sudden upward movement of the ball thereby permitting the gradual escape of the cushioning fluid up through the passages 36 and 38 and back into the central chamber 20. So long as the operator continues to exert his muscular force against the gate, the ball 39b will remain off its seat and the resultant flow of the oil or other cushioning fluid will permit the descent of the plunger 5 and into the position it occupies when the gate 1 is fully closed. As soon as the operator ceases to apply his muscular force the overbalancing stress in the spring 39a will again force the ball 39b firmly upon its seat thereby cutting off further communication through the passage 38.

When it is desired to open the gate, the exertion of a comparatively small amount of force upon the gate will overcome the opposition of the weight 25a and will permit an upward movement of the plunger 5, and a resultant flow of the cushioning fluid through the passages 9 and 19. In practice, passage of the cushioning fluid through such passages may be made rapid or slow, depending upon the tension on spring 39a.

The gate 1 having reached its open position due to the movement of the plunger 5 in the path just described, it will be maintained in this open position until some further positive act takes place at the instigation of a person desiring to close the gate and use the elevator. Such act may be either the exertion of the required amount of physical force as above explained, or it may be the simpler expedient of pressing the button or other circuit closing device provided at each floor as well as within the elevator for controlling the energization of the electro-magnet 57. These circuits to the electro-magnet 57 are not shown in the accompanying drawings for the reason that the description and illustration thereof in the aforesaid Bassett Patent No. 1,709,301 is to be understood as a part of this disclosure just as though incorporated herein.

As shown the passage 46 is provided with a ball valve 49 normally closing said passage, suitable means such as spring 50 being provided for maintaining the ball in passage closing position. Means are provided for opening the passage 46 against the normal tendency of spring 50. As shown such means comprise the flat headed pin 51 and the striker 52 normally resting on the head of pin 51 and capable of forcing the latter downwardly to force the ball 49 from its normal position. The preferred means for causing downward motion of the striker 52 comprises a rocker arm 53 pivoted to the frame 40 by suitable means as pin 54. The rocker arm 53 which

rests in the dash line position shown in Fig. 2 when the gate 1 is open, has associated therewith means for causing its movement into the position shown in full lines in Fig. 2. As shown this means comprises a solenoid 57 mounted by suitable means on the frame 40.

With the foregoing construction it is apparent that no movement of the plunger 5 from the position shown in dash lines in Fig. 2 can occur (assuming that the regulating screw 39 is adjusted so as to provide an over-balancing stress in the spring 39a as above explained) until such time as the ball valve 49 is removed from its closed position which it occupies by virtue of the pressure exerted by spring 50. In the meantime, the body of fluid beneath the plunger 5 has no avenue of escape, the passage 36 being completely blocked by the ball 39b and the passage 47 by the ball 49. The plunger 5 is therefore held in the upper position shown in dash lines in Fig. 2 or in whatever position it attained on the opening movement—the gate may not have been fully opened—and cannot move the slightest distance downwardly until one or the other of these ball valves is removed from its seat.

Upon energization of the solenoid 57 the bumper 52 is swung, thereby forcing the pin 51 downwardly and pushing the ball 49 away from its seat. When the ball 49 has thus been forced from its seat the cushioning fluid formerly trapped beneath the plunger 5 can now escape through the passage 47 at a rate dependent upon the adjustment of the regulating valve 48. The fluid after passing upwardly through the passage 33 enters the chamber 20. The plunger 5 accordingly descends into the path vacated by the by-passed fluid and in response to the urge of the closing weight 25a; the speed of movement and hence the speed of the door in closing depending upon the adjustment of the regulating valve 48.

As shown in Figures 1 and 2, means are provided for postponing the effectiveness of the electrically controlled closing means just described until the door has reached a predetermined point in its opening movement, such point being preferably at a distance approximately equal to the width of the body of the average person. As shown in these figures, such means comprises a knob 90 shown here in the form of an adjustable cap screw secured to boss 91 on crank 92 and normally resting against the under surface of the arm 53, the crank 92 being mounted on the shaft 93 of gear 7 and adapted to be rotated as the gate operating arms 2 and 3 swing back and forth with the gate. The parts are shown in Figures 1 and 2 as they appear with the gate fully closed while the positions of the parts when the door is open are shown in dash lines. From an inspection of these figures, it is evident that the first portion of the door's opening movement carries the knob 90 out of engagement with the arm 53 thereby permitting the latter to move to the position shown in dash lines in Fig. 2 in which position the pin 51 is free to move upwardly, the pin being lifted by the force of the spring 50.

From this point on to the full open movement of the gate the parts just referred to remain in the dash line positions indicated in Fig. 2 and the ball 49 remains firmly seated by the pressure exerted by spring 50. The parts will remain in such positions until again forced to the full line positions either by energization of the solenoid 57 or by the return motion of the crank 92 as the latter returns to the full line position of Fig. 2

in response to the closing of the gate by the action of the alternative closing means previously described.

The provision of the additional by-pass 34a and needle valve 48a makes it possible to obtain two speeds of movement in closing, the last portion of the stroke being retarded by the cutting off of the first by-pass.

From the foregoing description it is evident that a door or gate controlling mechanism has been provided, which, through the utilization of a single body of fluid contained in a single unit can be made to cushion and retard the movement of the door or gate in either direction and at the same time function to positively restrain the door or gate from making any return movement in the closing direction after passing a pre-determined point in its opening movement until such time as such return movement is desired and until one of two alternative operations is effected to carry out such desire; one of such operations being electrically controlled as an incident to the use of the elevator and the other of which is made to operate by the application of additional muscular force on the part of the user of the elevator.

Other constructions and arrangements of the parts may be employed, as will be obvious to persons skilled in the art without departing from the scope of this invention and disclosed herein and defined in the appended claims.

I claim:

1. In a door operating device, in combination, a fluid containing cylinder, a plunger in said cylinder, means tending to force said plunger into said fluid containing cylinder against the fluid therein, a by-pass for the fluid above said plunger comprising a passage through said plunger, a by-pass for the fluid beneath said plunger, and means normally closing said latter by-pass and thereby preventing downward movement of said plunger, said by-pass closing means comprising a valve and a spring exerting a force upon said valve greater than the force of said means acting on the plunger and transmitted to said fluid and acting on said valve, said valve spring being yieldable under pressure of the fluid thereagainst greater than the pressure exerted thereagainst by said means tending to force said plunger into said fluid containing cylinder, the yielding of said spring permitting said valve to open and thereby permitting movement of said plunger, and means for releasing fluid compressed in said cylinder beneath said plunger at a pressure below the pressure necessary to overcome the force of said valve-spring, and thereby also permitting movement of said plunger, and means holding said last named releasing means open during part of the travel of said plunger.

2. In a device of the character described, a casing having a fluid-containing cylinder and a plunger therein, door operating connections to said plunger, a relief valve permitting movement of said plunger in one direction, an automatic pressure-responsive valve closing said cylinder to normally prevent movement of said plunger in the opposite direction, and yielding at a predetermined fluid pressure produced in said cylinder to open said automatic valve to vent said cylinder and thereby permit movement of said plunger in said opposite direction, and means operable from the exterior of said casing to also vent said cylinder and also thereby permit movement of said plunger in said opposite direction, and means operably connected with said plunger adapted to

hold said last named venting means open during a part of the movement of said plunger.

3. In a device of the character described, a casing having a fluid containing cylinder and a plunger in the lower part thereof, and a reservoir for fluid above said cylinder, door operating connections to said plunger, an inwardly opening automatic relief-valve permitting movement of said plunger in one direction, channels between said reservoir and the lower part of said cylinder, a normally closed inwardly opening and a normally closed outwardly opening valve respectively in said channels, mechanical means for opening said last-named inwardly-opening valve, to thereby permit movement of said plunger, said outwardly opening valve being an automatic pressure-responsive valve yieldable at a predetermined fluid pressure produced in said cylinder to open said automatic valve to vent said cylinder and thereby permit movement of said plunger.

4. In a device of the character described, a casing having a fluid containing cylinder and a plunger in the lower part thereof, and a reservoir for fluid above said cylinder, door operating connections to said plunger, an inwardly opening automatic relief-valve permitting movement of said plunger in one direction, channels between said reservoir and the lower part of said cylinder, a normally closed inwardly opening and a normally closed outwardly opening valve respectively in said channels, mechanical means for opening said last-named inwardly-opening valve, to thereby permit movement of said plunger, said outwardly opening valve being an automatic pressure-responsive valve yieldable at a predetermined fluid pressure produced in said cylinder to open said automatic valve to vent said cylinder and thereby permit movement of said plunger, said mechanical valve-operating means comprising a push-rod extending through said casing.

5. In a device of the character described, a casing having a fluid containing cylinder and a plunger in the lower part thereof, and a reservoir for fluid above said cylinder, door operating connections to said plunger, an inwardly opening automatic relief-valve permitting movement of said plunger in one direction, a channel between said reservoir and the lower part of said cylinder, an inwardly opening valve in said channel, mechanical means for opening said last-named inwardly opening valve to thereby permit movement of said plunger, said mechanical valve-operating means comprising an armature, connections between said armature and mechanically opened valve, and a part movably connected to said door-operating connections actuating said armature to keep said vent-valve open during a predetermined part of the movement of said door-operating connections.

6. In a device of the character described, a casing having a fluid containing cylinder and a plunger therein, door-operating connections to said plunger, a relief valve permitting movement of said plunger in one direction, a vent-valve for trapping fluid in said cylinder, and mechanical means for opening said vent valve, said means comprising a part movably connected to said door operating connections and actuating said mechanical means to keep said vent-valve open during a predetermined part of the movement of said door-operating connections.

7. In a device of the character described, a casing having a fluid containing cylinder and

a plunger therein, door operating connections to said plunger, a relief valve permitting movement of said plunger in one direction, a vent-valve for trapping fluid in said cylinder, and mechanical means for opening said vent valve, 5 said valve operating means comprising an armature, connections between said armature and mechanically opened valve, and a part movably connected to said door-operating connections actuating said armature to keep said vent-valve open during a predetermined part of the movement of said door operating connections. 80

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10	85
15	90
20	95
25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150