July 10, 1934. D. E. RIGGINS 1,965,805

DOORCHECK

Original Filed Dec. 24, 1931 2 Sheets-Sheet 1

Fig. 1.

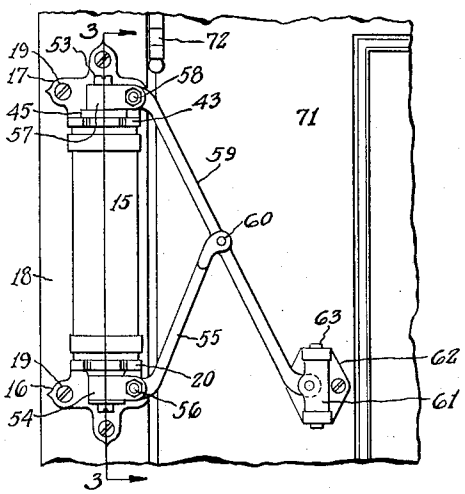


Fig. 2.

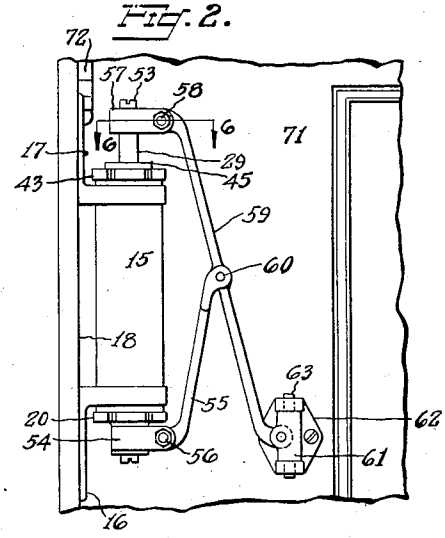


Fig. 3.

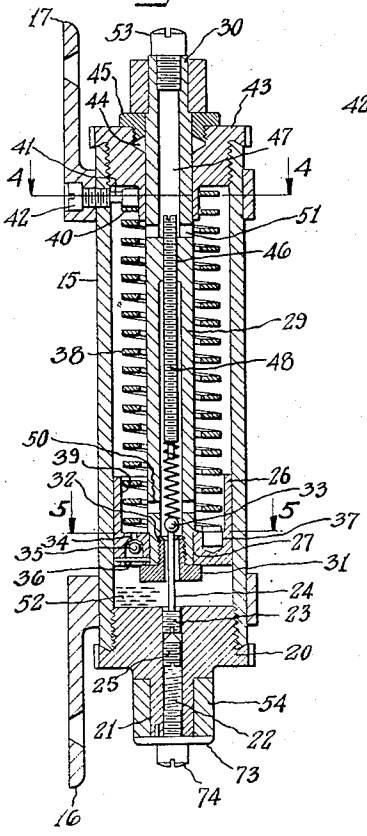


Fig. 4.

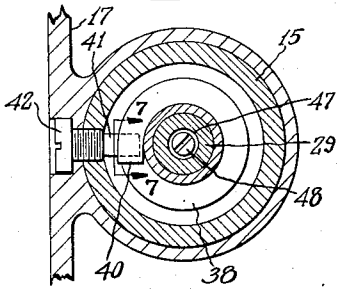


Fig. 5.

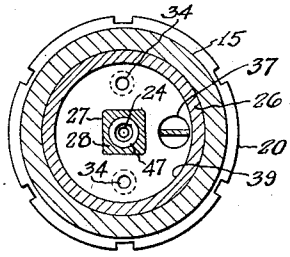


Fig. 7.

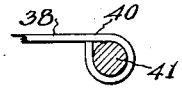
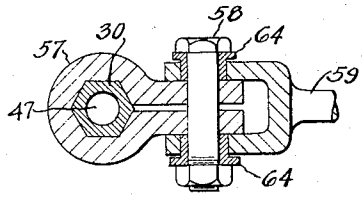


Fig. 6.



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July 10, 1934. D. E. RIGGINS 1,965,805

DOORCHECK

Original Filed Dec. 24, 1931 2 Sheets-Sheet 2

Fig. 8.

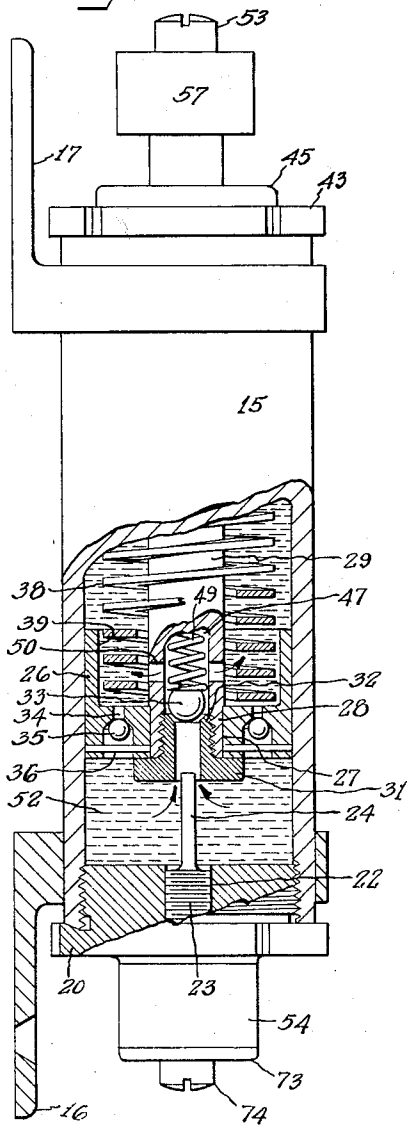


Fig. 9.

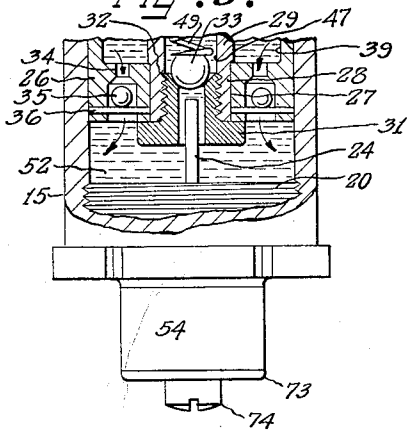


Fig. 10.

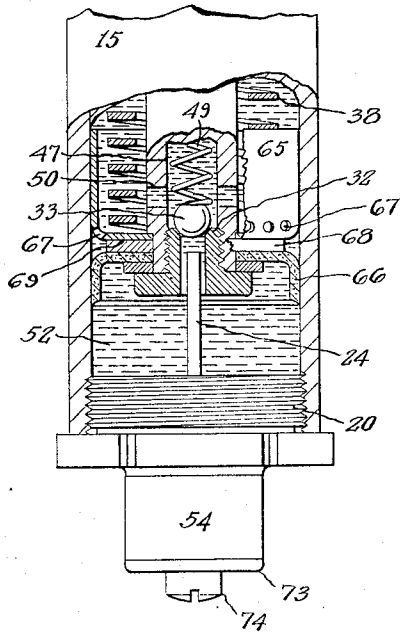
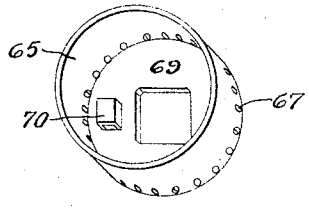


Fig. 11.



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1,965,805

DOORCHECK

David E. Riggins, Milwaukie, Oreg.

Application December 24, 1931, Serial No. 582,907
Renewed December 4, 1933

1 Claim. (Cl. 16—52)

This invention relates generally to door-controlling and operating devices, and particularly to an improved form of door check.

The main object of this invention is the provision of a door check which will gently but positively move a door toward the closed position and complete the closing movement with an abruptly accelerated force.

The second object is to so construct the check that the door may be opened or closed manually at any desired speed without imposing undue strains on the check or its fastenings or to the door or frame thereof.

These, and other objects, will become more apparent from the specification following as illustrated in the accompanying drawings, in which:

Fig. 1 is a front elevation of the device showing the door closed.

Fig. 2 is a side elevation of the device showing the door open.

Fig. 3 is a section taken along the line 3—3 in Fig. 1.

Fig. 4 is a section taken along the line 4—4 in Fig. 3.

Fig. 5 is a section taken along the line 5—5 in Fig. 3.

Fig. 6 is a section taken along the line 6—6 in Fig. 2.

Fig. 7 is a section taken along the line 7—7 in Fig. 4.

Fig. 8 is an enlarged side elevation of the check showing a portion broken away to disclose the parts in a door-closing position.

Fig. 9 is a fragmentary sectional view showing the parts in a door-opening position.

Fig. 10 is a fragmentary sectional view showing an alternative form of piston.

Fig. 11 is a perspective view of the piston illustrated in Fig. 10.

Similar numbers of reference refer to similar parts throughout the several views.

Referring in detail to the drawings, the device consists of a tubular cylinder 15 whose lower end is supported by means of a bracket 16 and whose upper end is supported by means of a bracket 17, both brackets being secured to the door casing 18 by means of the screws 19. Both ends of the cylinder 15 are internally threaded and the lower end is provided with a lower cap 20 from which projects downwardly the cylindrical stem 21. The threaded hole 22 passes through the stem 21 and the cap 20.

Within the hole 22 is mounted the threaded end 23 of the release post 24 which projects upwardly into the cylinder 15. A pointed set screw 25, which bears against the under side of the release post 24, locks it into any adjusted position.

Within the cylinder 15 is placed a piston 26 having a square central opening 27 for the reception of the squared end 28 of a tubular piston rod 29 whose upper end 30 is made hexagonal in shape. The lower end of the rod 29 is threaded internally to receive a valve bushing 31 which also serves to hold the piston 26 on the rod 29. The upper end 32 of the valve bushing 31 is countersunk to form a seat for the ball check 33, which can be unseated when the valve bushing 31 moves downwardly around the release post 24, as will be described presently.

The piston 26 is provided with a pair of holes 34 each of which is counterbored from the bottom end to receive a ball 35. Each ball is held in place by means of a retaining pin 36. The piston 26 is also provided with a recess 37 for the lower end of a combined torsion and compression spring 38 whose lower end occupies a recess 39 at the top side of the piston 26, and whose upper end 40 has a hook formed thereon which engages the inwardly projecting end 41 of the screw 42, which also holds the cylinder 15 in relation to the bracket 17. A top cap 43 closes the upper end of the cylinder 15 and surrounds the rod 29. A stuffing box is formed on the top side of the upper cap 43 containing the packing 44 which is held in compression by the gland nut 45.

Within the piston rod 29 is formed a threaded hole 46 which is of a smaller diameter than the bore 47 of the piston rod 29. An adjusting screw 48 in the hole 46 regulates the compression of the spring 49, which bears against the ball check 33. A hole 50 passes through the piston rod 29 a short distance from the lower end thereof and forms a port for the passage of oil from the top side of the piston to the under side thereof. A hole 51 passes through the rod 29 at the upper end of the reduced opening 46 and it is through the hole 51 that oil 52 can be introduced into the device through the bore 47, whose upper end is normally closed by a screw plug 53. The device will also operate satisfactorily with air alone.

On the stem 21 is rotatably mounted a lower shackle 54 to which is hinged the lower end of the short arm 55 by means of a bolt 56. On the hexagonal end 30 is non-rotatably secured the upper shackle 57 to which is hinged, by means of a bolt 58, the upper end of the long arm 59, which is hingedly connected at its mid portion to the upper end of the short arm 55 by means of a pin 60. The lower end of the long arm 59 is piv-

otally attached to the swivel 61 which is mounted on the swivel base 62, connection being made by the pin 63. It is desirable in making the connection at the bolt 58 to employ bushings 64 (as shown in Fig. 6) to provide the necessary clamping action for the shackle without causing undue friction between the shackle and the short and long arms 55 and 59.

The form of the device illustrated in Figs. 10 and 11 differs from that previously described only in mechanical details. In this form of the device the piston 65 is of metal and serves only as a guide for a cup leather 66, which is mounted on the under side thereof between the piston 65 and the bushing 31. The piston 65 is provided with a plurality of holes 67 which would be the equivalent of the holes 34 in the first described form of the device, while the cup leather 66 would function similar to the balls 35. A spacer 68 is placed between the piston end 69 and the cup leather 66. A projection 70 is formed in the upper side of the end 69 to receive the spring 38. The swivel base 62 is secured to the door 71 which swings from the hinges 72.

The operation of the first described form of the device is as follows: The device is mounted on a door (as shown in Fig. 1) namely, with the brackets 16 and 17 on one side of the center line of the hinges 72 and with the shackle base 62 mounted on the door on the opposite side of the hinge center line. The vertical axes of the cylinder 15 and the shackle base, 62 being in front of the hinge 72, it follows that an opening movement of the door 71 will move the shackle base 62 toward the bracket 16 and at the same time rotate the piston rod 29 on its axis. The rod 29 being attached to the lower end of the spring 38 whose upper end is secured by the screw 42 it can be seen that the turning movement is resisted by the spring when the door is being opened and the energy is stored up in the spring which will later be employed to close the door.

While this is taking place, as can be seen from a comparison of Figs. 1 and 2, the upper shackle 57 has been elevated due to the angular change in relationship between the arms 55 and 59. This also causes the spring 38 to be placed in compression adding this factor to the torque load simultaneously placed on the spring.

During the door-opening operation, that is while the piston 26 is rising and oil 52 is attempting to flow downwardly through the holes 34, the balls 35 are forced away from their seats (as shown in Fig. 9) permitting oil to flow freely through the openings 34 and for the first portion of the travel oil may also flow downwardly through the valve bushing 31 whose ball 33 has been temporarily raised from its seat by the release post 24 (as shown in Fig. 3). In other words, there is little more than the retarding action of the spring 38 and the restriction provided by the orifices 34 to hinder a rapid opening of the door.

Assuming now that the door is open and it is released, the spring 38 attempts to push the rod 29 inwardly and turn it on its axis reversing the movement hitherto imparted to the arms 55 and 59, moving the door toward a closed position. In this case the spring must overcome the inertia of the door and a greater restriction to the flow of oil since the holes 34 are now closed by the seating of the balls 35 caused by the upward passage of the oil 52 which is occasioned by the downward movement of the piston 26. However, the release post 24 is so adjusted that just before the door is completely closed the ball 33 comes into contact with the post 24 and is unseated, permitting oil to pass freely through the bushing 31. In other words, there is provided a door check whose resistance to manual movement is slight and whose automatic closing operation is mild during the earlier stages of the operation but quite abrupt at the final portion of the movement in order to overcome any friction which may exist between the door and its surrounding structure.

With door checks now in use the springs are normally made strong enough to completely close the door, and this strength, together with the accelerated movement, often brings the closing speed above that desired, and when retarding devices are applied they prevent the door from completely closing when the additional friction load is imposed on the device.

There is no difference in the operation of the form shown in Figs. 10 and 11 than in the previously described form of the device, except that the downward movement of oil from the interior of the piston 65 will pass through the holes 67 instead of through the holes 34, the cup leather 66 serving in the same manner as do the balls 35.

In order to time the release of the ball 33 the set screw 25 is removed and the release post 24 is adjusted vertically by rotating its threaded end 23 by means of a screw driver and then returning the set screw 25 to a holding position.

It is desirable to provide a washer 73 on the under side of the lower shackle 54 and to hold same in place by means of a screw 74 which threads into the hole 22.

In actual operation the first portion of the closing movement of the door is relatively rapid causing a rush of fluid through the holes 34, and it is this rush which causes the balls 35 to a seating position affording the increased restriction which slows down the travel of the door until the release is made through the bushing 31 the instant the ball 33 comes into contact with the post 24.

Attention is drawn to my co-pending application, Serial Number 457,331, over which this device is an improvement.

I claim:

In a door check, the combination of a stationary cylinder arranged to be mounted on a door casing, a piston in said cylinder having a rod projecting therefrom, a long arm secured to said rod and pivoted between said rod and the door being operated for imparting a rotary and sliding movement to said rod as the door is operated, a short arm pivotally connected to the cylinder near its major axis and hingedly connected to an intermediate portion of said long arm in a manner to provide a floating fulcrum for said long arm and to increase the sliding effect produced by the operation of said door upon said piston, a check valve in said piston which opens during an opening movement of the door check, and an adjustable ball check trip valve which closes under a closing movement of said door check and is opened near the end of the closing movement of said door check.

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