Aug. 14, 1934. A. LARSON 1,970,008

DOORCHECK

Filed June 28, 1932 2 Sheets-Sheet 1

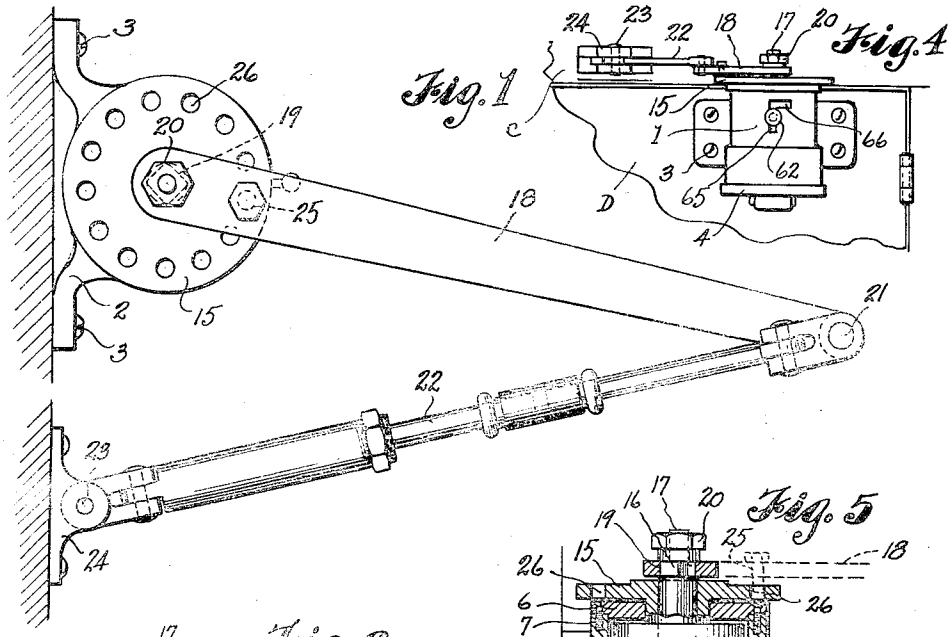


Fig. 1

Fig. 4

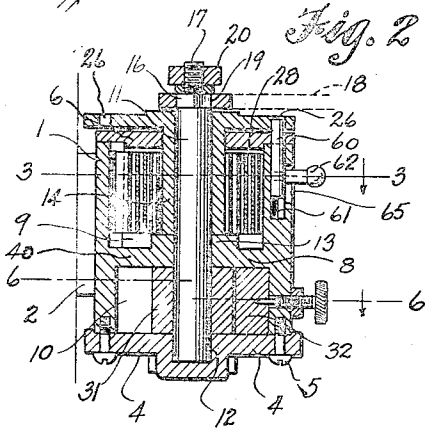


Fig. 2

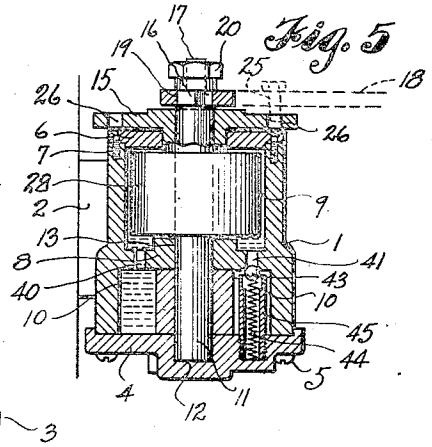


Fig. 5

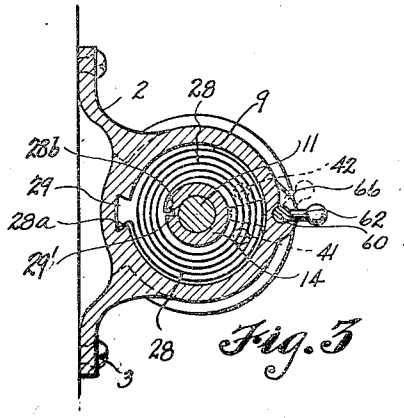


Fig. 3

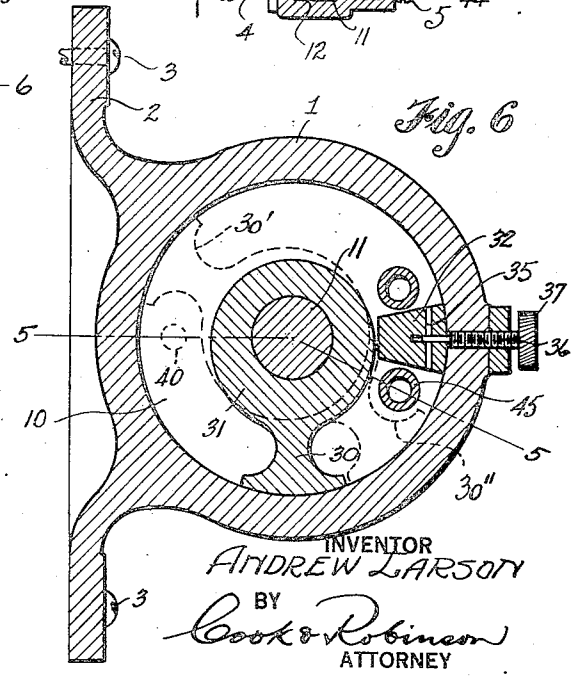


Fig. 6

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DOORCHECK

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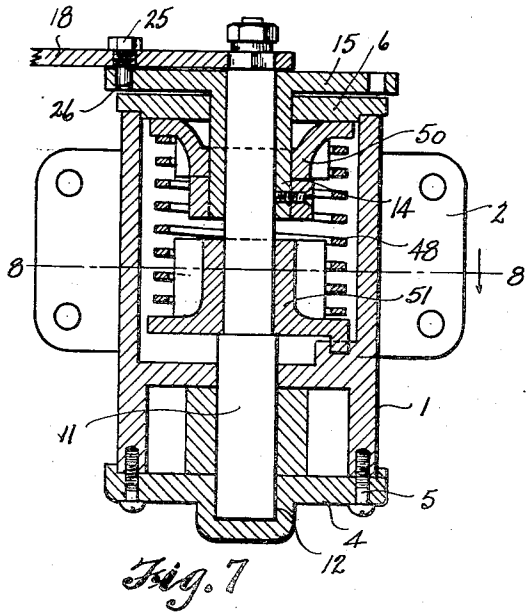


Fig. 7

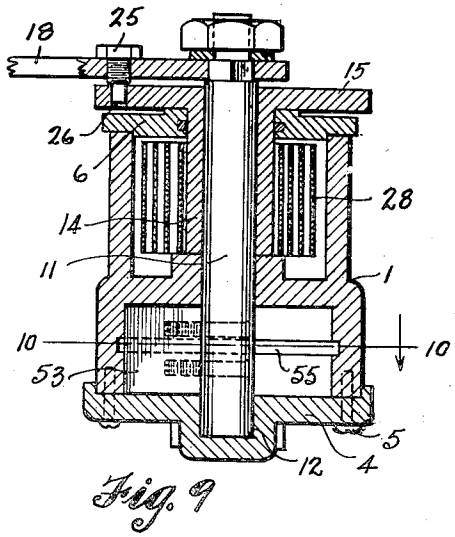


Fig. 9

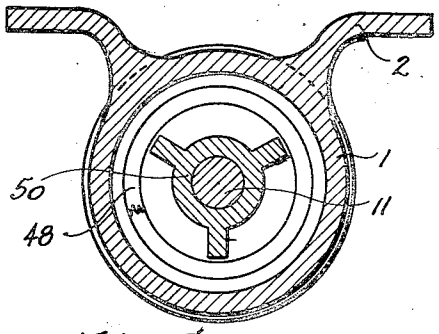


Fig. 8

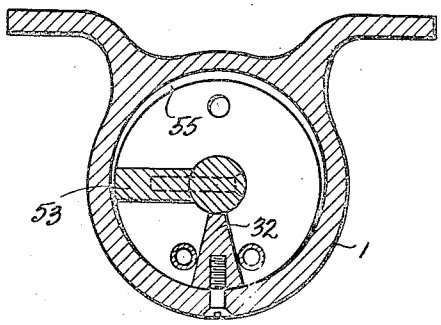


Fig. 10

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1,970,008

DOORCHECK

Andrew Larson, Tacoma, Wash.

Application June 28, 1932, Serial No. 619,619

3 Claims. (Cl. 16—58)

This invention relates to improvements in door checks, and it has reference more particularly to devices of that character for positively and quickly closing a door after it has been opened and for checking the force of the closing movement at proper time to prevent slamming.

It is the principal object of the invention to provide a device of the above character especially useful in public buildings, apartment houses or homes on outside doors that are used frequently; which is relatively simple in construction and not apt to become out of order or adjustment; which may be easily adapted to either right or left hand opening doors and which may, when occasion requires it, be used as a lock for holding the door at a set position.

It is also an object of the invention to provide a door check of the above character wherein the force for closing the door is furnished by a coiled spring and wherein the rate of closing of the door is under control of a hydraulic mechanism including a cylinder filled with a liquid medium and in which there is a fixed stator and a rotary piston; the latter being movable in accordance with the closing action of the door, to force the liquid through a restricted by-pass between the stator and piston hub from one side of the piston to the other.

Another object is to provide the piston with an eccentric hub or mounting portion whereby, incident to rotation, the area of the by-pass will be gradually restricted as the door closes to finally check flow through the passage.

Other objects of the invention reside in the details of construction and in the combination of parts, both in the preferred form and alternative forms, and in their mode of operation as will hereinafter be fully described.

In accomplishing these and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Fig. 1 is a top, or plan view, of a door check embodied by the present invention.

Fig. 2 is a vertical section in an axial plane of the hydraulic cylinder.

Fig. 3 is a horizontal section, on the line 3—3 in Fig. 2, showing the closing spring.

Fig. 4 is an elevation of the device as applied to a door.

Fig. 5 is a vertical section taken on the line 5—5 in Fig. 6.

Fig. 6 is an enlarged, horizontal section taken on line 6—6 in Fig. 2.

Fig. 7 is an axial section of a device of an alternative form of construction.

Fig. 8 is a horizontal section on line 8—8 in Fig. 7.

Fig. 9 is a vertical sectional view of another alternative form of device.

Fig. 10 is a horizontal section on line 10—10 in Fig. 9.

Referring more in detail to the drawings—

The cylinder, or housing, 1, which is substantially the same in the preferred and alternative forms of devices, is provided at one side with an integral base flange 2 for receiving screws 3, or the like, for securing it functionally to a door, or the like, D as in Fig. 4.

The lower end of this cylinder is closed by a removable end plate, or head 4, held in place by screws 5, and the upper end is closed by a plate 6 fitted therein and secured in place by screws 7, as seen in Fig. 5. Approximately midway of the cylinder is a partition wall 8 which divides it into two compartments, namely, an upper spring compartment 9 and a lower piston compartment 10.

A shaft 11 is contained co-axially within the cylinder 1 and it is rotatably fitted, at its lower end, within a bearing socket 12 in the plate 4 and extends in a close, non-leaking fit through a bearing portion 13 in the partition wall 8 and along its upper portion is revolubly contained in a sleeve 14 formed as a part of a disk or plate 15 which closely overlies the top end plate 6. The sleeve portion 14 extends rotatably through an opening in the top plate 6 in a close, non-leaking fit and at its lower end rests against the bearing portion 13 of wall 8. The upper end of the shaft 11 extends beyond plate 15 and has a squared portion 16 and an extended, threaded shank 17. A lever arm 18 is provided at one end with a square hole 19 to which the squared upper end portion of the shaft is applied and the lever is held thereon by a nut 20 threaded onto the shank. This lever arm horizontally overlies the cylinder and at its outer end is pivotally attached, as at 21, to the outer end of an adjustable link 22 which, in turn, is pivotally attached at its inner end by a pin 23 to a block 24 attached to the door casing C, as seen in Fig. 4.

With the link and lever so connected, opening of the door will cause the lever to rotate the shaft 11 in the cylinder according to the degree of opening of the door.

As seen best in Figs. 1 and 5, a stud 25 is threaded downwardly through the lever arm and its lower end portion is seated in one of a series

of holes 26 arranged circularly about the shaft in the periphery of the plate 15. This connection provides that the shaft 11, plate 15 and sleeve 14 are normally fixed against relative rotation and all move rotatably in accordance with movement of the lever.

A flat coiled spring 28 is contained in the upper or spring compartment 9 and this has opposite end hooks 28*a* and 28*b* seated, respectively, in slots 29 and 29′ in the cylinder wall and in the sleeve 14, thereby to maintain the spring under tension and to provide an operative connection whereby the tension of the spring will cause the shaft 11 to be rotatably actuated for closing the door after it has been moved to an open position and then released. The tension of the spring may be increased or decreased to a desired degree by withdrawing the stud bolt and then rotating plate 15 and the sleeve to wind up or unwind the spring, then resetting the stud in one of the holes 26 so that there will be no relative movement between the sleeve and arm.

Fitted within the lower chamber 10 of the cylinder, and fixed on the shaft 11 is a rotary piston 30, which extends across the spaces between the shaft and one wall of the cylinder. This piston has a cylindrical hub portion 31, the axis of which is parallel with but eccentrically offset from the shaft in the direction of the piston. There is also a stator 32 fixed to the cylinder wall to extend across the space between the wall and piston hub. The inner end of this stator presents a flat surface parallel to a vertical line on the hub 31 and the space between the surface of the stator and hub defines a by-pass for the liquid medium in the cylinder.

The arrangement of parts, as shown in Figs. 1 and 4, is such that when the door is opened or closed, the piston is caused to move in the cylinder from one side of the stator about the cylinder toward the other side thereof. When the parts are properly arranged and the door with which the device is associated is open, the piston 30 will be disposed in the cylinder at some point opposite the location of the stator, such as that position designated in dotted lines at 30′ in Fig. 6, and by reason of the eccentric relation of the hub 31 relative to shaft 11, the space between the inner end surface of the stator and hub of the piston will be quite open to provide a by-pass of an area sufficient to permit of easy passing of liquid therethrough, but as the door swings back toward closed position, and the piston moves back toward the stator, the passage gradually closes to check the flow therethrough. The eccentricity of the hub provides that the door approaches its final closing position, the by-pass is substantially closed and the door is checked for a slow and easy closing action under power of the coiled spring and as provided by a slight leakage permitted through a passage 35 through the stator. The rate of flow of liquid through this latter passage is under control of a needle valve 36 threaded through the casing and adjustable from the outside of the casing by a nut 37.

To provide for easy and quick flow of liquid across the stator from one side of the piston to the other, on opening the door so that its opening will be easy, I provide an open port 40 through the partition wall at a point substantially opposite the stator, through which the liquid will be forced by the piston when the door opens up into the spring chamber. Also, there are valve ports 41 and 42 through the wall 8 closely adjacent opposite sides of the stator. The port at that side of the stator toward which the piston moves on closing the door is closed against back flow from the lower to the upper chamber by a ball check valve 43, as seen in Fig. 5; the valve ball being held yieldingly seated in the opening by upward pressure thereagainst of a coiled spring 44 in a tubular guide 45 fixed in the base plate 4.

It will be here stated that the two ports 41 and 42 are provided only that the check may be easily adapted to either right or left hand opening doors. Ordinarily one port would not be equipped with the check valve.

Assuming the device to be so constructed, with the cylinder 1 properly mounted on a door and its link 22 connected to the door casing, as seen in Fig. 4, the operation is as follows:

Starting with the door in closed position and the piston located closely adjacent one side of the stator, as at 30″ in Fig. 6, when the door is opened, the linkage 22 retains the lever arm 18 against outward movement with the door and thus it causes a rotative action of shaft 11 in the cylinder. This operates to rotate the piston through the full line position as seen in Fig. 6 toward the dotted line position 30′. This movement of the piston forces the liquid medium ahead of the piston upwardly through port 40 into the spring chamber and then to the back side of the piston through the open valve 41. Also part of the liquid may, after the initial opening movement of the door, flow through the by-pass provided by the opening of the space between the piston hub and stator. Thus, there is no material retarding of the door in opening.

On releasing the door, the spring 28, under tension, rotates the shaft 11 toward door closing position and as the piston 30 then moves back toward the stator, the liquid trapped by closing of valve between the piston and stator, is forced out through the by-pass which gradually closes by reason of the surface of the eccentric hub moving toward the end of the stator as the door closes. Thus, as the door approaches its final closing position the by-pass is completely closed and the movement of the door checked to that movement permitted only by the leakage through passage 35 which may be accurately controlled by setting the needle valve 36. Thus, by properly locating the piston, the instant of complete closing of the by-pass may be accurately timed to check movement of the door just prior to its slamming, yet the pressure of the spring will finally completely close it.

In the alternative form of device, as shown in Figs. 7 and 8, the principle of construction is substantially the same as that of the device of Figs. 2 to 6, inclusive. However, instead of using the clock type of coiled spring I employ a flat, spiral coil 48 which is connected at its upper and lower ends, respectively, to mounting members 50 and 51 which in turn are connected to the cylinder and sleeve 14 so that the function of the spring of this device is exactly the same as that in the preferred form.

In the device of Fig. 9 the spring arrangement is like that of the device of Fig. 1 and the lower end of the shaft 11 mounts a piston 53 at one side thereof, and the stator fits the shaft in a close connection. Instead of having the eccentric hub on the shaft which moves away from the stator when the door opens to provide a by-pass for the liquid, I provide a by-passing groove 55 in the casing wall and the base of the groove

is eccentric with respect to the shaft and it terminates at its ends at distances spaced slightly from the opposite sides of the stator so that when the door opens, liquid may by-pass from one side of the piston to the other through this groove, but as the door closes the piston gradually closes off the passage and as it passes beyond the end of the groove, the liquid is trapped to check the movement of the door.

In the device of the preferred form, and also the devices for the alternative constructions, I provide a means for locking the device to retain a door at different positions of adjustment. This locking means comprises a bolt 60 that is slidably contained in a vertical bore 61 in the cylinder wall and opening through the upper end plate 6 in alinement with the circular row of openings 26 in the plate 15. The bolt has a handle portion 62 whereby it may be shifted upwardly to move the upper end of the bolt into one of these holes, thus to lock the disk 15 against rotative movement, and since the opening and closing movement of the door is dependent upon the rotative movement of the disk relative to the housing, this locking bolt will hold the door at any set position. The handle for the bolt is movable within a vertical slot 65 in the housing wall and it may be turned into a lateral portion of the slot 66 to hold the bolt in locked position.

It is to be understood that details may be changed without departing from the spirit of the invention, and for this reason it is not desired that the claims shall be confined to details but shall be given an interpretation commensurate with the scope of the invention disclosed.

Having thus described my invention, what I claim as new therein and desire to secure by Letters-Patent is—

1. In a door check and closing device, a hydraulic cylinder divided between its ends to form a by-pass chamber and a piston chamber, a shaft axially rotatable in the cylinder, a piston mounted on the shaft having a working fit within the piston chamber, a stator fixed in the piston chamber and opposed to the piston; said piston having a hub portion that is eccentric of the axial line about which it rotates and adapted to open a passage between the stator and hub as the piston rotates away from the stator and to gradually close off the passage when the piston returns toward the stator; said chambers having interconnecting passages providing for passage of liquid across the piston as it rotates away from the stator.

2. In a door check and closing device, a hydraulic cylinder formed with a piston chamber and a by-pass chamber, a shaft axially rotatable in the cylinder, a piston fixed on the shaft and having a working fit in the piston chamber, a stator fixed in the piston chamber to oppose the piston; said chambers having an interconnecting port and a valved passage for the flow of the hydraulic medium across the piston as the piston moves away from the stator, and said piston having a hub portion eccentric of the axial line about which it rotates adapted to open a passage between the stator and hub as the piston rotates away from the stator and to gradually and finally close the passage when the piston returns toward the stator.

3. In a door check of the character described, a hydraulic cylinder provided between its ends with a partition wall setting off a spring chamber and a piston chamber, a shaft axially rotatable in the cylinder and extending therefrom for operative connection with a swinging door, a spring contained in the spring chamber and connected under tension with the cylinder and shaft to rotate the latter for closing the door, a piston fixed on the shaft in the piston chamber, a stator fixed in the chamber to oppose the piston; said piston having an eccentric hub portion adapted to open a passage between the stator and hub as the piston swings away from the stator and to gradually and finaly close the passage as it swings toward the stator, and said partition wall having a by-pass port providing for flow of the hydraulic medium from the piston chamber to the spring chamber when the piston swings away from the stator, and having a valved port through which it may flow across the piston from the spring chamber to the piston chamber only as the piston swings away from the stator.

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