

May 31, 1949.

A. VAN VEEN ET AL

2,471,707

DOOR CHECK

Filed Aug. 31, 1945

2 Sheets-Sheet 1

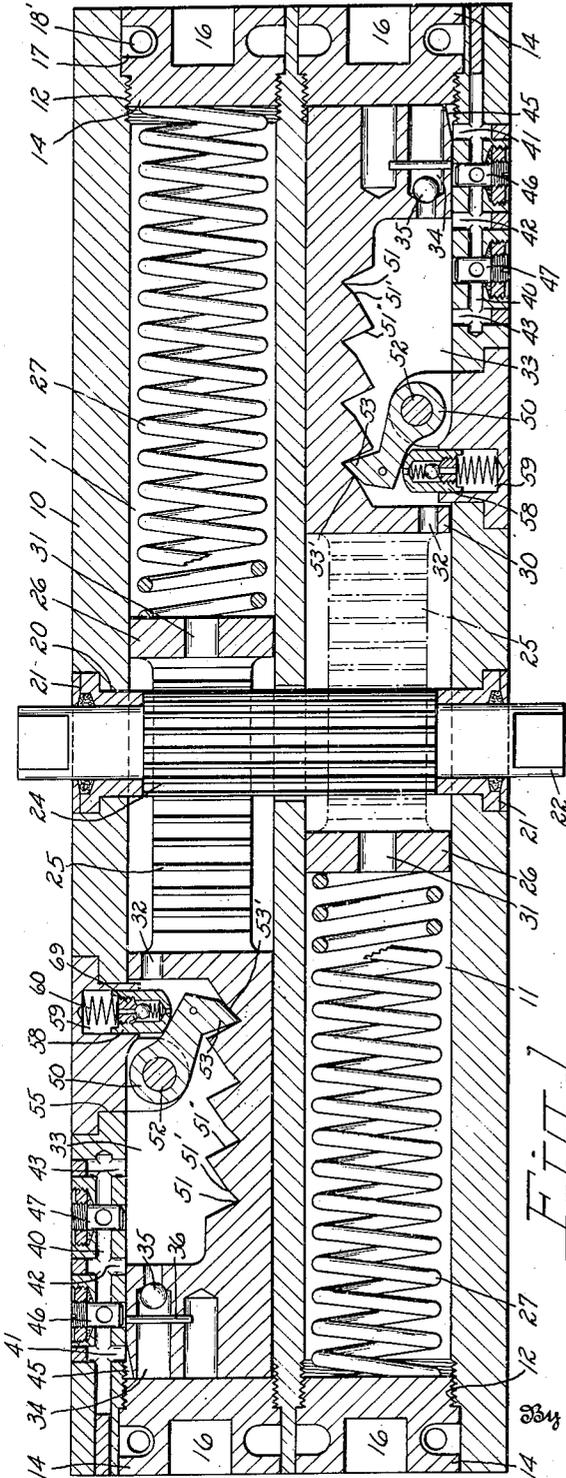
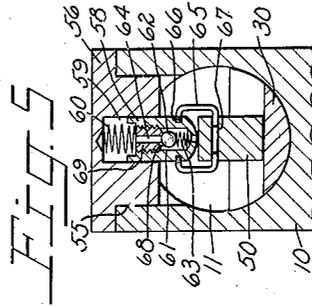


FIG. 1

FIG. 2



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2 Sheets-Sheet 2

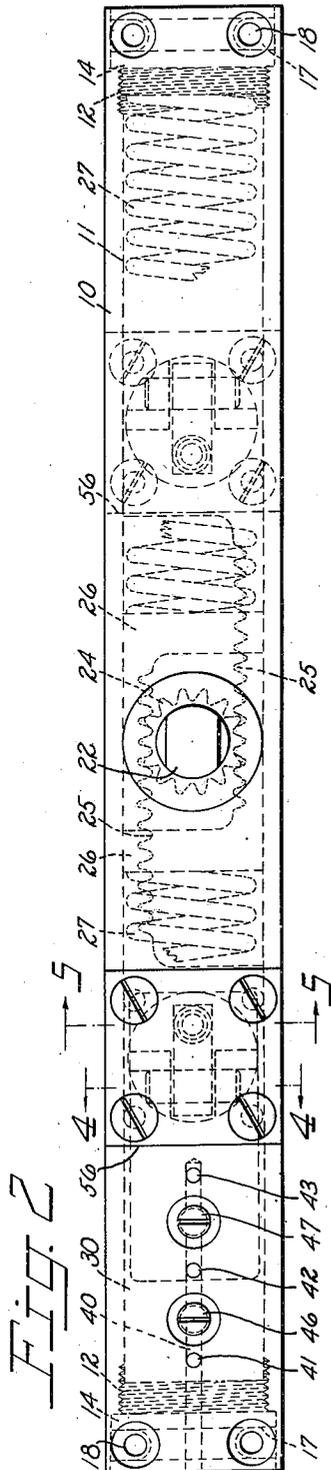


FIG. 4

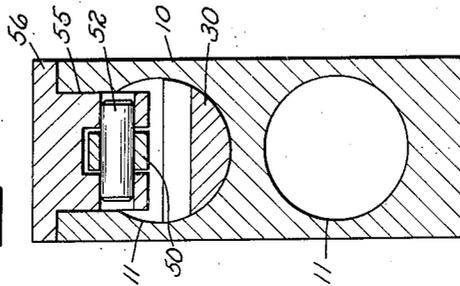
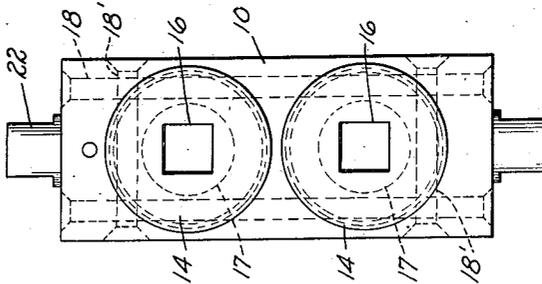


FIG. 3



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2,471,707

DOOR CHECK

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Application August 31, 1945, Serial No. 613,720

8 Claims. (Cl. 16-62)

1

This invention relates to door closers and more particularly to a door closing and checking device of the spring and fluid type.

An aim of the invention is to provide a door closer of this type having a shape, form and mechanism rendering it suitable for installation in many different positions on various types of doors.

A further aim of the invention is to provide a door closer which is installable, without mechanical changes, on the inside or outside of a door and which may be used on doors opening to the right or to the left.

Another aim of the invention is to provide an improved door closer of efficient design and compact construction with a self-contained means in the body of the device which will be effective to hold the door open in various positions when the door is brought to a stop at the desired degree of opening and which will be releasable by swinging the door from the set position.

A still further aim of the invention is to provide an improved door closer of efficient mechanical design wherein the torsional twists encountered in the usual types of door closers are eliminated by equalization of the forces involved in the operation of the device.

Another object of the invention is to provide an improved door closer which can be regulated for use on both heavy and light doors, wherein the snubbing action is adjustable without mechanical changes, and in which the force of the closing action is increased when the door nears closed position in order to insure the positive shutting thereof.

A further object of the invention is to provide a compact and efficient door closer of a design rendering it capable of installation inside a door without the necessity of external mutilation of the door and in which the device may be moved at any time from an exterior installation to an interior installation on the door without mechanical changes.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the drawings—

Figure 1 is a longitudinal cross sectional view of the device, the rack in the lower bore being shown in broken lines;

2

Fig. 2 is a top plan view of the device;

Fig. 3 is an end plan view of the device;

Fig. 4 is a cross sectional view taken on line 4—4 of Fig. 2; and

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 2.

Referring to the present illustrative drawings, our improved device comprises a casing 10 which may be formed of a single rectangular block of metal. Horizontally disposed one above the other in casing 10 are parallel bores or chambers 11. Bores 11 are threaded internally at their ends, as at 12, and threaded plugs 14 are provided which are screwed into the ends of the bores. The inner surfaces of plugs 14 are flat, and the outer ends are provided with recesses 16 for screwing the plugs into place. The plugs have peripheral grooves 17 adjacent their outer ends and these grooves align with horizontal bolt-receiving openings 18 or vertical bolt-receiving openings 18' (Fig. 3) to accommodate bolts for securing the casing in position on a door.

The exact longitudinal and latitudinal center of casing 10 is vertically bored, as at 20, and, rotatably mounted in the vertical bore 20 in suitable fluid-tight bearings 21, is a spindle 22 which projects above and below the casing to provide means for attaching an arm (not shown) of the door check. The central portion of the spindle 22 is cut to form the teeth 24. Slidably mounted in bores 11 are plungers which are of identical construction, but which are oppositely disposed relative to one another. Each plunger comprises a piston 30 to which is secured a rack 25 having teeth meshing with the teeth 24 of the spindle, the racks 25 being disposed on opposite sides of the spindle in the respective bores. On the other ends of the racks 25 from the pistons are fixed plates 26 and between plates 26 and the adjacent plugs 14 are positioned helical compression springs 27 which are adapted to bear against plates 26 in order to urge the plungers toward the opposite ends of the bores. Because racks 25 are disposed on opposite sides of the spindle and are, therefore, forced in opposite directions when the spindle is rotated, excessive torsional strain upon the spindle which would be imposed by one rack alone is eliminated and wear on the apparatus is thereby reduced. This construction provides compensating action of the pistons and makes possible the compactness and mechanical efficiency of the device.

The door check is filled in the usual manner with fluid and there are certain passageways and ducts to provide for the proper flow of fluid

during the operation of the device. To this end, plates 26 are apertured, as at 31, to permit fluid to flow from the spring-containing sections of the bores into the piston sections as the plungers move toward the spring sections of the bores and the capacity thereof is reduced. Pistons 30 are provided with ducts 32 adjacent the racks 25 and these ducts 32 lead into chambers 33 in the pistons. At the outer ends of chambers 33 are ducts 34 which extend through the piston heads. These ducts contain balls 35 which permit the flow of fluid out of chambers 33 and through ducts 34 but prevent the flow of fluid in the opposite direction. Pins 36 are inserted across ducts 34 to prevent displacement of the balls out of the ducts. From the foregoing description it will be seen that, when a plunger moves away from normal position, there is provided a continuous passage for fluid flowing from the decreasingly smaller capacity of the spring end of the bore into the increasingly larger capacity of the piston end.

In order to provide for the return flow of fluid from the piston ends of the bores to the spring ends when the plungers are forced in their door-closing strokes by the pressure of the springs 27, there are provided the usual systems of ducts in the casing 19 adjacent the piston ends of the bores. In the present illustrative drawings, these systems of ducts comprise horizontally disposed passages 40 and ducts extending therefrom into bores 11. Ducts 41 are situated adjacent the outer ends of the piston sections of the bores and pistons 30 have tapered notches, as at 45, to permit continual flow of fluid in these ducts throughout the entire return stroke of the plungers. Other ducts 43 are located inwardly of ducts 41 and open at all times into chambers 33 of pistons 30. Thus, when a plunger is on its return stroke, fluid will flow through duct 41, passage 40, out of duct 43 into chamber 33, and thence through passageway 32 and through aperture 31 back into the spring end of the chamber. In order to permit mechanical adjustment of the amount of fluid which will flow through the system of ducts, there are provided in each duct system a pair of vented valve screws 46 and 47 which extend vertically across passage 40 and control the flow of fluid therethrough. By turning these screws and changing the position of the vent holes relative to passage 40, the area through which fluid can flow can be varied. In operation, as the plungers move on their return strokes, the flow of fluid from the piston ends of the bores into the spring ends of the bores will remain constant except during the last stage of the closing of the door when it is desirable that more force be made available so that the door will positively shut. This additional force is obtained by adding ducts 42, situated between ducts 41 and 43 and so located that they are covered by the pistons until just before the plungers reach the ends of their return strokes. Then the ducts 42 are uncovered and open into chambers 33. The additional openings into chambers 33 allow more freedom of flow and the opposition of the fluid to the return strokes of the plungers is sharply decreased so that the full force of the springs will be thrown against the spindle to slam the door positively shut.

Since it is highly desirable to provide means whereby a door will remain partially open for ventilation or other reasons, the present invention is further provided with an automatic holding device. This device comprises pawls 50 adapted to cooperate with a series of ratchet teeth 51

horizontally disposed in chambers 33 of pistons 30 and having specially constructed surfaces including 51' and 51''. Each pawl is pivoted on a pin 52 horizontally secured to a plug 56 which is adapted to be screwed into holes 55 in casing 19 so that the pawls lie within chambers 33. The ratchet ends 53 of the pawls are urged to cooperate with ratchet teeth 51 by small pistons 53 which are slidably mounted in recesses 59 in plugs 56. The pistons and the pawls are secured together by U-shaped links 65 which may be threaded into the plungers, as at 66, and extended into holes 67 in the pawls. The pistons are urged inwardly into chambers 33 by light piston springs 68 and are hollowed, as at 61, to hold balls 62 which are urged by ball springs 63 to close vents 64 in screws 69 which are threaded into the open ends of the hollows. Small bleed openings 68 in the ends of screws 69 are adapted to bypass the ball valves.

When the door is opened, the ends 53 of the pawls ride over the surfaces 51'' of the ratchet teeth 51 and the pawls 50 push the pistons 53 into the recesses 59 from which fluid is forced through the ball valves. The bleed openings 68 permit a gradual leakage of fluid back into the recesses, but the springs 69 are not strong enough to return the pistons to their normal positions promptly against the fluid pressure in the chambers. Therefore, when the piston 30 is in motion, the ratchet ends 53 of the pawls ride over the tops of the ratchet teeth and do not drop into the notches. However, if the door is held for a few seconds in one position, the pawls will be forced into the notches by springs 68. The surfaces 53' on the pawls then engage against the surfaces 51' of the ratchet teeth. When the pawl is in a position whereby the surfaces 53' and 51' are in engagement, the return or door-closing movement of the pistons 30 is prevented and the door will be held open. In order to disengage the pawls from holding position, it is simply necessary to open the door a little further so that the ratchet ends 53 will ride over the adjacent surfaces 51''. The door may then be released and, because the action of the pistons 58 is so retarded as heretofore described, the pawls will not return to holding position while the plungers are in motion.

The installation of the device is simple. In view of the particular construction, it can be used for right or left-hand doors simply by turning the apparatus over and attaching the arm of the door check mechanism to one end or the other of the projecting spindle. The construction of the device enables its manufacture with extremely small width, depth and length. This permits an internal concealed installation in a door by mortising the instrument into the top or even into the bottom of a door. In either position, the directional action can be reversed simply by substituting the top of the instrument for the bottom, and, therefore, the closer can be used on a right or left-hand door as stated. The device may also be installed externally on any door. Because the door check is flat, a door on which it is used can be opened further than with the usual types of door closures. When concealed in a steel or wood door, no external mutilation of the door is necessary and it may be changed at any time from an external mounting to a concealed mounting without changing any part of the mechanism. By the use of two oppositely disposed spring and plunger members, excessive torsion on the spindle is avoided. Furthermore, the use of two members

lessens the possibility that the apparatus will cease to function completely owing to valve stoppages or for other reasons. The valves 46 and 47 permit close adjusting of the fluid flow and hence enable the device to be adapted for use with heavy and light doors. The apparatus can be made adequate for an extremely heavy door simply by inserting a stronger spring, which can be done at the factory or upon installation by removal of the end plugs, withdrawal of the old spring and insertion of a new spring. The pawls which enable the apparatus to hold a door open at a predetermined degree are of simple construction and provide a valuable accessory in the door check for use in hospitals and homes where the holding of a door ajar is desirable, and these self-contained devices eliminate the need for the usual foot door checks.

In view of these factors, this door check is capable of being used and sold without specification for use in or on any doors and without the need of stipulating a right or left-hand model. Hence, a dealer does not have to carry in stock a large variety and number of units for different uses, only one model being necessary and the parts thereof being standardized and interchangeable.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

We claim as our invention:

1. In a door closing and checking device, an elongated casing having rectangular parallel top and bottom walls and rectangular side walls and provided with openings to permit attachment of either side wall to a support, said casing having a bore extending longitudinally therein and containing a fluid, a rotatable toothed spindle vertically mounted midway between the ends of said casing and midway between the side walls thereof and having its end projecting above and below the top and bottom walls of the casing, a plunger slidably mounted in said bore and having a rack meshing with said spindle, a spring in said bore urging said plunger in one direction, and means for controlling the flow of fluid to the opposite ends of the plunger.

2. In a door closing and checking device, an elongated casing having two longitudinally-extending bores, one above the other, and containing a fluid, a rotatable toothed spindle vertically mounted in the longitudinal and latitudinal center of the casing and extending at right angles through said bores and having its ends respectively projecting above and below the casing, oppositely acting plungers in said bores having racks on opposite sides of said spindle and meshing therewith, a compression spring in each bore urging said plungers in an opposite direction relative to one another, and means for controlling the flow of fluid to the opposite ends of the plunger.

3. In a door closing and checking device, an elongated rectangular casing having parallel top and bottom side walls, said casing having two lon-

gitudinal bores therein disposed one above the other and containing a fluid, a rotatable toothed spindle journaled in said casing and extending through said bores at right angles thereto, said spindle being located midway between the ends of said casing and midway between the sides thereof whereby the device may be inverted for use either on right or left-hand doors, a plunger in each bore having a rack meshing with said spindle, a spring behind each plunger, and means for controlling the flow of fluid from one end of the plunger to the other, said plungers being oppositely disposed and said racks being disposed on opposite sides of the spindle.

4. In a door closing and checking device, a casing having a longitudinal bore containing a fluid, a spindle journaled in the casing, a plunger mounted in said bore cooperating with said spindle so as to turn the same when the plunger is moved in the bore, a spring normally urging the plunger in a direction to turn the spindle and close the door, means for controlling the flow of fluid to opposite ends of the plunger, and means for stopping the closing movement of the plunger at one of a number of preselected positions, said means comprising a series of ratchet teeth on said plunger, a pawl carried by the casing and adapted to engage said teeth, and means responsive to movement of said plunger for maintaining the pawl disengaged from the ratchet teeth until the door is momentarily held at the selected position.

5. In a door closing and checking device, a casing having a longitudinal bore containing a fluid, a spindle journaled in the casing, a plunger mounted in said bore cooperating with said spindle so as to turn the same when the plunger is moved in the bore, a spring normally urging the plunger in a direction to turn the spindle and close the door, means for controlling the flow of fluid to opposite ends of the plunger, and means for stopping the closing movement of the plunger at one of a number of preselected positions, said means comprising a series of teeth spaced apart longitudinally on the plunger, a pawl pivoted to the casing and engageable with the teeth, the teeth and pawl being arranged so that the pawl will ratchet over the teeth during the opening movement of the plunger, and means for maintaining the pawl in said overriding position during the closing movement of the plunger unless the door is momentarily stopped at a preselected position.

6. In a door closing and checking device, a casing having a longitudinal bore containing a fluid, a spindle journaled in the casing, a plunger mounted in said bore cooperating with said spindle so as to turn the same when the plunger is moved in the bore, a spring normally urging the plunger in a direction to turn the spindle and close the door, means for controlling the flow of fluid to opposite ends of the plunger, means for stopping the closing movement of the plunger at one of a number of preselected positions, said means comprising a series of teeth spaced apart longitudinally on the plunger and a pawl pivoted to the casing and urged into engagement with the teeth, and means associated with the pawl for retarding movement thereof into the notches between the teeth.

7. In a door closing and checking device, a casing having a longitudinal bore containing a fluid, a spindle journaled in the casing, a plunger mounted in said bore cooperating with said spindle so as to turn the same when the plunger is moved in the bore, a spring normally urging

7

the plunger in a direction to turn the spindle and close the door, means for controlling the flow of fluid to opposite ends of the plunger, means for stopping the closing movement of the plunger at one of a number of preselected positions, said means comprising a series of teeth spaced apart longitudinally on the plunger and a pawl pivoted to the casing and urged into engagement with the teeth, said casing having a recess adjacent said pawl, and a spring-driven piston slidably mounted in said recess and adapted to urge the pawl into the notches between the teeth, said piston having a ball valve therein to permit one-way flow of fluid out of said recess, said piston also having a bleed opening around said valve for gradual leakage of fluid into said recess.

8. In a door checking device comprising a casing having a longitudinal bore and a plug threaded into one end of said bore so as to close the same, means positioned interiorly of the casing for permitting reversible fastening of the

8

casing to a support comprising a plurality of bolt receiving openings in said casing extending transversely through the bore and a circumferential groove on said plug adapted to register with said openings when the plug is screwed into the end of the bore to provide apertures extending through the bore of said casing for receiving bolts to secure the device in position on a door.

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