Nov. 17, 1931. F. C. GARRISON 1,832,699

FLOOR CHECK FOR SWINGING DOORS

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Fig. 1.

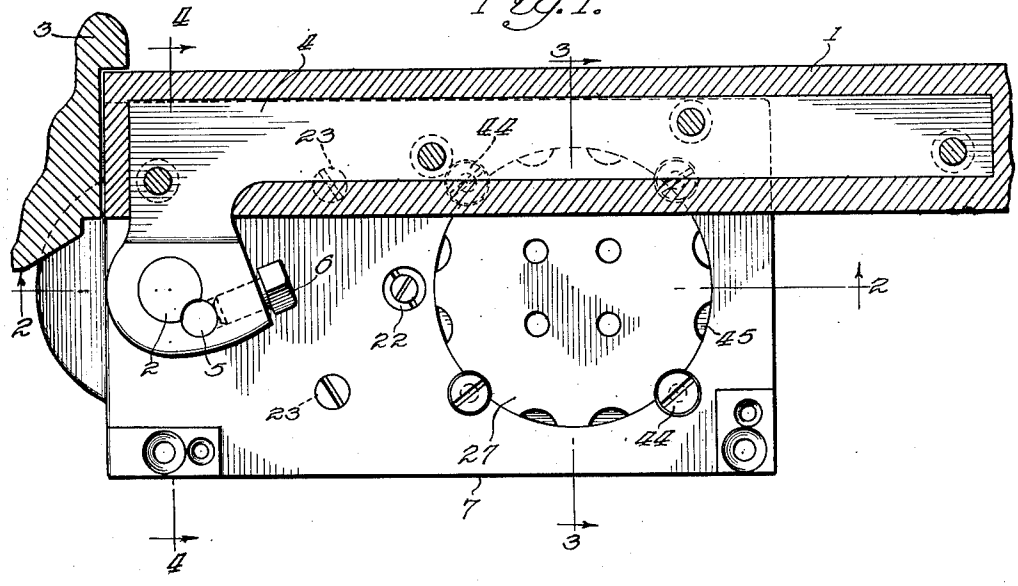
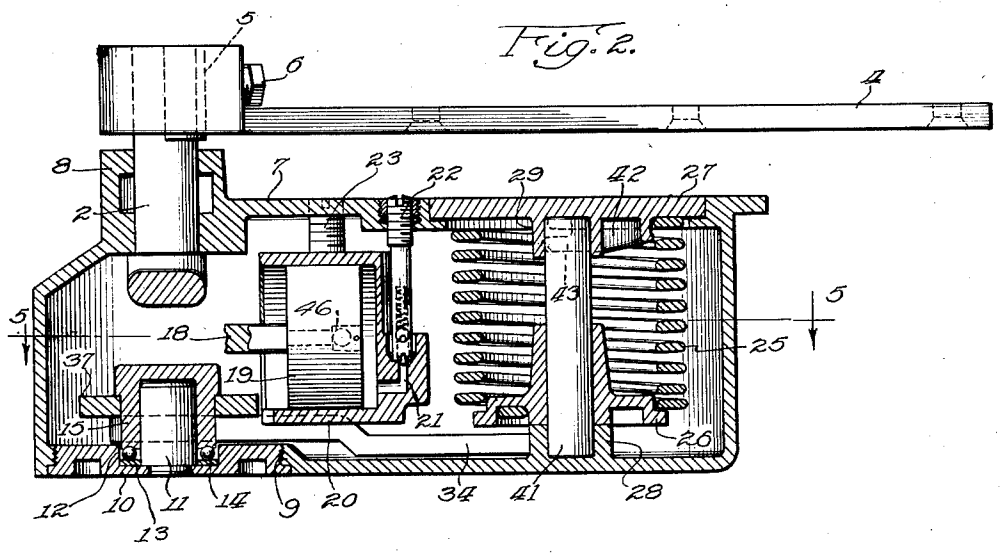


Fig. 2.



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Fig. 3.

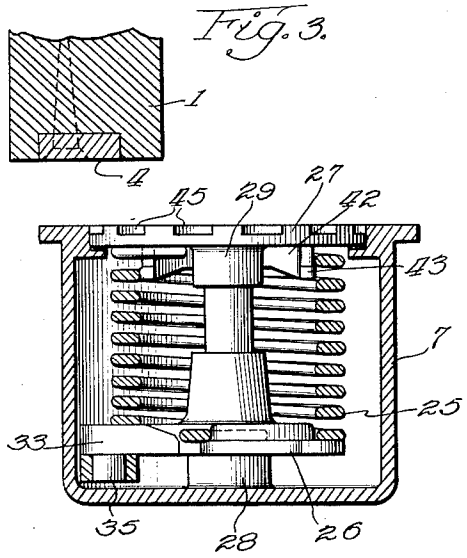


Fig. 4.

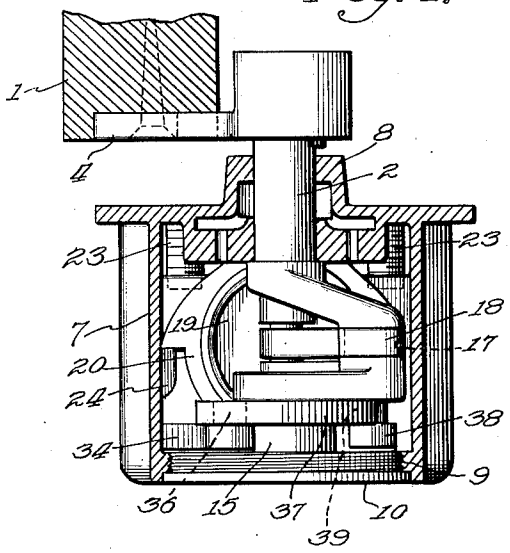
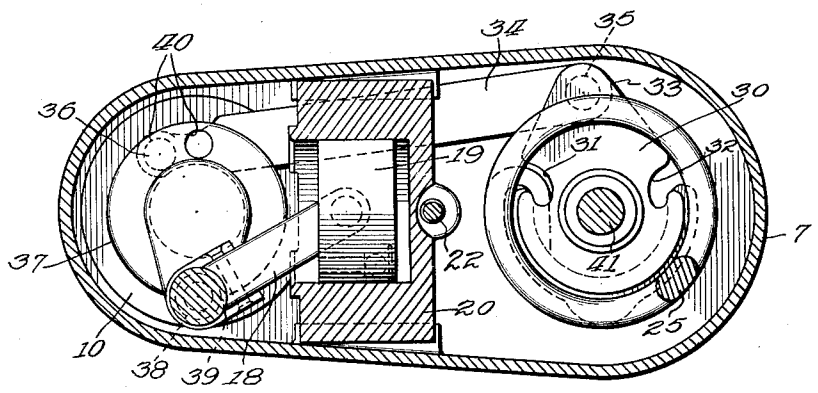


Fig. 5.



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Fig. 6.

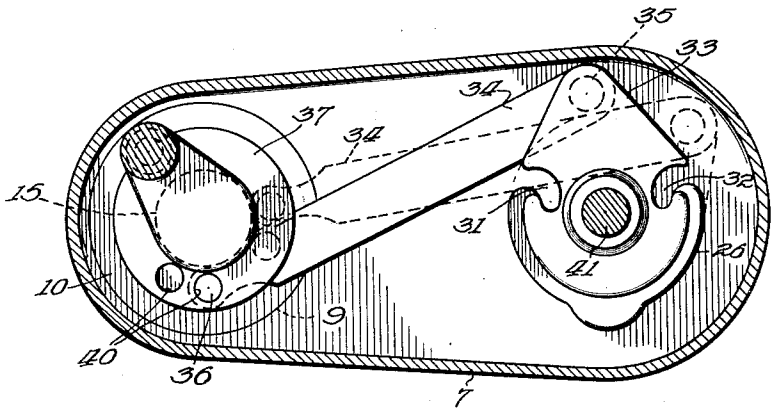


Fig. 7.

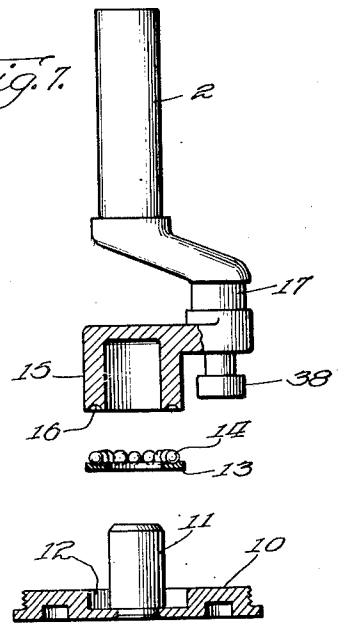
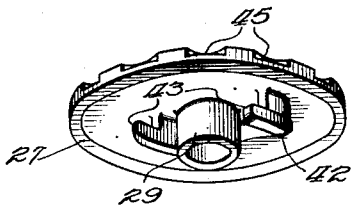


Fig. 8.



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Patented Nov. 17, 1931 1,832,699

UNITED STATES PATENT OFFICE

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FLOOR CHECK FOR SWINGING DOORS

Application filed November 3, 1930. Serial No. 493,094.

This invention relates to constructions for supporting doors at their hinge ends, and which are housed out of view within a depression in the floor, and have provision for cushioning or checking the action of the door, urging the door toward and retaining the door in its closed position, and also for retaining the door in its fully open position.

The purposes of the invention are to provide structural improvements in the door closer and check described in applicant's Patent No. 1,773,988 of August 26, 1930, and the patent to Rixson No. 1,064,255 of June 10, 1913.

Among these improvements are the arrangement of linkage between the door closing spring, and pivot spindle for the door in combination with door checking or cushioning means, which functions with the spring and linkage for effecting the desired action of the door from an intermediate or dead center position toward closing position or toward a hold-open position; to provide improved means for varying the extent of angular motion of the door from the closed position to the hold-open position; and to provide improvements in the spring mounting for this class of door closer and check.

The purposes of the invention are accomplished by the construction illustrated in the drawings, in which:

Figure 1 is a plan view of the door check, and shows, in section, a portion of the door and door jamb.

Fig. 2 is a longitudinal sectional view of the door check taken on the line 2—2 of Fig. 1.

Fig. 3 is a sectional detail taken on the line 3—3 of Fig. 1.

Fig. 4 is a sectional detail taken on the line 4—4 of Fig. 1.

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

Fig. 6 is a plan view to illustrate the linkage connection and motion thereof between the door supporting spindle crank and the spring retainer, showing the casing in section.

Fig. 7 shows details partly in section of the door supporting spindle and foot bearing therefor.

Fig. 8 is a perspective view of the spring adjuster.

The general arrangement of the principal parts of this type of door check is described in the above mentioned patent to Garrison, No. 1,773,988. The particular improvements herein described are a particular link connection between the door supporting spindle and crank and the lower spring carrier which serves to transmit motion between the door and the door closing spring which is hooked to the spring carrier, a spring retaining and tension regulating device at the upper end of the spring, and a bearing for the door supporting spindle. The angular adjustment of the door around its hinges may be varied to suit different needs as to hold-open position merely by changing the point of connection between the above mentioned link and a disk which rotates with the spindle and serves as a crank connection between the spindle and the link connecting with the spring retainer.

Referring to the drawings, a portion of the bottom end of a door is shown in section at 1, and its hinge support is along the axis of the spindle 2. The door jamb is indicated in section at 3. The spindle 1 carries an offset arm 4 which is keyed to the spindle by a key 5, locked to the spindle and the arm 4 by a set screw 6. The spindle 2 supports the weight of the door and is mounted for rotation within bearings provided for by and within the case 7, of the door checking and closing mechanism. This case is generally mounted within a floor box having a removable cover extending over the top of the door check casing 7. The upper bearing 8 for the spindle 2 is provided for by a boss cast integrally with the casing 7. At the bottom

of the casing is an internally threaded opening 9 for receiving the foot bearing element for the lower end of spindle 2. The member 10 is threaded to fit the opening 9, is unhardened, but has riveted thereto a central hardened post 11, and surrounding this hardened post is a depression 12 for receiving a washer-shaped bearing race 13 and a set of ball bearings 14. The lower end 15 of spindle 2 is hollow for receiving post 11, and it is also cut and hardened to provide a ball race 16, at which point the spindle rests upon this lower bearing.

The spindle as shown in Figure 7 has an integral crank formation 17 for receiving a connecting rod 18. Fig. 5, for a piston 19. Piston 19 fits a cylinder 20; therefore, when the door is oscillated on its hinge supports, piston 19 reciprocates within the cylinder. The action of the door is cushioned at a rate determined by the size of the port 21, Fig. 2, in the end of the cylinder. The case 7 is about three-fourths filled with a liquid checking medium, and when the door swings to closed position, the rate of passage outwardly of the liquid through this port is determined by the adjustment of a needle valve 22. Upon opening the door the liquid enters the cylinder more freely through the ball check valve, Fig. 2.

The cylinder 20 is retained stationary within the casing 7 by set screws 23, which hold the cylinder tightly against shoulders 24 on the inside of the walls of casing 7 and cast integral therewith.

For the purpose of urging the door to its closed position, or if open far enough, to retain the door in its open position, a flat coil spring is mounted under tension between a lower spring carrier 26 and an upper spring adjuster 27.

The lower spring carrier 26 is rotatably mounted on a post extending between the boss 28 on the casing 7 and the boss 29 on the adjuster 27. The spring carrier 26 has a radially extending flange 30, recessed at 31 and 32 to receive the hooked ends of either right or left springs, and also has an extension 33 in the form of an arm to which is pivoted one end of a link 34, by a pin 35 riveted to arm 33 and passing through a hole in the link. The opposite end of link 34 is also apertured to receive a pin 36, riveted to the disk 37 rotatable with spindle 2. The disk 37 has a central aperture fitting the bottom end 15 of spindle 2, and is secured to the spindle to rotate therewith by a headed post 38, fitting a slot 39 cut in the edge of the disk. The post 38 extends downwardly from the crank portion 17 of spindle 2.

The pin 36 may be placed at different points angularly around the disk 37 in correspondence with the arc of movement of the particular door to which the door check is applied. The dead center position of link 34 is indicated by broken lines in Fig. 6, and the link is shown by the full lines, as it would appear when the door is in its fully open position. Fig. 5 shows the link 34 as it would appear when the door is closed. The spring 25 through the spring retainer 30 pushes the link toward this last mentioned position and holds the door closed.

When, however, the door is swung open against the resistance of spring 25, carrying the link 34 past the dead center position indicated by the broken lines in Figure 6, the spring then serves to push the link into the position indicated by the full lines in this figure and hold the door open. Should it be desired that the door have a less arc of motion than that corresponding with the link position, illustrated by Figure 6, the connection between disk 37 and the link 34 is changed to meet such different requirements by securing the pin 36 at a different point around the disk 37. For this purpose the disk 37 is provided with a plurality of drilled holes 40 for receiving pin 36. For example, if the link is attached to disk 37, at the right hand hole 40, Fig. 5, instead of the left hand one, as shown, the spring retainer 30 will be rotated a few degrees to the right, carrying the lower end of the spring with it in this direction. Change in the tension of the spring may be compensated for by means of the spring adjuster 27. With the link connected in this manner, the door check mechanism is arranged for a decreased arc of movement of the door, as the angular motion of the spindle 2 is the distance between the location of the right hand hole 40, Fig. 5, and the location of the pin 36, Fig. 6.

The spring adjuster is a cast disc having a boss 29 for receiving post 41, around which the spring retainer 26 oscillates, and a semi-circular flange 42 having projections 43 at its ends with which the hooked ends of right or left springs are engaged. The tension of the spring 25 is regulated by the rotation of the adjuster 27 with a spanner, and securing the adjuster in the desired position by screws 44 threaded into the top of casing 7 and having heads for engaging semi-circular recesses 45 on the upper edge of adjuster 27.

In the operation of the device, it functions for the three purposes of closing the door, holding the door in its hold open position, and cushioning the action of the door in either direction. When the door is swung from its closed position toward its open position, the spindle 2 rotates the same number of degrees. The link 34 moves from the position indicated in Figure 5 toward the dead center position indicated in Fig. 6, against the action of spring 25. If the door is released before the link passes the dead center position, the spring swings the door back to its closed position, at a rate which is permitted by the passage of liquid through the port 21. Since

the piston 19 has a pitman connection with the crank on the spindle 2, any motion of the door is cushioned. If the door is swung toward its open position beyond the dead center position of link 34, as indicated by the broken lines in Fig. 6, the spring 26 serves to push the door to its fully open position, link 34 coming to rest as indicated by the full lines in Fig. 6.

The rigid link connection 34 between the spring carrier 26 and the disk 37 rotatable with spindle 2, permits this type of door check to be serviceable for holding the door open as well as for closing the door. Midway between these positions, as indicated by the broken lines of Fig. 6, the link has a dead-center position and when passing this position the spring becomes effective for continuing to swing the door in its direction of movement either toward closed position or the hold-open position. The door cushioning piston 19 is in its extreme outer or left-hand position when the link 34 is at dead center. The connecting rod 18 therefore passes through the dead center at approximately the same time as link 34. Thus both the door cushioning and closing means have substantially the same action when moving the door to the hold-open position as when moving the door to its closed position.

The disk 37 provides for a variable throw-crank connection between the door spindle 2 and the link. Thus by changing the point of connection between the link 34 and the disk 37 the angular motion of the door from its closed position to its hold-open position may be varied. The tension of spring 25 is changed accordingly, but irrespective of this adjustment between the link 34 and disk 37 the spring may be restored to its normal amount of tension by means of the spring adjuster 27.

I claim:

1. In a door check, a door supporting spindle formed to include a crank thereon, door cushioning means connected with said crank, door closing means including a connection to said spindle comprising an element secured to said spindle to rotate therewith, means for pivotally attaching a link to said element at different angularly spaced points thereon, a rigid link pivoted to said element at one of said points, a door closing spring, the opposite end of said link being pivotally connected with said door closing spring, said element and link being arranged to be capable of passing a dead-center position, whereby the spring may be utilized to both hold the door open and to close the door.

2. A door-checking closing and hold-open device comprising a casing, a spindle mounted in said casing and having a connection with a door for oscillation therewith, door cushioning means connected with said spindle and arranged to check the door in movement thereof toward the closed and the hold-open positions, a door closing and hold-open spring mounted in said casing, and a rigid connection between said spring and spindle arranged to be reciprocated and oscillated by the spindle past a dead center position as the door moves between the closed and hold-open positions.

Signed at Chicago this 31st day of Oct., 1930.

FORREST C. GARRISON.