Dec. 28, 1937. E. BOMMER 2,103,660

DOOR CHECK AND CLOSER

Filed Dec. 26, 1934 2 Sheets-Sheet 1

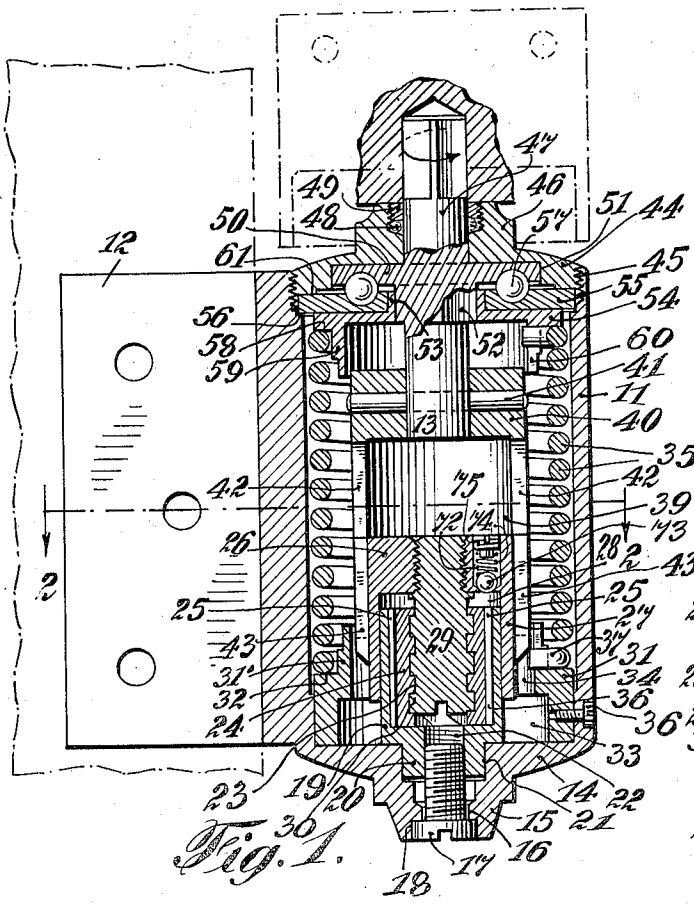


Fig. 1.

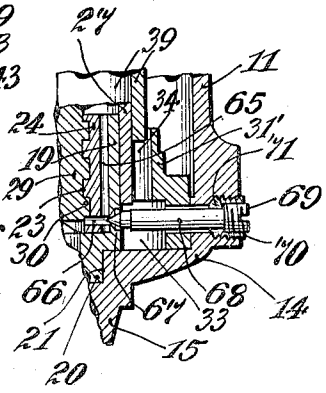


Fig. 3.

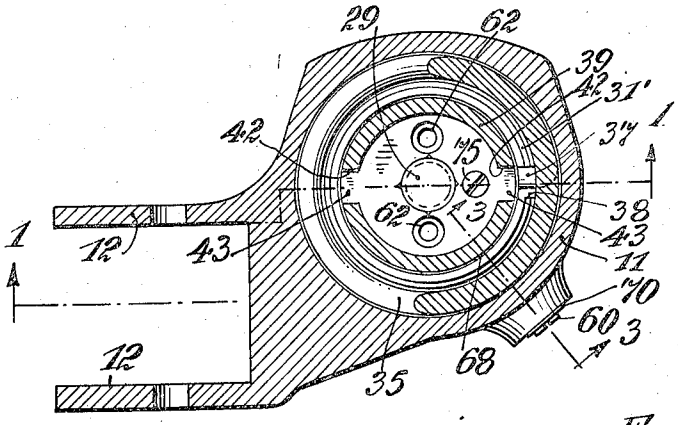


Fig. 2.

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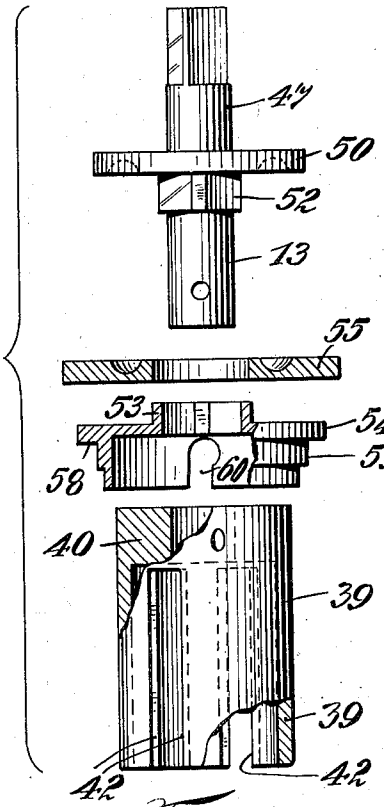


Fig. 4.

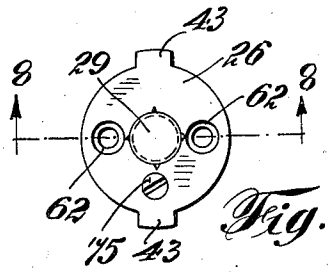


Fig. 7.

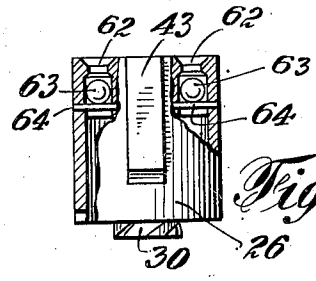


Fig. 8.

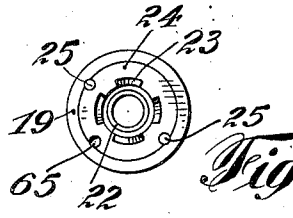


Fig. 9.

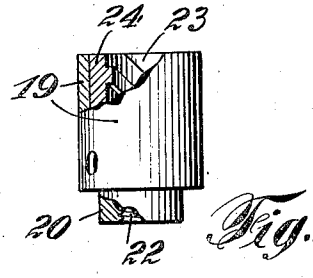


Fig. 10.

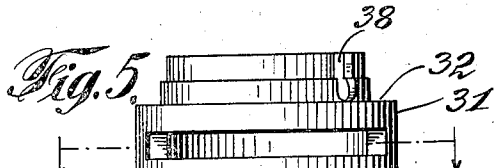


Fig. 5.

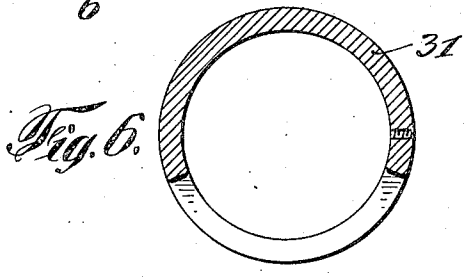


Fig. 6.

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Patented Dec. 28, 1937

2,103,660

UNITED STATES PATENT OFFICE

2,103,660

DOOR CHECK AND CLOSER

Emil Bommer, Brooklyn, N. Y.; Gustav Bommer, John F. Voelkel, and Charles F. Gehrmann executors of said Emil Bommer, deceased

Application December 26, 1934, Serial No. 759,170

5 Claims. (Cl. 16—50)

This invention has reference to improvements in or relating to a door check and closer of the type in which the action of a tensioned spring causes closing movement of the door and at the same time causes movement of a piston against checking medium whereby automatically to regulate the closing movement of the door.

The invention has for its object to improve generally in the construction and operation of a door check and closer and is illustrated as embodied in a hinge adapted to be engaged with a stile for use in connection with lavatory doors or the like, and I desire to make it understood that my invention is not confined or limited to this particular type of hinge, but may be employed in suitably designed door-supporting or closing constructions, whether engageable with the stile, with the flooring below the door or the lintel above the door.

An object of my invention is to provide within the casing containing the checking medium, a sliding connection between the door spindle and the piston which is opposed by the checking medium during the closing movement of the door, and a screw-threaded connection between such piston and an anchor member. By my simple and novel arrangement, the piston turns with the turning movement of the spindle and by reason of its screw connection with the anchor member it is automatically given an independent axial movement relatively to the spindle when it is turned by the spindle. During the closing movement of the door, the piston while turning is moved axially against the checking medium in a pressure chamber which is formed between the piston and the anchor member, and during the opening movement of the door the piston is actuated in a counterdirection in which it is unopposed by the pressure force of the checking medium.

Another object of the invention is to provide in a construction of the character described a valve for regulating the flow of checking fluid in the relief passage leading from the pressure chamber, the parts being so arranged that this regulating valve may be disposed for manipulation from the outside of the casing. Another object of the invention in this connection is to provide in association with the pressure chamber, a valve guarded relief or dumping chamber adapted instantly to accommodate some of the checking fluid in order to relieve stresses and strains on the working parts in the event it is attempted manually to force the closing movement of the door.

Another object of the invention is to provide a construction in which the door-engaging spindle is furnished for easy turning movement with a ball bearing device which is mounted in the top portion of the casing whereby this spindle and also the weight of the door supported thereby, in cases where the spindle supports the door, will be supported in the top portion of the casing.

With the foregoing and other objects in view, my invention consists of the features of construction, and of the combination and relative arrangement of the several parts as hereinafter described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 represents a vertical sectional view through a door check and closer made in accordance with my invention;

Fig. 2 is a cross sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a sectional detail taken on the line 3—3 of Fig. 2, showing the valve for regulating the flow of checking fluid in the outlet passage of the pressure chamber;

Fig. 4 is an elevational part sectional view, showing the parts by means of which the door-engaging spindle is mounted and slidingly connected with the piston, these parts being shown separated but in proper relation for assembly;

Fig. 5 is a side elevational view of the stationary or lower anchor member for the torsion spring;

Fig. 6 is a cross sectional view taken on the line 6—6 of Fig. 5;

Fig. 7 is a top plan view of the piston;

Fig. 8 is a side elevation and section of the piston, the section being on the line 8—8 of Fig. 7, to show the ball valves;

Fig. 9 is a top plan view of the anchor post; and

Fig. 10 is a side and part sectional view thereof.

Referring now in detail to the accompanying drawings, wherein for purposes of illustration only, I have shown my improvements as embodied in a hinge designed for use in connection with lavatory doors, 11 denotes a casing of general cylindrical form and of appropriate length, having spaced leaves 12 for embracing the stile and having a spindle 13 for engaging the door, the upper end of the spindle for this purpose being preferably of angular or polygonal form in cross section in order to engage in a correspondingly shaped socket in the door.

The casing is represented as provided with an integral bottom end 14 formed with an axial downwardly projecting boss 15 in which is provided a central opening 16 for a securing screw 17, the outer end of the opening being appropriately countersunk as at 18 to accomodate the head of the screw. 19 denotes a vertically dis-

posed cylindrical member or post the lower end of which consists of a reduced portion or boss 20 which fits in a circular recess 21 in the bottom end and is axially provided with a screwthreaded opening 22 for engagement by the inner end of the screw whereby to secure this element or post rigidly with the casing. This cylindrical element or post, along its longitudinal axis, is provided with spirally cut female threads 23, and for convenience in manufacture these threads are preferably produced in a separate member or sleeve 24 which is fitted within a suitable bore in the post and secured in place by means of elongated pins 25 inserted in bores made partly in the post itself and partly in the sleeve as shown in Figs. 1 and 9.

26 is the piston and this element is formed with a tubular portion 27 slidably fitting around the post 19 to provide therewith a checking fluid chamber 28. The piston is provided with an axial stem 29 which is furnished with male spiral threads 30 for engagement in the threads of the post.

Resting upon the bottom end 14 and of a dimension to engage the inner face of the side wall of the casing is a collar or ring 31, its upper portion 31' being inwardly offset and having an interior diameter of sufficient size to provide an annular space between it and the exterior surface of the tubular portion 27 of the piston. Due to the provision of the inwardly offset portion 31', this collar has an annular top seat or ledge 32 and it forms around the post a chamber 33 of copious size, which chamber is in communication with the main chamber of the casing through the annular space 34. This collar or ring 31 is designed to serve as an anchorage and seat for the coil torsion spring 35. To this end, in the present embodiment, said collar 31 is secured rigidly with the casing by means of a set screw 36. The lowermost coil of the torsion spring rests upon the annular shoulder 32 of the collar and the lower terminal 37 of this spring is engaged in an open notch 38 provided in the inwardly offset portion 31' of the collar.

Between the spindle and the piston there is provided a connecter device by means of which the piston is rotated with the rotation of the spindle and at the same time is permitted to have an independent axial movement which is compelled by the spirally shaped threads between the piston and the anchor post. In the present embodiment, this connecter device is represented as comprising a cylindrical body 39 in which the piston is telescoped for its functional movements, the upper or closed end 40 of this element being rigidly secured to the lower end of the spindle 13 by means of a pin 41. The cylindrical wall of this element is provided lengthwise thereof along diametrically opposite lines with keyways or guide slots 42 in which are slidably engaged key members 43 provided on the periphery of the piston parallel with the longitudinal axis thereof. The spiral threads between the piston and the stationary post are so cut that on the opening movement of the door the piston while rotating with the spindle, will be caused to rise upwardly from the post, enlarging the checking fluid chamber 28 for the flow thereinto of checking fluid; and on the closing movement of the door the piston will be compelled to move in a counterdirection, that is to say, toward the top end of the stationary post, thereby contracting the checking fluid chamber and moving against the checking fluid therein.

The spindle with the weight of the door supported thereby, if the spindle is used in an arrangement for supporting the door, is supported for operation in the top portion of the casing and journaled in a cap closure 44 which is screwthreaded at 45 in the top of the casing. The closure 44 is by preference made with a central exterior hub or boss portion 46 having a suitable bore in which the plain or smooth portion 47 of the spindle is journaled; and also by preference this hub portion at its outer end is provided around the smooth portion 47 of the spindle, with a cavity for containing packing or the like 48 which is held in place by an appropriate nut 49 threadedly engaged with the portion 46. Adjoining its plain portion 47 the spindle is provided with a disk 50 which has rotary fit in a suitable circular recess 51 provided for the purpose in the underface of the closure. In the present instance, this disk is represented as being made integral with the spindle, but this of course is not essential. Adjacent to and below the disk 50, the spindle is formed with an angular portion 52, herein shown to be four-sided, and this four-sided portion fits in a corresponding opening provided in the flange 53 upstanding from the collar or ring 54. The outer face of the flange 53 is of circular form and it is surrounded by a disk 55 of larger diameter than the disk 50 and which rests upon an annular shoulder or ledge 56 provided in the casing wall immediately below the screw-threads 45. Antifriction ball elements 57 are disposed between the disks 50 and 55 and in suitable raceways provided therein. The collar or ring 54 is formed with an annular shoulder or seat 58 for the upper end of the torsion spring and it is also formed with a cylindrical portion or apron 59 at the inner face of the spring and which, it will be observed, is of larger diameter than the upper end 40 of the connecter. Said cylindrical portion 59 is provided with an open notch 60 in which the upper terminal of the torsion spring is engaged. From an inspection of Fig. 1, it will be observed that the parts of this spindle mounting are so arranged that when the cap closure is tightly screw-threaded into place, its bottom portion 61 will be tightly engaged with the disk 55 opposite the annular shoulder 56 on which this disk rests, thereby holding all of the parts securely in place and permitting rotation of the collar 54 with the rotation of the spindle.

In assembling the parts of the device, the stationary post with the threadedly engaged piston having been applied, and the lower anchor collar having been applied, the torsion spring is inserted and more or less compressed to act in opposite directions against the end collars, and the polygonal portion 52 of the spindle is applied to the correspondingly shaped opening in the flange of the collar 54 in such manner that the spring will be tensioned, that is to say, wound or twisted at the upper end portion thereof, to the extent necessary to furnish the torsional force or power which it is desired to supply to the particular door in connection with which the device is to be utilized. In short, the spring is given its desired tensional force before the application of the polygonally formed portion 52 to the correspondingly formed opening in the collar 54, and this is of course done before the application of the cap closure to the casing.

For admitting checking fluid into the checking fluid chamber 28 during the rising actuation of the piston, the latter is provided with inlet

passages 62 in which are provided upwardly seating ball valves 63. During the upward movement of the piston, the checking fluid passes downwardly around the ball valves and around the pins 64 which support these valves adjacent the chamber. On the descending movement of the piston, the checking fluid forces the valves upwardly against their seats. The relief outlet for the checking fluid is provided in the stationary post and consists of a passage 65 which leads downwardly through said post and has a branch 66 which discharges into the space below the screw stem of the piston and also has a port 67 which discharges into the chamber 33. The discharge of the checking fluid, which of course is effected during the descending movement of the piston against the checking fluid in the chamber 28, is regulated by a pointed pin valve 68 which is disposed with its point entering through the port 67 and so as to be manipulated for adjustment from the outside of the casing, as best shown in Fig. 3. The passage 67 is tapered to suit and accommodate the pointed end of the pin valve so that the discharge of checking fluid into the chamber 33 can be controlled by adjusting the pin valve. Pressure built up in the passage 65, branch 66 and space below the screw stem of the piston is relieved through the passage 67 around the pointed end of the pin valve. From the chamber 33 the liquid rises into the main chamber of the casing through the annular space 34. The pin valve has a screw-threaded head 69 which is screw-threaded into a sealing nut or gland 70, the latter in turn being screw-threaded into the wall of the casing and against suitable packing 71 whereby to prevent any leakage of the checking fluid to the outside of the casing. By manipulating the pin 68 from the outside of the casing the discharge of the checking fluid through the passage 67 may be regulated so as to control to a nicety the checking fluid resistance to the closing operation of the door.

Provision is made whereby effectually to relieve shocks and strains upon the working parts due to attempts manually made to force the closing movement of the door. To this end, the piston is provided with a checking fluid dumping cavity 72 in communication with the chamber 28. Entrance of checking fluid into this cavity from the chamber 28 is normally prevented by a ball valve 73 urged downwardly into its seat by a spring 74 which acts against the ball valve below it and against a screw plug 75 above it, said screw plug being screwthreaded into the wall surrounding the upper end of the cavity. If, under this arrangement, it be attempted to force the closing action of the door, the pressure force of the checking liquid in the cavity 28 will unseat the ball valve 73 immediately permitting oil to enter into the cavity and thereby relieving the working parts of strain.

In the construction and arrangement herein illustrated and described, simplicity, compactness and thorough lubrication of all parts are realized. Application of the stored power of the torsion spring directly through the collar 54 upon the spindle assures a prompt and effective closing of the door while due to the sliding connection between the connecter and piston and the spiral threads between the piston and the anchor post, the piston is moved with a combined rotary and axial movement against the opposing checking fluid. The parts cannot readily get out of order and are in their functioning subject to a minimum of strain and wear, besides being thoroughly lubricated at all times.

I have herein shown and described an embodiment of my present invention which has been found highly satisfactory in actual use. Nevertheless it is to be understood that the essential features of my invention may also be embodied in various structural forms other than those herein shown by way of example, and I, therefore, reserve the privilege of resorting to all such changes and modifications as may be fairly considered within the spirit and scope of the invention as claimed.

I claim:—

1. A door check and closer comprising a fixed casing, a rotatable door-engaging spindle, a connecter within the casing fastened to the spindle to turn therewith, a two-part dashpot forming a checking fluid chamber within the casing comprising a telescoping piston and stationary element fixed to the casing and connected to cause axial movement of the piston on the turning movement thereof, and a sliding connection between said connecter and piston to cause turning of the piston with the turning of the spindle in either direction and permitting axial movement of the piston in either direction as a part forming with the stationary element the checking liquid chamber.

2. A door check and closer comprising a fixed casing having a door engaging spindle journaled in one end thereof for rotation, a connecter within the casing fastened to the spindle to rotate therewith, a telescoping piston and a fixed element forming between them a checking fluid chamber within the casing and threadably connected to cause axial movement of the piston on the rotation thereof, means connecting the connecter and piston to cause rotation of the latter by the rotation of the spindle and permitting axial movement of the piston, inlet and outlet passages for said chamber, the inlet passage being in the piston and the outlet passage extending through said fixed element, an inlet valve in the inlet passage, and a regulating valve in the outlet passage disposed and arranged to be adjusted from the outside of the casing.

3. A door check and closer having in combination with a fixed casing and a rotatable door-engaging spindle, a top end closure for the casing with a bearing in which the spindle is journaled, mounted on the casing to operatively support the spindle and hence the door thereon, a torsion spring which coils about the central interior of the casing attached to the spindle to be tensioned by the rotation of the spindle in one direction and adapted by its stored power to cause reverse rotation of the spindle, a connecter fastened to the spindle to rotate therewith, a telescoping piston and a stationary element forming between them a checking fluid chamber and threadably connected to cause axial movement of the piston on the rotation thereof, a sliding connection between said connecter and piston to cause rotation of the piston with the rotation of the spindle and in either direction and permitting free axial movement of the piston in either direction, said spring being disposed below and confined by said bearing and said connecter, piston with its stationary element, and said sliding connection, all being disposed centrally within said spring.

4. In a door check and closer, the combination of a stile leaf, a casing fixed thereto and provided in its lower portion with a stationary post, a piston telescoping the post and forming a

checking fluid chamber therewith, a stem on the piston threadably engaged with the post to cause axial movement of the piston on the rotation thereof, a rotary door engaging and supporting spindle journaled in the upper portion of the casing and connected with the piston to cause rotation of the piston by the rotation of the spindle, its connection with the piston being effective to provide for the free axial movement of the piston for enlarging and contracting the checking fluid chamber formed by and between the piston and post.

5. In a door check and closer, the combination with a fixed casing provided with a stationary post at one end, a piston telescoping the post and forming a checking fluid chamber therewith, a stem on the piston threadably engaged with the post to cause axial movement of the piston on the rotation thereof and in either direction, a rotary door engaging and supporting spindle journaled in the opposite end of the casing, a connection between the spindle and piston for rotating the latter by the rotation of the former while permitting axial movement of the piston, a valved inlet in the piston communicating with said chamber for admitting checking fluid when the piston is moved axially in a direction to expand said chamber, and a valved outlet passage for the chamber extending through the post to discharge checking fluid when the piston is moved axially in a direction to contract said chamber.

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