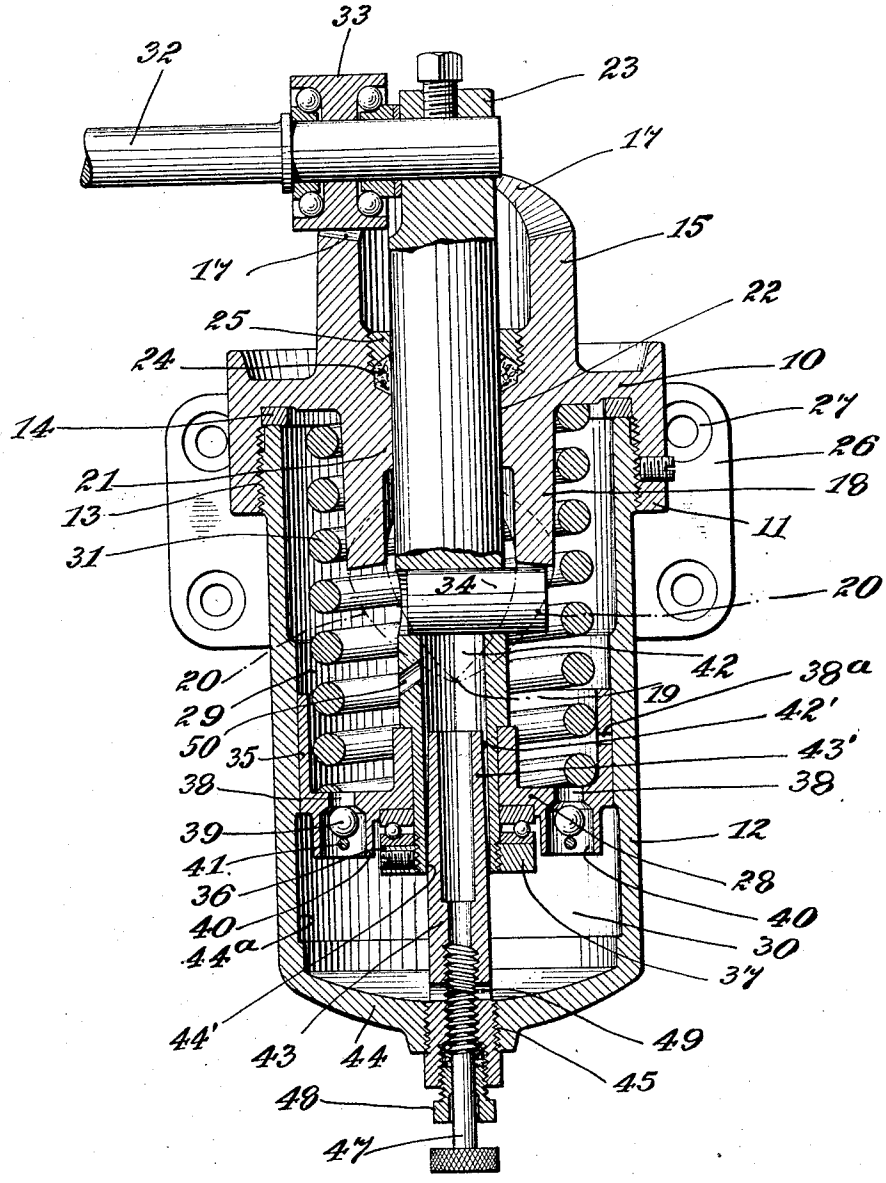
July 28, 1931. E. BOMMER 1,816,169

DOOR CLOSER AND CHECK

Filed Aug. 16, 1929



INVENTOR
Emil Bommer
BY C. F. Wegel
his ATTORNEY

Patented July 28, 1931

1,816,169

UNITED STATES PATENT OFFICE

EMIL BOMMER, OF BROOKLYN, NEW YORK

DOOR CLOSER AND CHECK

Application filed August 16, 1929. Serial No. 386,365.

This invention relates to certain improvements in door closers and checks, and has for its primary object the provision of an improved construction of this character which will be highly efficient in use and economical to manufacture, and one in which the interior parts are so constructed and related that a greater range of adjustment can be given to the speed of the door, and that the oil or fluid acting as a pressure medium will be directed and controlled in such a manner that no leakage will result from the flow of the oil or liquid under pressure during regulation of the closing movements of the door.

Another object of the invention is the provision of a construction of means which will prevent any slamming action of the door and insure a smooth and even closing movement thereof, without the possibility of oil or fluid leakage as a result of the exercise of the pressure forces.

Furthermore, the invention has for an object the provision of a construction whereby, as the door approaches or reaches the place where its latch bolt will engage the strike plate, the pressure forces offering resistance to the expansion of the spring will be relieved, permitting the spring to act with a force sufficient to effectuate the pressing of the latch bolt aside when it engages the strike plate, whereby to insure complete closing of the door with the latch bolt engaged with its keeper.

More particularly, the purpose and object of the present invention are the provision of certain improvements in the type of door closers and checks which embody an expansile spring whereby to effect closing movement of the door, and an oil or fluid as a pressure medium for modifying and regulating the expansile action of the spring, the improvements relating to distribution of the oil or liquid under pressure and the flow thereof into the chamber adjacent the stuffing box in which the piston stem is arranged to have turning and sliding movement.

With the above and other objects in view, the invention consists in the improved door closer and check, and in the form, construction, and relative arrangement or arrangements of parts, as will be hereinafter more fully described, illustrated in the accompanying drawing and subsequently incorporated in the subjoined claims.

One simple and practical embodiment of the invention is illustrated in the accompanying drawing, which forms a material part of this specification.

The figure represents a vertical central section through a door closer and check embodying my present improvements.

With more particular reference to the drawing, the liquid containing casing is disclosed as comprising a head end 10 formed with a depending annular flange 11, and a cylindrical casing or shell 12 which is detachably secured to the inner periphery of the depending flange 11 by means of suitable screw threads as indicated at 13, a suitable gasket or washer 14 being interposed between the top annular end of the casing and the underneath face of the head end. Formed integral with the head end is a central upwardly extending tubular portion 15 which is made with a high point or dwell and two cam faces or edges 17 which curve downwardly from said high point or dwell. Also formed integral with the head end is a central depending tubular portion 18 having a low or dwell 19 from which two cam faces 20 curve upwardly from the low point or dwell. The tubular portion 18 has formed integral therewith a central portion or web 21 having a central hole 22 through which the piston stem 23 passes. Seated within the cavity of the tubular portion 15 around the piston rod 23 and upon the central portion 21 is a stuffing box construction comprising a suitable packing 24 and a packing nut 25 which is threadedly engaged with the interior wall of the tubular portion and screwed down tightly upon the packing material.

With the flange 11 is formed an integral bracket part 26 having suitable apertures 27 therein adapted to receive appropriate fastening means whereby to be secured to the door for supporting the door closer and check to the door in the customary manner.

Within the liquid containing casing the piston stem carries a piston 28 by which the interior of the casing is formed into an upper chamber 29 adjacent the head end and a lower chamber 30 remote from the head end. The expansile means comprises a coil spring 31 which is imprisoned between the head end and the piston, a portion of the spring surrounding the tubular portion 18 whereby suitably to be held in operative position. To the upper end of the piston stem is secured an arm 32 carrying a roller 33 adapted to cooperate with the cam faces 17, the said arm 32 being connected with suitable link members (not shown) which are connected in any suitable or approved manner to the door-jamb. A pin 34 attached to the piston stem below the tubular portion 18 cooperates with the cam faces 20 whereby to prevent outward displacement of the piston stem. By this arrangement, when the bracket 26 is mounted to a swing door and the arm 32 through its connected links is connected with the door-jamb, opening movement of the door causes the roller to ride upwardly upon one of the cam faces 17 and to rotate and elevate the piston stem, causing the piston to compress the coil spring 31. As is customary with door closers and checks of this type, a door, when opened or partly opened, is promptly closed through the expansion of the coil spring, the piston stem and piston carried thereby descending as the door closes.

As clearly shown in the drawing, the piston 28 is formed with an annular upwardly projecting flange 35 which slidably fits the interior periphery of the casing 12. The piston with its flange is mounted to the piston stem for movement upwardly and downwardly therewith, but in a manner to permit the piston stem to turn freely without necessitating the turning of the piston with its flange, the mode of mounting the piston to the piston stem being disclosed as comprising a ball-bearing anti-friction device 36 fitted around the piston stem and against the underneath face of the piston, such device being held in place by means of a securing nut 37 which is screw-threaded upon the lower end portion of the piston stem.

According to an important feature of my improvements, the piston 28 is provided with two ports 38 and two accompanying check valves 39 in the form of ball checks arranged in depending tubular portions 40 formed integral with the piston, suitable transverse pins 41 being arranged transverse the tubular portions and in such a position as to retain the ball checks operatively in place. Through the annular upwardly extending flange 35 of the piston 28, there is provided an oil release port 38^a adapted, as the piston stem approaches the lower terminal of its stroke, to register with an annular recess 44^a provided on the inner face of the casing or shell 12 adjacent its bottom end 44. As is customary with devices of the present character, a suitable supply of oil or other liquid is put in the container. When the piston ascends, the oil or fluid above it flows from the upper chamber downwardly through the ports 38 and by the ball checks into the lower chamber 30. On the other hand, as the piston descends, the oil or fluid in the lower chamber 30 closes the ball checks and prevents the passage of oil upwardly through the ports 38. The piston stem is represented as being provided with a bore or liquid flow path 42 which extends upwardly longitudinally of the piston stem and across the plane of the piston from the lower end of said stem which terminates within the lower chamber 30. Preferably and as shown, a tubular member 43 extends upwardly from the bottom end 44 of the casing and into the bore 42.

This tubular member 43 is carried by a plug 45 which is screw-threaded in the bottom end 44 of the casing, and an adjustable valve 47 is arranged to operate within the tubular member 43, said valve being screw threaded within the plug 45 and passing through a plug 48 which is also screw-threaded within said plug 45. This valve is arranged to regulate the passage of oil under pressure into the interior of the tubular member 43 through inlet openings 49 provided in the tubular member adjacent the bottom end 44. The tubular member 43 has communication with the flow path 42 of the piston stem, so that upon the descent of the piston the oil or fluid under pressure will flow through the inlet 49 and thence upwardly through the tubular member 43 and into the flow path 42. According to an important feature of my invention, the outer face of the tubular member 43 is inwardly and upwardly tapered at 43′, commencing at an annular zone as 44′ and extending upwardly to the top end of the member, so as to provide an annular space 42′ between the outer face of the member and the inner face of the piston stem, said space 42′ constituting a continuation of the flow path 42. Between the path 42 and the upper chamber 29, there is an outlet opening 50 provided transversely in the wall of the piston stem and pointed toward the upstanding piston flange 35 so as to direct the stream of oil under pressure against the said piston flange. Said outlet opening 50 is preferably inclined in a downward direction, that is to say, in a direction opposite to the stuffing box construction arranged upon the central portion 21. The commencement of the tapering portion 43′ is at a zone which comes below or opposite to the opening 50 when the piston stem is at its lowest point. By this

provision during the descent of the piston, the closing movement of the door is sharply checked just prior to the engagement of the latch bolt of the door with its strike plate, since during the down stroke of the piston stem, the fluid or oil is forced downward into the narrowing space 42′ after passing up through the tubular member and bore or flow path 42, with the result that prior to escaping through the outlet opening 50 the flow of the fluid in passing through the narrowing space 42′ is appreciably checked so as to sharply increase the resistance to the expansion of the spring. In this way, I prevent any harsh clashing of the latch bolt upon the strike plate. Only a relatively small stream of oil or fluid can issue from the outlet opening 50 and strike the piston flange 25, so that the expanding actuation of the coil spring is fully modified and regulated, inasmuch as said spring can force the piston downwardly and hence close the door no more rapidly than the oil under pressure in the lower chamber 30 can escape from the outlet opening 50; but when the oil release port 38ª comes into the zone of the annular recess 44ª the pressure forces in the chamber 30 are relieved by the escape of oil through the release port 38ª into the chamber 29. With this construction the door cannot close with a sudden movement or slamming action, but is caused to close with an even and smoothly regulated movement. The stream of oil or fluid, issuing from the outlet opening 50 and striking against the piston flange 35, or churning oil thereagainst (depending upon the absence or presence of a quantity of oil above the piston), is broken up and disintegrated so that during the descent of the piston no oil stream under excessive pressure can be directed toward the under face of the central member 21 and thereby cause leakage through the stuffing box construction owing to the turning and sliding movement therein of the piston rod. Moreover, the stream issuing from the outlet opening 50 and being directed downwardly thereby toward the piston flange, cannot induce leakage through the stuffing box. In door closers and checks of the present type now in use it has been found that the outlet for the oil flowing under pressure from the lower chamber is so located that, irrespective of the type of stuffing box employed, there is leakage of the oil at the top end of the liquid containing casing during the downward turning and sliding movement of the piston rod within the stuffing box. By the arrangement of the present invention it has been found in practice that there is no leakage of oil through the stuffing box connections during the operation of the piston. Owing to provision of the two check valves 38, the oil or fluid can freely escape into the lower chamber during the movement of the piston so that the opening movement of the door is not unnecessarily retarded.

During the closing movement of the door and at or near the point where the latch bolt strikes the strike plate, the release port 38ª comes into open communication with the annular recess 44ª with the result that the oil pressure, effective in retarding the expanding action of the coil spring, is relieved so that the coil spring can exercise its expanding power and positively force the latch bolt to pass by its strike plate and into its keeper. In this way provision is made for insuring complete and automatic closing of the door after each opening movement thereof.

From the foregoing description, taken in connection with accompanying drawing, it will be evident that I have disclosed an extremely simple and thoroughly satisfactory form of construction which embodies the features of advantage enumerated in the statement of invention and in the foregoing description; and while I have, in the present instance, shown and described a single preferred embodiment thereof as reduced to practice, it is to be understood that the construction is susceptible of modification in various particulars without departing from the spirit or scope of my invention or sacrificing any of its advantages.

I claim:

1. In a door closer and check of the kind set forth, consisting of a stem and a liquid containing casing having a packing box in one end in which the stem is mounted for turning and sliding movement, a piston carried by the stem within the casing and forming chambers for the fluid within the casing, one chamber being formed adjacent the packing box end and the other being formed remote therefrom, said stem having therein a fluid passage which is in communication with said remote chamber, means for moving the piston against the resistance of the fluid in the remote chamber to force a discharging stream of liquid through said passage, a flange member projecting from the piston in the chamber adjacent the packing box end, said stem having therein a transverse opening forming an outlet from the passage into the chamber adjacent the packing box, said outlet opening being obliquely inclined and pointing toward said flange member and in a direction away from the packing box end so as to direct fluid received under pressure from the passage to said flange in a direction opposite to the packing box end, whereby to prevent leakage through said packing box end resulting owing to the turning and sliding movement of said stem.

2. In a door closer and check of the kind set forth, consisting of a stem and a liquid

containing casing having a packing box in one end in which the stem is mounted for turning and sliding movement, a piston carried by the stem within the casing and forming chambers for the fluid within the casing, one chamber being formed adjacent the packing box end and the other being formed remote therefrom, said stem having therein a fluid passage which is in communication with said remote chamber, means for moving the piston against the resistance of the liquid in the remote chamber to force a discharging stream of liquid through said passage, a flange member projecting from the piston in the chamber adjacent the packing box end, said stem having therein a transverse opening forming an outlet from the passage into the chamber adjacent the packing box, said outlet opening being obliquely inclined and pointing toward said flange member and in a direction away from the packing box end so as to direct fluid received under pressure from the passage to said flange in a direction opposite to the packing box end, whereby to prevent leakage through said packing box end resulting owing to the turning and sliding movement of said stem, and means in said stem for restricting the stream of discharging liquid through said outlet opening as the piston nears the terminal of its movement within the remote chamber.

3. In a door closer and check of the kind set forth, consisting of a liquid containing casing with a recess adjacent its bottom end, a stem and a piston carried by the stem within the casing and forming upper and lower chambers for the fluid within the casing, the lower chamber being formed in communication with said recess, a flange member carried by the piston in sliding engagement with the casing and projecting into the upper chamber, a spring acting on the piston to force movement of the piston towards said bottom end, against resistance of the liquid in the lower chamber, and a release port in said flange adapted to come into registry with said recess to provide communication between said recess and the upper chamber, to relieve through the escape of liquid to the upper chamber the resistance of the liquid in the lower chamber and thus relieve resistance to the action of the spring.

4. In a door closer and check of the kind set forth, embodying a casing, a piston within the casing connected to a stem and dividing the casing into upper and lower fluid chambers, a spring acting on the piston to move it toward the bottom end of the casing against the resistance of the fluid in the lower chamber whereby to move the stem and thus effect closing of the door, said piston having a flange slidably fitting the interior of the casing and projecting into the upper chamber, the inner face of the casing being provided with a recess adjacent the bottom end and in communication with the lower chamber, and a fluid outlet associated with said flange and adapted, as the piston is moved toward the bottom end, to afford communication between said recess and the upper chamber, to relieve through the escape of fluid to the upper chamber, the resistance of the fluid in the lower chamber and thereby diminish resistance to the door closing action of the spring.

5. In a door closer and check of the kind set forth, consisting of a casing, a piston therein forming therewith upper and lower liquid containing chambers, a stem which extends through the upper chamber carrying the piston and provided with a liquid passage and an outlet opening between the passage and the upper chamber, a fixed hollow member in the lower chamber entering the passage in the stem and forming a communicating channel between the lower chamber and the stem passage, means for moving the piston against the resistance of the liquid in the lower chamber so as to force a discharging stream of liquid through said hollow member, stem passage and outlet opening, said hollow member being shaped to provide a narrowing space whereby to restrict the flow of the stream from the stem passage to the outlet opening as the piston nears its terminal of movement within said lower chamber.

6. In a door closer and check of the kind in which the door is closed by the action of an expansion spring moving a piston structure against the resistance of liquid contained in a chamber, characterized by the fact that the piston structure includes a hollow stem having an outlet opening on the side of the piston remote from the chamber, a fixed member in the chamber slidably surrounded by the hollow stem and having a channel through which liquid will pass from the chamber to the interior of the stem and hence to the outlet opening, whereby to relieve resistance to the spring-urged piston, said member within the stem being constructed and arranged to restrict the outlet opening before the piston reaches its terminal of movement in the chamber, and means for opening communication directly between the chamber and space on the remote side of the piston at a moment subsequent to the operation restricting said outlet opening, comprising a flange on the piston having a liquid escape opening, said chamber having in direct communication therewith a passage with which said escape opening is adapted to register.

In testimony that I claim the foregoing as my invention, I have signed my name hereto.

EMIL BOMMER.