Feb. 21, 1956 G. WARTIAN 2,735,132

DOOR CLOSER AND CHECK

Filed Jan. 14, 1953

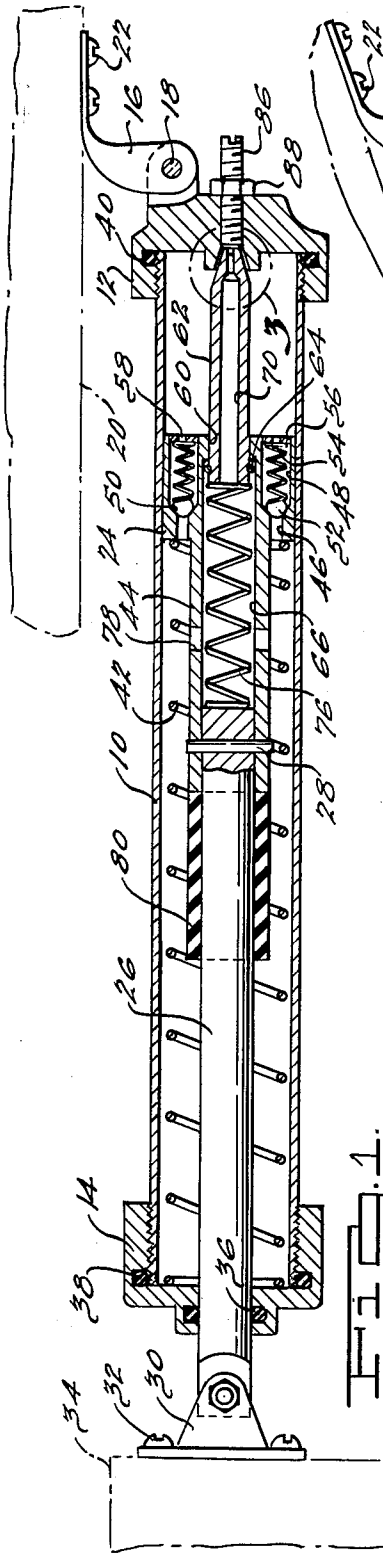


Fig. 1.

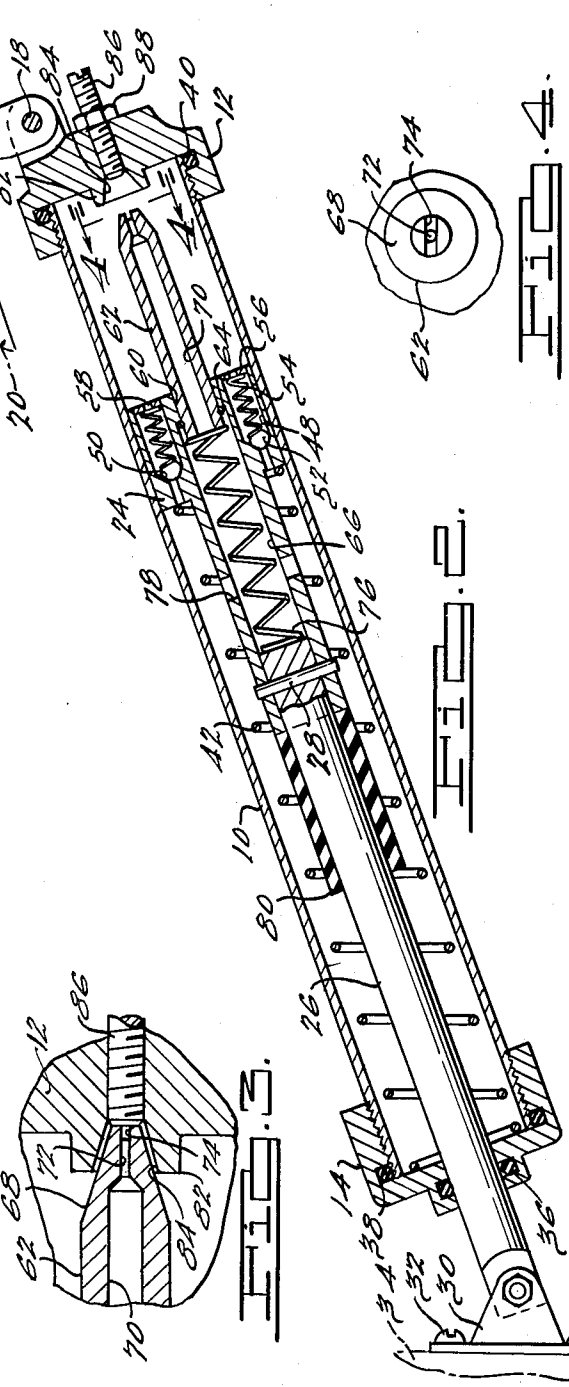


Fig. 2.

Fig. 3.

Fig. 4.

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United States Patent Office 2,735,132 Patented Feb. 21, 1956

2,735,132

DOOR CLOSER AND CHECK

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Application January 14, 1953, Serial No. 331,156

13 Claims. (Cl. 16—52)

This invention relates to new and useful improvements in a door closer and check, and has particular reference to such a device in which final closing movement of a door is accurately controlled and in which a positive checking of closing movement of the door is obtained just before the door is closed to prevent slamming of the door.

A principal object of the invention is to provide a new and improved door closer and check.

Another object of the invention is to provide a door closer and check in which closing movement of a door is checked just before the door is finally closed.

A further object of the invention is to provide a device of the type described in which final closing movement of the door may be accurately controlled.

Other and further objects of the invention will be apparent from the following description and claims and may be understood by reference to the accompanying drawing, of which there is one sheet, which by way of illustration shows a preferred embodiment of the invention and what I now consider to be the best mode in which I have contemplated applying the principles of my invention. Other embodiments of the invention may be used without departing from the scope of the present invention as set forth in the appended claims.

In the drawing:

Fig. 1 is a sectional view through my improved form of door closer and check, showing the door in closed position;

Fig. 2 is a sectional view similar to Fig. 1 but showing the door partially open and moving toward closed position;

Fig. 3 is an enlarged fragmentary view of the structure within the circle numbered 3 of Fig. 1; and

Fig. 4 is an enlarged fragmentary view taken along lines 4—4 of Fig. 2.

Referring more particularly to the drawing, the door closer comprises a cylinder **10** threaded at one end into an end cap **12** and at its other end threaded into an end cap **14**. A bracket **16** is pivotally connected to end cap **12** by means of a pin **18**, and such bracket may be secured to a door **20** by means of screws **22**. A piston **24** is reciprocable within cylinder **10** and has secured thereto a piston rod **26** by means of a pin **28**, the piston rod extending through an opening in end cap **14** and having its outer end pivotally connected to a bracket **30** which may be secured by screws **32** to the frame **34** within which the door **20** is hingedly mounted. A sealing gasket **36** is arranged within a groove in end cap **14** to provide a seal between piston rod **26** and end cap **14**, and gaskets **38** and **40** provide seals between cylinder **10** and end caps **14** and **12**, respectively.

The cylinder **10** is filled with a suitable fluid, such as oil, through which the piston **24** moves as the door **20** is opened and closed. It will be seen that opening of door **20** will effect movement of piston **24** toward the left end of cylinder **10** against the force of a spring **42** which surrounds piston rod **26** and tubular extension **44** of

piston **24** and reacts against end cap **14** and the enlarged head of piston **24** to bias the piston toward the right-hand end of the cylinder and effect closing movement of the door.

The piston is provided with a plurality of passages **46** opening into larger passages **48**, the passages **46** and **48** defining valve seats **50** therebetween. Ball valves **52** are adapted to seat on valve seats **50** under the influence of springs **54** backed up by suitable washers **56** or the like arranged at the right-hand ends of passages **48** and provided with openings **58**. Passages **46**, **48**, and **58** provide fluid flow passages through piston **24** when ball valves **52** are unseated against the force of springs **54**.

The piston **24** is provided with a central passage **60** communicating with the interior of tubular extension **44**, and a hollow tubular valve member **62** is reciprocably arranged in bore **60** and retained therein by snap ring **64** arranged in an annular groove in the left-hand end of valve member **62** and adapted to bear against a shoulder formed between bore **60** and passage **66** formed within the extension **44** of piston **24**.

The outer end of valve member **62** is tapered at **68** as shown and the central passage **70** through valve member **62** terminates at its right-hand end in a restricted passage **72** communicating with a cross-slot **74** formed in the end of the valve member **62**. A spring **76** is arranged within the passage **66** in extension **44** and reacts against the inner end of piston rod **26** and against valve member **62** to urge the valve member **62** toward the right relative to piston **24**.

With the door in the closed position shown in Fig. 1, opening of the door will effect the relative movement between piston **24** and cylinder **10** against the force of spring **42**. The fluid in the left-hand end of the cylinder will react against ball valves **52** and unseat the same against the force of springs **54** so as to open the passages through the piston **24** through which fluid may flow from the left end of the cylinder to the right end thereof. The size and number of the passages through the piston may be selected in such manner that the door may be opened with relatively little effort. A small amount of fluid in the left end of cylinder **10** may at this time be displaced through radial openings **78** in extension **44**, passage **66**, and passages **70** and **72** in valve member **62**. A resilient buffer member **80**, which may comprise a cylindrical piece of resilient material, surrounds piston rod **26** as shown and is adapted to engage the end cap **14** when the door is opened to its full extent and provides a cushioning effect at the end of opening movement of the door.

When the door is released, spring **42** reacts on cylinder **10** and piston **24** to move the piston toward the right-hand end of the cylinder to effect closing movement of the door. During this movement of the piston, oil in the right-hand end of cylinder **10** cannot flow through the passages **46**, **48** and **58** extending through the piston, and ball valves **52** will be seated on valve seats **50** by springs **54** and by the pressure of the fluid in the right-hand end of the cylinder. The only means for displacing oil from the right-hand side of the piston to the left-hand side thereof will be through the hollow valve member **62**, passage **66** and openings **78** in extension **44** of piston **24**. The passage **72** in the right-hand end of the valve member **62** provides a restricted opening through which such fluid is displaced, and the size of passage **72** is such as to permit the door to be closed at the desired rate under the influence of spring **42**.

The inner end of end cap **12** is provided with a central boss **82** having a tapered recess **84** therein having substantially the same degree of taper as the end **68** of valve member **62**. A set screw **86** is threaded into end cap **12** and has its inner end terminating in the bottom of tapered recess **84**. A nut **88** is threaded on to screw

86 for holding the same in any position to which it may be adjusted. As the door nears the end of its closing movement, the tapered end 68 of valve member 62 enters recess 84 and engages the inner end of screw 86, and this engagement of valve member 62 and screw 86 provides a perceptible or definite check in the closing movement of the door. With the tapered end 68 seated against screw 86 a slight clearance is provided between the end 68 and recess 84, as is more clearly shown in Fig. 3. This clearance between end 68 and recess 84 provides a restricted passage for the flow of fluid from the right-hand end of cylinder 10 through cross slot 74 and bore 70 of valve member 62 to the left-hand end of the cylinder and regulates the speed of the last few degrees of closing movement of the door. At the time the tapered end 68 enters recess 84 and engages screw 86 a definite or perceptible checking movement of the door is obtained due to the restricted clearance between the valve member 62 and recess 84, and also because the spring 76 urges the valve member 62 toward the right relative to piston 24 to tend to maintain the valve member 62 in such position relative to the piston and against screw 86. After the checking action has taken place the spring 42 will continue to move piston 24 toward the right end of the cylinder 10 and will move the piston relative to the valve member 62 against the force of spring 76. Adjustment of screw 86 will vary the clearance between the tapered end 68 and recess 84 and will also vary the point of piston travel at which the valve member 62 will engage screw 86 so that the final closing movement of the door may be regulated as desired, and such closing movement will be such that the door will not slam shut.

The checking action referred to above and the slower speed of closing of the door in the last few degrees of its closing movement will be obtained regardless of the extent to which the door may be opened from its closed position because tubular member 62 will be moved out of recess 84 at least to some slight extent even when the door is opened only a few degrees, and subsequent release of the door will effect the entry of the tapered end 68 into the recess 84 to slow down the final closing of the door. In other words, the door cannot be closed without the tapered end 68 being seated against screw 86 to obtain the checking and final closing action described above.

While I have illustrated and described a preferred embodiment of my invention, it is understood that this is capable of modification, and I therefore do not wish to be limited to the precise details set forth but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A door closer and check comprising a cylinder, a piston reciprocable in said cylinder, valve means in said piston adapted to permit the flow of fluid through said piston upon movement of said piston relative to said cylinder in one direction and adapted to prevent fluid flow through said piston upon movement of said piston in the opposite direction, spring means for moving said piston relative to said cylinder in said opposite direction, a hollow valve member movably carried by said piston and communicating with said cylinder on opposite sides of the piston and thereby providing a fluid flow passage through said piston, stop means in said cylinder, said valve member being adapted to engage said stop means during the last portion of the movement of said piston relative to said cylinder in said opposite direction to thereby effect relative movement between said piston and said valve member, spring means for resisting said relative movement between said piston and valve member, the end wall of said cylinder being formed to cooperate with said valve member to restrict the flow of fluid through said passage in said valve member when said valve member is seated against said stop means.

2. A door closer and check comprising a cylinder, a piston reciprocable in said cylinder, valve means in said piston adapted to permit the flow of fluid through said piston upon movement of said piston relative to said cylinder in one direction and adapted to prevent fluid flow through said piston upon movement of said piston in the opposite direction, spring means for moving said piston relative to said cylinder in said opposite direction, a valve member movably carried by said piston and having a fluid flow passage communicating with said cylinder on opposite sides of said piston, stop means at one end of said cylinder, one end of said valve member being adapted to be seated against said stop means during the last portion of the movement of said piston relative to said cylinder in said opposite direction to effect relative movement between said piston and said valve member during said portion of said movement, spring means reacting on said valve member and said piston for resisting the relative movement between said piston and valve member, and means providing a valve seat with which said end of said valve member is adapted to cooperate when in engagement with said stop means to restrict the flow of fluid through said passage in said valve member.

3. A door closer and check comprising a cylinder, a piston reciprocable in said cylinder, valve means associated with said piston adapted to permit fluid flow through said piston upon relative movement of said piston and cylinder in one direction and adapted to prevent fluid flow through said piston upon relative movement of said piston and cylinder in the opposite direction, spring means for biasing said piston and cylinder for relative movement in said opposite direction, a hollow tubular member reciprocably carried by said piston and communicating with said cylinder on opposite sides of said piston to provide a fluid passage through said piston, an adjustable stop member accessible exteriorly of said cylinder and with which said tubular member is engageable toward the end of said relative movement of said piston and cylinder in said opposite direction, said piston being movable relative to said tubular member when said tubular member is in engagement with said stop member, wall means in said cylinder cooperable with said tubular member when the latter is in engagement with said stop member for restricting fluid flow through said passage, and spring means reacting on said piston and said tubular member for resiliently opposing the relative movement between said piston and tubular member.

4. A door closer and check comprising a cylinder, a piston reciprocable in said cylinder, valve means associated with said piston adapted to permit fluid flow through said piston upon relative movement of said piston and cylinder in one direction and adapted to prevent fluid flow through said piston upon relative movement of said piston and cylinder in the opposite direction, spring means for biasing said piston and cylinder for relative movement in said opposite direction, a hollow tubular member carried by said piston and communicating with said cylinder on opposite sides of said piston to provide a fluid passage through said piston, a stop member associated with said cylinder, said tubular member being adapted to engage said stop member during said relative movement of said piston and cylinder in said opposite direction, said piston being movable relative to said tubular member and said cylinder in said opposite direction after engagement of said tubular member with said stop member, wall means in said cylinder cooperable with said tubular member when the latter is in engagement with said stop member for restricting fluid flow through said passage, and spring means for resiliently opposing the relative movement between said piston and tubular member.

5. A door closer and check comprising a cylinder, a piston reciprocable in said cylinder, valve means associated with said piston adapted to permit fluid flow through said piston upon relative movement of said piston and cylinder in one direction and adapted to prevent fluid flow through said piston upon relative movement of said piston and

cylinder in the opposite direction, spring means for biasing said piston and cylinder for relative movement in said opposite direction, a hollow tubular member carried by said piston and communicating with said cylinder on opposite sides of said piston, said tubular member being movable with said piston toward and away from an end wall of said cylinder and being engageable with said end wall of said cylinder only during the last portion of said relative movement of said piston and cylinder in said opposite direction, said piston being movable relative to said tubular member during said portion of said movement, and spring means reacting on said piston and said tubular member for opposing said relative movement between said piston and tubular member.

6. A door closer and check comprising a cylinder, a piston reciprocable in said cylinder, valve means associated with said piston adapted to permit fluid flow through said piston upon relative movement of said piston and cylinder in one direction and adapted to prevent fluid flow through said piston upon relative movement of said piston and cylinder in the opposite direction, spring means for biasing said piston and cylinder for relative movement in said opposite direction, a hollow tubular member movably carried by said piston and communicating with said cylinder on opposite sides of said piston, means for effecting relative movement between said tubular member and said piston during the last portion of said relative movement of said piston and cylinder in said opposite direction, said tubular member being movable with said piston except during said last portion of movement between said piston and cylinder and spring means resiliently opposing the relative movement between said piston and tubular member.

7. A door closer and check according to claim 6 including means accessible exteriorly of said cylinder for adjusting the relative position of said piston and cylinder at which the relative movement between said piston and tubular member is effected.

8. A door closer and check comprising a cylinder, a piston reciprocable in said cylinder, valve means in said piston adapted to permit the flow of fluid through said piston upon movement of said piston relative to said cylinder in one direction and adapted to prevent fluid flow through said piston upon movement of said piston in the opposite direction, a hollow valve member reciprocably carried by said piston and communicating with said cylinder on opposite sides of the piston and thereby providing a fluid flow passage through said piston, means providing a valve seat at one end of said cylinder, stop means associated with said valve seat and with which said valve member is engageable toward the end of the movement of said piston relative to said cylinder in said opposite direction, said valve seat being formed to restrict the flow of fluid through said passage in said valve member when said valve member is in engagement with said stop means.

9. In a door closer and check, a cylinder, a piston reciprocable in said cylinder, means biasing said piston toward one end of said cylinder, a valve member reciprocably carried by said piston, said valve member having a passage therein communicating with said cylinder on opposite sides of the piston and thereby providing a fluid

flow passage through said piston upon movement of said piston toward said one end of said cylinder, said valve member having a tapered end, one end of said passage terminating in said tapered end, means providing a tapered recess at said one end of said cylinder, and an adjustable stop member accessible exteriorly of said cylinder projecting into the bottom of said recess and with which said end of said valve member is engageable during the last portion of piston movement in said one direction, said recess being formed to cooperate with said end of said valve member to restrict the flow of fluid through said passage in said valve member when the latter is in engagement with said stop member, and a spring between said valve member and said piston.

10. In a door closer and check, a cylinder, a piston reciprocable in said cylinder, a valve member carried by said piston, said valve member having a passage therein communicating with said cylinder on opposite sides of said piston, means at one end of said cylinder with which one end of said valve member is engageable during the last portion of piston movement in one direction, said means including a surface formed to cooperate with said one end of said valve member to form a restriction between said one end of said cylinder and said passage in said valve member when said valve member is in engagement with said means.

11. A door closer and check according to claim 10 wherein said means comprises a threaded member accessible exteriorly of said cylinder and said surface surrounds the inner end of said threaded member.

12. In a door closer and check, a cylinder, a piston reciprocable in said cylinder, means biasing said piston toward one end of said cylinder, a valve member movably carried by said piston, said valve member having a passage therein communicating with said cylinder on opposite sides of the piston and thereby providing a fluid flow passage through said piston upon movement of said piston toward said one end of said cylinder, means providing a valve seat at said one end of said cylinder, said valve member being adapted to cooperate with said valve seat to restrict the flow of fluid through said passage in said valve member during the last portion of piston movement in said one direction.

13. A door closer and check comprising a cylinder, a piston reciprocable in said cylinder, spring means for biasing said piston and cylinder for relative movement in one direction, a hollow tubular member reciprocably carried by said piston and communicating with said cylinder on opposite sides of the piston and thereby providing a fluid passage through said piston, and fixed means in said cylinder cooperable with said tubular member during the last portion of said relative movement of said piston and cylinder in said one direction, said fixed means and tubular member forming a valve means adapted to restrict fluid flow through said passage.

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