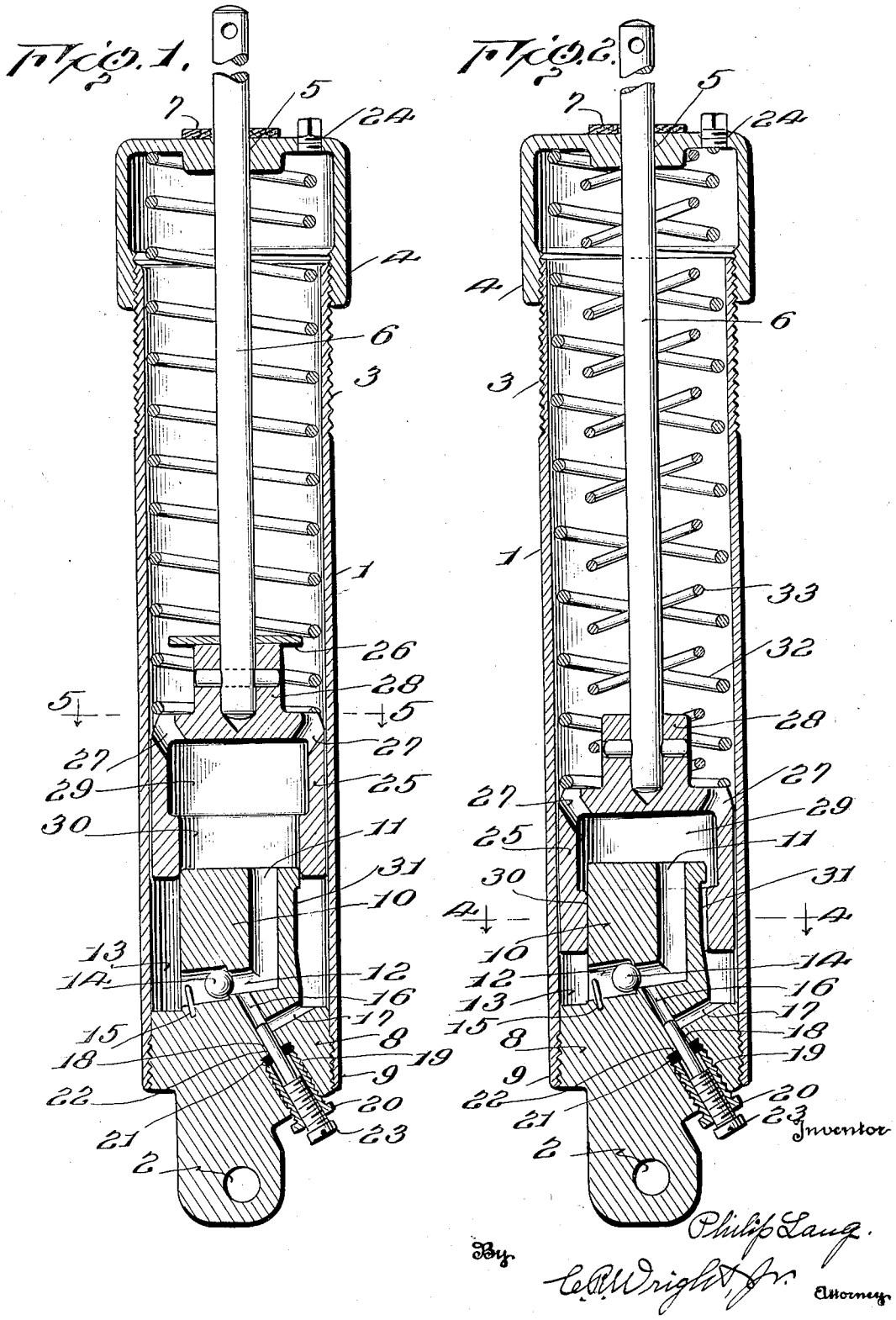
March 9, 1926. 1,576,286

P. LANG

DOOR CLOSER AND CHECK

Filed June 4, 1925 2 Sheets-Sheet 1



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Fig. 3.

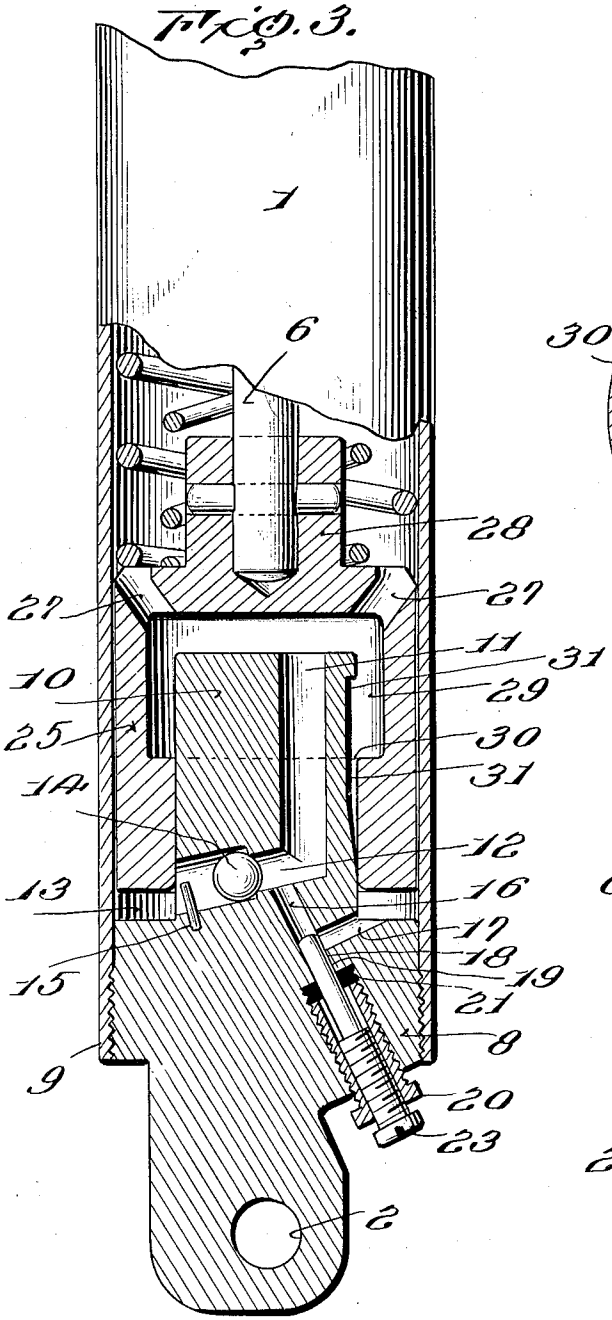


Fig. 4.

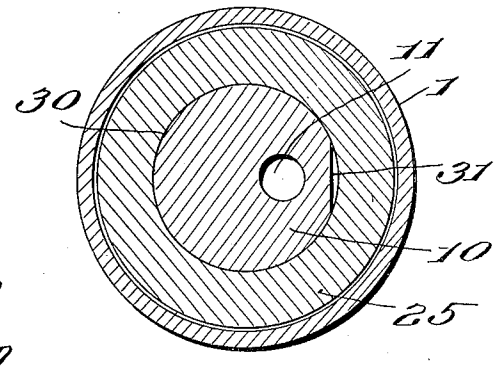
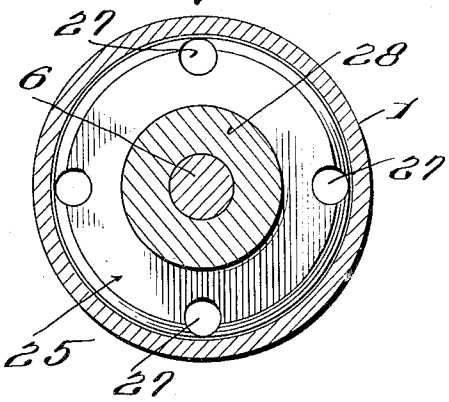


Fig. 5.



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UNITED STATES PATENT OFFICE.

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DOOR CLOSER AND CHECK.

Application filed June 4, 1925. Serial No. 34,989.

To all whom it may concern:

Be it known that I, PHILIP LANG, a citizen of the United States, of Cedar Falls, in the county of Black Hawk and State of Iowa, have invented certain new and useful Improvements in Door Closers and Checks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in door closers and checks.

The object of my invention is to provide a door closer and check for sliding doors and is particularly designed for elevator doors, in which the door is opened against spring tension and when released the spring tension imparts to the door a closing movement which is very slow for a certain distance and then allowed to move more rapidly for a predetermined distance, and is gradually checked on the final closing movement of the door, whereby there is practically no jar during any part of the closing movement and obviates the usual noise in the closing of the door.

Another object of my invention is to provide a door closer and check in which the tension of the spring can be readily adjusted from the outside of the casing and in which the speed of the final closing movement can also be regulated from the outide of the casing.

A further object of my invention is to provide a closer which can be readily applied to any elevator sliding door and at the same time provide a simple, cheap and effective closer having certain details of structure and combination of parts to accomplish certain results hereinafter more fully set forth.

In the accompanying drawings:—

Figure 1 is a longitudinal vertical sectional view of my improved closer.

Figure 2 is a longitudinal vertical sectional view similar to Figure 1 showing the piston near the end of its downward movement and showing two compression springs.

Figure 3 is a vertical sectional view of the lower end of the closer showing the piston at its extreme lower position.

Figure 4 is a horizontal sectional view taken on the line 4—4 of Figure 2.

Figure 5 is a transverse sectional view taken on the line 5—5 of Figure 1.

This invention is adapted to be applied to elevator doors such as shown in my copending application Serial No. 612,334, filed January 12, 1923, and therefore I am not showing the application of the closer of the door.

Referring now to the drawings, 1 represents the door closer which as shown is in a cylindrical form and having at its lower end an eye 2, by means of which it is connected to a movable member carried by the door. The upper end of the cylinder is externally screw threaded as indicated at 3, upon which is screwed the cap 4, having a central opening 5, through which passes the piston rod 6. Carried by the upper end of the cap and surrounding the piston 6 is an umbrella washer 7, adapted to form a tight joint with the piston rod and prevent dirt from passing into the cylinder and also prevent oil from passing upwardly around the piston. The upper end of the piston rod has means for attaching it to the elevator shaft.

The lower end of the cylinder 1 is closed by a head 8, which is screwed into the lower threaded end 9 of the cylinder and carries the eye 2, as fully shown in Figures 1 and 2 of the drawings. This head 8 is provided with a reduced upwardly extending cylindrical portion 10 which is of the same diameter throughout its length and provided with a vertical opening 11 extending downwardly through its upper end, which communicates at its lower end with the lateral opening 12 which extends outwardly and which communicates with the annular space 13 surrounding the reduced portion 10 of the head. Arranged within the passage 12 is a ball valve 14 adapted to close the same on one movement of the piston and to open on the other movement as will be hereinafter more fully described. In order to prevent the ball valve 14 from passing from the passage 12 I have provided the pin 15. Communicating with the passage 12 is an obliquely arranged passage 16, which com-

municates at its lower end with the passage 17, which extends upwardly and communicates with the annular space 13 surrounding the reduced portion 10 of the head. Communicating with the passage 17 is an obliquely arranged passage 18 which communicates with the enlarged threaded passage 19 which extends out through the lower end of the head 8. Screwed within the threaded opening 19 is a bushing 20, adapted to compress the washer 21 against the valve 22 which is threaded into the sleeve 20, and operated by a nut or screw head 23. By this structure it will be seen that the passage of the fluid from space 13 to the space 29 can be regulated, whereby the movement of the piston, hereinafter described, can be regulated. The valve 22 can be screwed outwardly and removed so that the oil can be drained from the cylinder, without removing any of the parts, and new oil can be placed therein through the plugged opening 24, carried by the cap 4.

In the form shown in Figure 1, the piston 25 has the piston rod 6 connected thereto, and carried by the piston rod. Directly above the piston is a baffle plate 26, against which the oil strikes in its upward movement through the openings 27 in the piston and is prevented from passing upwardly with any force to the upper end of the cylinder.

The piston 25 closely fits the walls of the cylinder 1, and has a series of openings 27 arranged around the reduced portion 28, whereby the oil passes through the piston. These openings 27 communicate with the enlarged portion 29 of the bore of the piston and the reduced portion 30 of the bore of the piston is of a size to tightly fit the reduced extension 10 of the head 8. One side of the reduced portion 10 of the head is provided with cut away portion 31 which extends from a point adjacent the upper end of the plug and gradually tapers downwardly to nothing at the lower end.

In the modification shown in Figure 2 of the drawings it will be seen that I have employed two springs 32 and 33 and these springs as shown form baffles above the opening 27 and therefore the baffle plate 26 is dispensed with. From the foregoing description it will be seen that immediately upon the commencement of the checking movement of the closing operation of the door the piston moving downwardly, and the bore 30 of the piston closely fitting the projection 10 as in Figure 1, there will be a high pressure checking movement of the piston for a short movement thereof, oil being displaced slowly from the space 13 past the regulating valve 22, and after the portion 30 has passed below the upper end of the reduced portion, it passes below the upper end of cut away portion 31, thus forming an auxiliary passage for the oil from space 13, as shown in Figure 2 of the drawings. A continued downward movement of the piston gradually closes the cut away portion 31 and prevents the passage of the oil therethrough and thus the downward movement of the piston during the last part of its downward stroke is again controlled by the regulating screw 22 as shown in Figure 3 of the drawings.

The valve 22 is set so that the movement of the door can be regulated so that it will close more rapidly or slower as desired. The ball valve 14 moves outwardly against the pin 15 when the piston starts upwardly and prevents any suction or vacuum in the space 13 around the plug 10 and allows the oil to flow down through the passages 11 and 12 to the space and fill the same while the piston is moving upwardly and the door is being opened thus the oil has a free passage and does not in any way retard the movement of the door.

When heavy doors are closed at a high speed they develop a comparatively large momentum, and in order to check such doors a checking cylinder is required which offers a high pressure resistance to destroy the momentum without shock. This is accomplished by the piston developing a high pressure on the checking liquid until such a momentum is spent and then the pressure is relieved by the intermittent by pass in the projection. This relieves the door operating links and brackets of the heavy strain to which they are usually subjected and which prevents the rebound and the jerking motion usually found in doors just prior to the total closing of the door.

Having thus fully described my invention what I claim is:—

1. A door closer and check comprising a cylinder adapted to retain liquid, a piston therein, a spring in the cylinder and normally holding the piston at the lower end of the cylinder, a projection carried by the cylinder and cooperating with the piston for retarding the movement of the piston against the tension of the spring and constructed to have a high checking pressure upon the first part of the checking movement of the piston and partially releasing said pressure for a short movement of the piston and gradually retarding the movement of the piston against the tension of the spring on the last part of the movement.

2. A door closer and check, comprising a cylinder adapted to retain liquid, a piston therein, a spring in the cylinder and normally holding the piston at the lower end of the cylinder, a projection carried by the cylinder and cooperating with the piston, and having a cut-away portion in its outer wall intermediate its ends, whereby there is a high checking pressure upon the first part of the downward checking movement

of the piston and said pressure partly released for a short movement of the piston, and gradually retarding the movement of the piston against the tension of the spring on the last part of its movement.

3. A door closer and check comprising a cylinder adapted to retain liquid, a piston therein, a spring in the cylinder and normally holding the piston at the lower end of the cylinder, a projection carried by the cylinder and extending within the hollow piston and having one side cut away intermediate its ends, whereby there is a high checking pressure on the first part of the downward movement of the piston and said pressure released and a gradual retarding of the piston on the last part of its downward movement.

4. A door closer and check comprising a cylinder adapted to retain liquid, a piston therein, having a hollow lower end, a spring within the cylinder and normally holding the piston at the lower end of the cylinder, a projection carried by the lower end of the cylinder and adapted to enter the hollow lower end of the piston and having a passage therethrough, and a valve controlling the passage of fluid from the space around the projection through the projection, said projection having one side cut away intermediate its upper and lower ends, whereby there is a high checking pressure on the first part of the downward checking movement of the piston and said pressure released and a gradual retarding movement of the piston during the last part of the downward movement.

5. A door closer and check comprising a cylinder adapted to retain liquid, a hollow piston therein, a spring in the cylinder and normally holding the piston in the lower end of the cylinder, a projection carried by the cylinder and cooperating with the hollow piston, means for regulating the flow of liquid through the hollow projection from below the piston and said projection constructed to have a high checking pressure on the piston during the first part of the checking movement thereof, and releasing said pressure and gradually retarding the movement of the piston at the lower end of the downward stroke.

6. A door closer and check comprising a cylinder adapted to retain liquid, a hollow piston therein, a spring in the cylinder and normally holding the piston in the lower end of the cylinder, a cylindrical projection cooperating with the hollow piston, means for regulating the flow of liquid from below the lower end of the piston through the projection, said projection having a cut away portion intermediate its ends and gradually tapering toward its lower end, and an automatic valve for breaking the vacuum below the piston through the projection on the upward movement of the piston.

7. A door closer and check, comprising a cylinder adapted to retain liquid, a hollow piston therein, a spring normally holding the piston in the lower end of the cylinder, a projection cooperating with the hollow piston and having a cut away portion in its outer face intermediate its ends and gradually tapering toward its lower end, a valve for regulating the flow of liquid from below the piston through the projection, means for removing said valve, whereby the cylinder may be drained and means for breaking the vacuum below the piston during its upward movement.

8. A door closer and check comprising a cylinder adapted to retain liquid, a piston therein, a spring in the cylinder and normally holding the piston in the lower end of the cylinder, a cylindrical projection cooperating with the hollow piston and having a cut away portion in its outer face intermediate its ends and gradually tapering toward the lower end, a valve controlling the flow of fluid from below the piston through the projection, means for breaking the vacuum below the lower end of the piston on the upward movement of the piston, and a baffle carried by the piston rod above the piston to prevent the oil from passing upwardly to the upper end of the cylinder.

In testimony whereof, I have signed this specification.

PHILIP LANG.