

Dec. 15, 1970

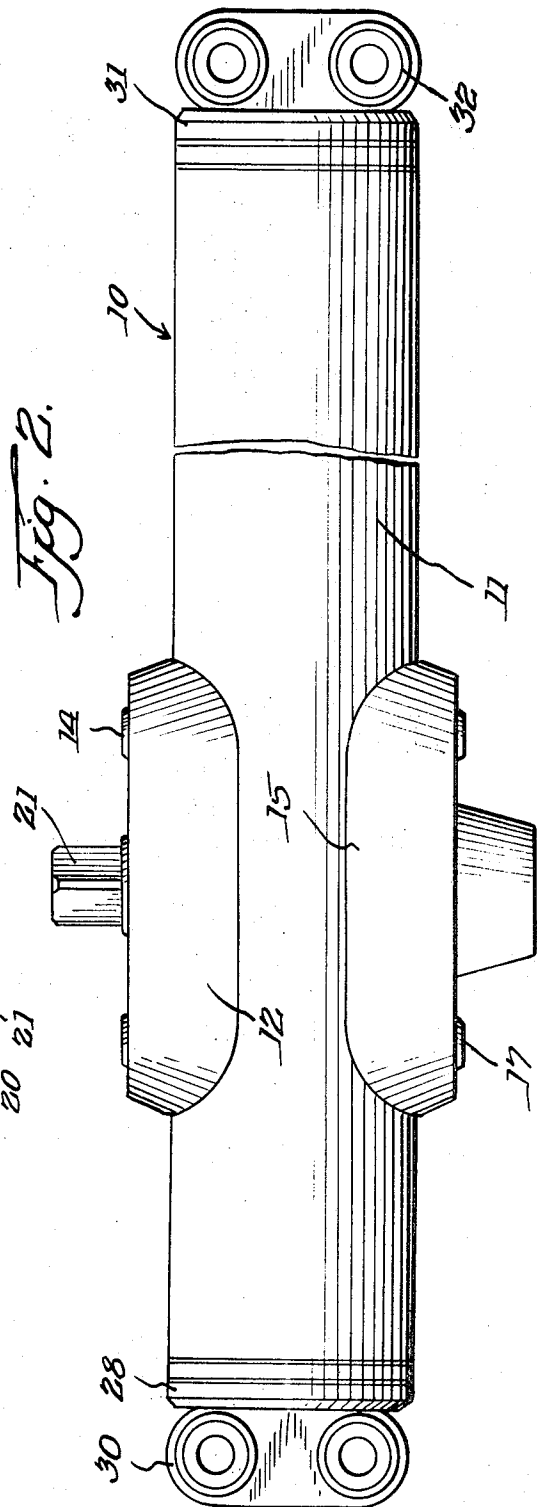
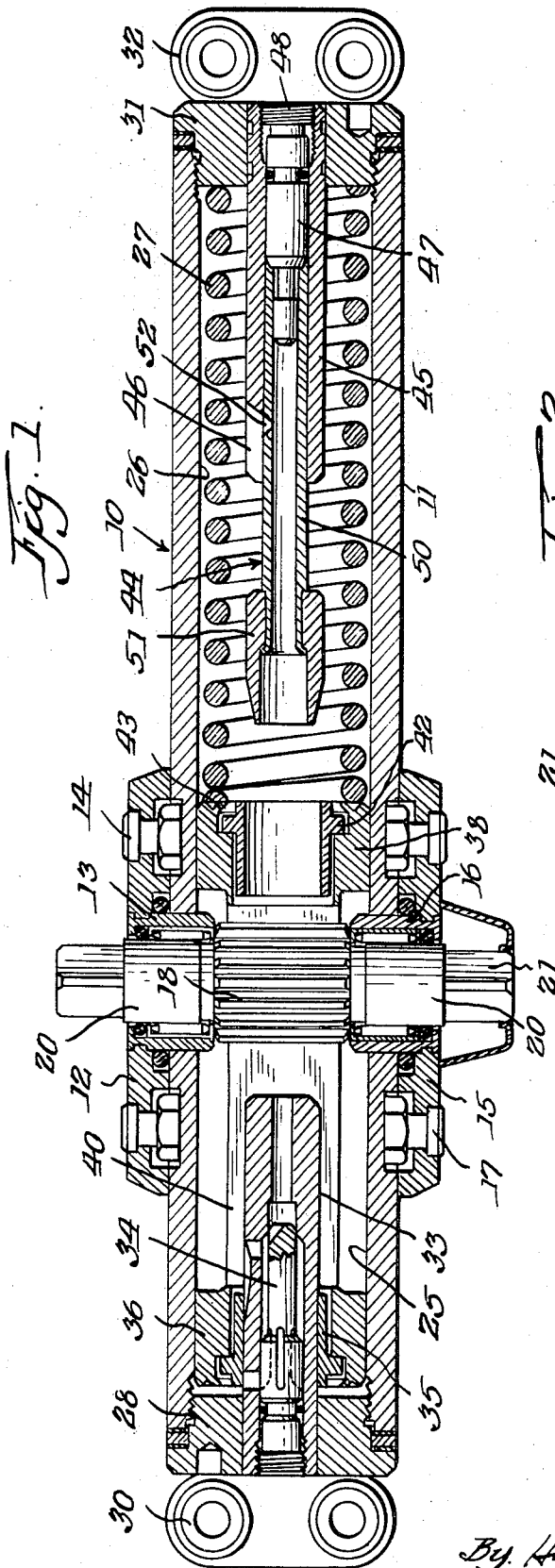
R. L. POLLACK ET AL

3,546,734

ADJUSTABLE BACKCHECK MECHANISM FOR DOOR CLOSERS

Filed July 10, 1968

3 Sheets-Sheet 1



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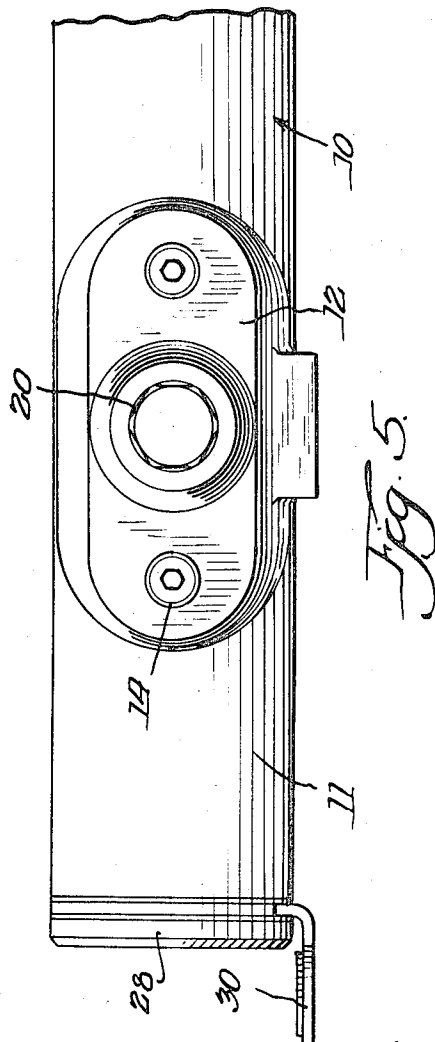
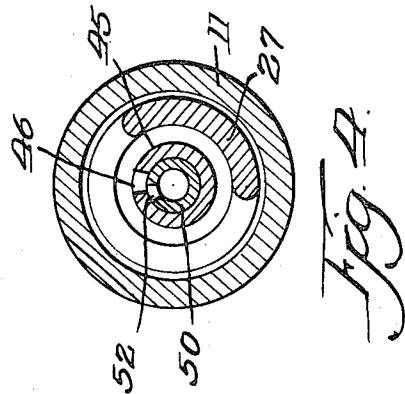
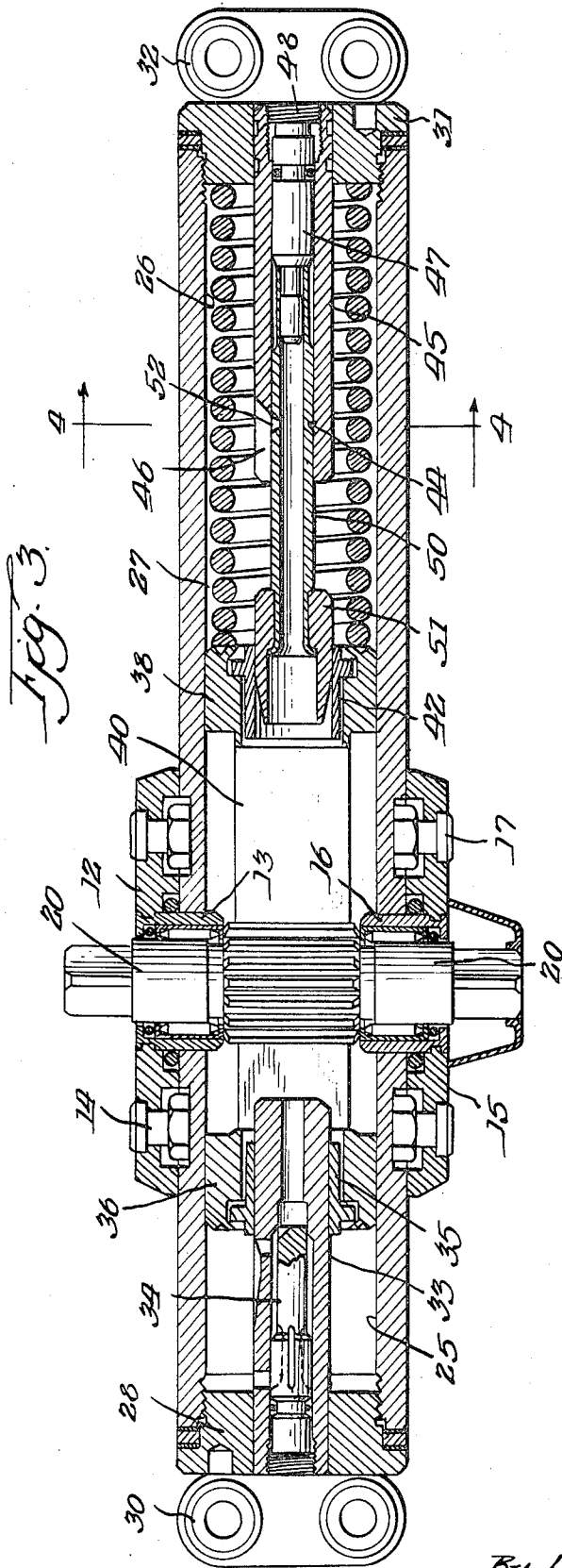
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ADJUSTABLE BACKCHECK MECHANISM FOR DOOR CLOSERS

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3 Sheets-Sheet 2



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ADJUSTABLE BACKCHECK MECHANISM FOR DOOR CLOSERS

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Int. Cl. E05f 3/10

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8 Claims

ABSTRACT OF THE DISCLOSURE

The invention is characterized by a tubular probe which extends inwardly from the end wall of the rear chamber of door closing and checking mechanism. A floating check valve is carried by the rear piston of the door closing and checking mechanism and said check valve has telescoping relation with the tubular probe at a certain location in the reciprocating movement of the piston due to the closing action of the door, whereby the piston upon telescoping the probe will trap hydraulic fluids in the rear chamber and which can escape only by flowing through a restricted passage provided by the tubular probe.

The invention relates to door checking mechanism of the hydraulic type employing a reciprocating piston for forcing an hydraulic fluid to flow through one or more restricted passageways during the closing action of the door, and has reference more particularly to adjustable backcheck mechanism for such door closers.

In door closers as heretofore manufactured, a backchecking took place when the head of the piston passed a port provided in the cylinder wall at a specific location. As the piston head moved past this port, the liquid remaining in the checking end of the cylinder was confined and the liquid could escape only through the backcheck valve.

The valve could be adjusted so that the volume of liquid allowed to escape could be infinitely regulated. This allowed the closer mechanism to exert a strong or a weak restraining influence on the continued movement of the piston and therefore on the opening swing of the door. This is referred to as the intensity of adjustment.

Piston movement within the cylinder is the determining factor regarding the degree of door opening at which the backchecking function can be initiated. It is often desirable to have this backchecking function take place earlier or later in the opening swing of the door. Previous backchecking mechanisms had no provision for accommodating such a desire.

Accordingly an object of the invention is to provide backcheck mechanism for door closers which can be adjusted for intensity and which can also be varied as to the location at which the backchecking function will occur.

Another object of the invention is to provide backchecking mechanism for an hydraulic door closer wherein a check valve located in one end of the reciprocating piston has telescoping relation with a probe fixed to one end wall of the housing of the closer and extending inwardly, the parts coacting automatically as the piston reciprocates to control the flow of the hydraulic fluid through the piston and to thus exert a restraining influence on the opening swing of the door.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

In the drawings which illustrate an embodiment of the

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device and wherein like reference characters are used to designate like parts:

FIG. 1 is a longitudinal sectional view taken through a door closing device of the hydraulic type and which embodies the backchecking mechanism of the invention, the figure showing the piston in a door closed position;

FIG. 2 is a front elevational view of the tubular housing of the door closing device of FIG. 1;

FIG. 3 is a longitudinal sectional view of the door closing device similar to FIG. 1 but showing the piston in an opening position of the door with the check valve in initial telescoping relation with the probe;

FIG. 4 is a cross-sectional view taken along line 4—4 of FIG. 3 and showing the valve formation for controlling the intensity of the backchecking function;

FIG. 5 is a fragmentary top elevational view of the tubular housing as shown in FIG. 2;

FIG. 6 is a fragmentary sectional view showing the backchecking mechanism of FIG. 1 on an enlarged scale with the probe located forwardly for an earlier backchecking function; and

FIG. 7 is a fragmentary sectional view on the same scale as FIG. 5 but showing a modified form of backchecking mechanism coming within the invention.

The door checking device which has been selected for illustrating the present invention is shown in longitudinal section in FIG. 1 wherein the parts have the position which they assume when the door is closed. The housing 10 essentially consists of the metal tubing 11 which is provided with journalling means for a pinion shaft. The top journalling means includes the plate 12 having a substantially flat top surface and an arcuate undersurface so as to fit the curvature of the tubing 11. The plate 12 retains the bearing assembly 13. The plate is fixed to the tubing by securing screws 14. The bottom plate 15 is similar in shape to the plate 12 and said bottom plate retains the bearing assembly 16 and said plate is secured in place on the tubing by the screws 17. The pinion shaft provides the pinion 18 and said shaft has cylindrical bearing portions 20 for journalling relation by the roller bearing assemblies 13 and 16, respectively. Each end of the pinion shaft is formed as at 21 for receiving an arm for connecting the door with the door closer device. The particular end of the pinion shaft to which the arm is connected depends on whether the door is hinged on the left or on the right.

The housing unit 10 by means of the tubing 11 provides a cylinder with a pair of aligned chambers 25 and 26, the chambers having location on opposite sides of the pinion shaft. Chamber 26 on the right side of the shaft is longer than chamber 25 and this feature in the construction of the housing unit has been selected so that power spring 27 can be located in the chamber 26. The closing plug 28 is threadedly secured to the end of the chamber 25 for sealing this end. The said plug clamps one leg of the right angled bracket 30 to the metal tubing, thus fixedly securing the bracket to the housing unit. It will be understood that the bracket provides one of the mounting elements for mounting the door closing device. In a similar manner the end of cylinder 26 is closed and sealed by the plug 31 and the right angled bracket 32 is clamped by the said plug to thus fixedly secure the other mounting element for the device to the housing unit.

The plug 28 is centrally apertured for receiving a stem 33 which forms the valve body of the door closer mechanism. The stem in turn is provided with a regulating screw 34 and said stem extends inwardly of the chamber 25 so that the check valve 35 carried by the forward piston head 36 rides on and has telescoping relation with the stem 33. The check valve and the stem provide a valve system removed from the body portion of the housing

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and the said parts coast automatically as the piston reciprocates to control the flow of hydraulic fluid through the said end of the piston for controlling and checking the closing action of the door.

The structure and operation of the door checking mechanism shown in FIGS. 1 and 3 is disclosed and claimed in the copending application of Lasier and Pollack Ser. No. 654,306, filed June 28, 1967, now U.S. Pat. No. 3,426,383, issued Feb. 11, 1969 and entitled Door Closer Mechanism. Reference is made to said application for a more complete understanding of the stem 34 and associated parts which occupy the chamber 25.

The forward piston head 36 is joined to a rear piston head 38 by the connecting portions 40 and the portions are spaced for location on respective sides of the pinion 18. One connecting portion has rack teeth on its inside surface for meshing relation with the teeth of the pinion 18. The coil spring 27 is confined between the rear piston head 38 and the rear plug 31. The coil spring is compressed by the opening action of the door and the energy thus stored in the spring functions to move the piston in a direction towards the left for closing the door.

The backchecking mechanism of the invention is located within the chamber 26 and the same has coaction with the float check valve 42 carried by the rear piston 38. The float check valve is similar to 35, which is located in the forward piston 36, both in formation and in operation. The valve has an annular flange which is adapted to seat on a shoulder provided by the piston. When the piston moves from left to right with the opening of the door, the flange engages the shoulder and the valve is in closed position. When the piston moves from right to left with the closing of the door the valve is in an open position. The formation 43 is peened over to retain the float check valve in position within the opening provided for it in the piston 38.

The float check valve is essentially a ring and the same has telescoping relation with an inwardly extending probe indicated in its entirety by the numeral 44. The cylindrical tube or housing 45 of the probe has a tight sealing fit in the plug 31 and the housing is provided at its inner end with a longitudinal slot 46. The regulating screw located within the housing has a solid body portion 47 which is threaded at 48 for threaded relation with the housing at its rear end. The tubular part 50 of the probe has a tight press fit with the body portion to form a unit therewith and the forward extending end of the same is enlarged as at 51. In order to form valving means for intensity regulations the tubular part 50 is provided with the opening 52 which in certain rotated positions of the tubular part can be caused to align or partly align with the slot 46 in the housing.

The outside diameter of the enlarged head 51 of the probe is such that the member will receive the float valve 42. In the opening action of the door the piston 38 and float check valve 42 will travel to the right from the position of FIG. 1 to the position of FIG. 3 and the float check valve will have telescoping relation with the probe. The hydraulic fluid in chamber 26 will flow freely through the center of the float valve until the telescoping of the probe takes place. This action will check the flow of the hydraulic fluid since the only outlet for the fluid is through the slot 46 and opening 52. The incompressibility of the fluid restrains the piston in its movement and this causes a resulting slowing of the opening swing of the door. The restraining action on the door would be abrupt except that the shape of the head 51 of the probe causes a gradual shut-off of the fluid passage decelerating the piston movement evenly. As the door is released and the coil spring 27 causes the piston to move from right to left, the float valve 42 will open allowing unrestricted fluid flow from chamber 25 to chamber 26.

As previously mentioned the intensity of the backchecking function can be regulated by a turning of the regulating screw 47 to align or partly align the opening

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52 with the slot 46 as illustrated by FIG. 4. Also the probe can be advanced toward the piston 42 to cause the backchecking function to take place earlier in the opening swing of the door. This requires that the regulating screw be rotated the required number of times in order to advance the probe the desired extent as illustrated in FIG. 6. The threaded relation of the regulating screw within its fixed housing makes this longitudinal adjustment of the probe possible.

The backchecking mechanism of the invention is thus unique since the probe can be adjusted to vary the intensity of the backchecking operation and the probe can also be adjusted longitudinally to vary the location at which the function occurs.

In the modified form of the invention shown in FIG. 7 the housing of the probe as well as the regulating screw are longitudinally adjustable for varying the location in the travel of the piston at which the backchecking function is initiated, and for also varying the intensity of the backchecking function.

Referring more particularly to said modification, the piston 38 retains the floating valve 42 by means of the portions 43 which are peened as shown. The probe generally indicated by the numeral 60 extends inwardly from the end wall of the chamber 26. The rear end is threadedly secured at 61 in the plug 31. The probe 60 is tubular and an opening 62 is located in the same in substantial alignment with the reduced end 63 of the regulating screw 64. The screw is located within the right hand end of the probe and said screw is threadedly secured to said probe as at 65. The end 63 of the regulating screw is cut away at 66 and by rotating the screw to adjust its position longitudinally, the size of the fluid escape passage formed by the opening 62 and the cut away portion 66 can be varied. This varies the intensity of the backchecking operation.

The longitudinal position of the probe is also adjustable by rotating the probe with respect to the plug 31. The threaded relation of the parts effects a longitudinal positioning of the probe for either an earlier or a later initiation of the backchecking function which takes place when the float valve 42 telescopes the probe 60.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings, as various other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

We claim:

1. In a backchecking mechanism for a door closer device of the hydraulic type, the combination comprising:
 - a housing having a cylindrical bore therein for containing hydraulic fluid;
 - a probe fixed to one end wall of said housing and extending inwardly within said cylindrical bore;
 - a piston mounted within said cylindrical bore for reciprocating movement in first and second directions;
 - said piston having a first opening, extending longitudinally through said piston and being complementarily shaped to said probe for receiving said probe and permitting said piston to telescope said probe when it is reciprocated in said first direction;
 - said probe being disposed in relation to said first opening in said piston such that said probe and said first opening are out of telescoping relation when said piston is positioned at the terminus of said reciprocating movement in said second direction;
 - said piston having a second opening extending longitudinally through said piston;
 - check valve means, carried by said piston for controlling said second opening, which closes when said piston reciprocates in said first direction and opens when said piston reciprocates in said second direction, whereby a quantity of hydraulic fluid is trapped between said piston and said end wall of said cylinder since said check valve means are closed when said

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piston has telescoping relation with said probe and which action substantially closes said first and second openings in said piston;

and restricted passage means for controlling flow of hydraulic fluid from said trapped side of said piston to the opposite side of said piston during movement of said piston from its initial telescoping relation with said first opening of said probe until said piston begins said reciprocating movement in said second direction.

2. Backchecking mechanism for a door closer device as defined by claim 1, wherein the check valve means is in the form of a ring and which is located in said second opening in the piston, whereby the telescoping action takes place between the ring and the probe.

3. Backchecking mechanism for a door closer device as defined by claim 1, wherein the probe is tubular for a portion of its length, and whereby the said tubular portion of the probe forms a part of the restricted passage controlling flow of the hydraulic fluid as claimed.

4. Backchecking mechanism for a door closer device as defined by claim 1, wherein the check valve means is in the form of a ring and which is located in the opening in the piston, whereby the telescoping action takes place between the ring and the probe, and wherein the probe is tubular for a portion of its length and which is so constructed and arranged that the tubular portion of the probe forms a part of the restricted passage controlling flow of the hydraulic fluid as claimed.

5. Backchecking mechanism for a door closer device as defined by claim 1, wherein the nose end of the probe within the cylindrical bore is tapered in shape having its minimum size at its nose end and having its maximum size at its end towards the wall of the housing.

6. In a backchecking mechanism for a door closer device of the hydraulic type, the combination with a housing providing forward and rearward opposed chambers, of a piston having reciprocating movements within the chambers as a result of opening and closing action of the door, a generally tubular, longitudinally adjustable probe extending inwardly of the rearward chamber, a rotatable adjusting screw associated with the probe at its rearward end and forming an adjustable restricted passage permitting flow of the hydraulic fluid from the rearward chamber through the passage and through the tubular part of the probe to the inwardly extending end of the probe, a check valve carried in an opening extending through the piston by that end of the piston which has location within the rearward chamber, said check valve being in the form of a ring having an opening just slightly larger in diameter than the probe, said check valve having telescoping relation with the probe at a certain location in the reciprocating movement of the piston due to the opening action of the door, said check valve opening to permit unrestricted flow of the hydraulic fluid through said end of the piston only during closing action of the door, whereby the piston upon telescoping action with the probe will trap hydraulic fluid in said rearward chamber and which can escape only by flowing through said restricted passage.

7. In a door closing device, the combination with a housing providing forward and rear chambers, a piston having reciprocating movements within the housing as a result of opening and closing movement of the door, said piston including a rearward piston head located within the rear chamber, a probe supported by the rear wall of the housing and having a tubular part extending within the rear chamber, an adjusting screw in associated relation

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with the rear portion of the probe and providing a restricted passage leading from the rear chamber and including the tubular part of the probe, a floating check valve in the form of a ring having location in an opening extending through the rearward piston head, said check valve having telescoping relation with the probe at a certain location in the reciprocating movement of the piston head due to opening action of the door, said check valve opening to permit unrestricted flow of the hydraulic fluid through said rearward piston head only during closing action of the door, whereby the piston head upon telescoping action with the probe will trap hydraulic fluid in said rear chamber between the piston head and the rear wall of the housing, and whereby said trapped fluid can escape only by flowing through the restricted passage, threaded means rendering the adjusting screw rotatably adjustable for varying the size of the restricted passage, and said probe having threaded relation with respect to the rear wall of the housing whereby the longitudinal position of the probe can be adjusted to vary the location in the reciprocating movement of the piston head at which the check valve has initial telescoping relation with the probe.

8. In a backchecking mechanism for a door closer device of the hydraulic type, the combination with a housing providing forward and rearward opposed chambers, of a piston having reciprocating movements within the chambers as a result of opening and closing action of the door, a generally tubular probe extending inwardly of the rearward chamber, said probe including a tapered inwardly extending nose having a minimum diameter at the nose end and a maximum diameter at its rearward end, an adjusting screw associated with the probe at its rearward end and forming a restricted passage permitting flow of hydraulic fluid from the rearward chamber through the passage and through the tubular part of the probe to the inwardly extending end of the probe, a check valve carried in an opening extending through the piston by that end of the piston which has location within the rearward chamber, said check valve being in the form of a ring having an opening just slightly larger in diameter than the maximum diameter of the probe, said check valve having telescoping relation with the probe at a certain location in the reciprocating movement of the piston due to the opening action of the door, said check valve opening to permit unrestricted flow of the hydraulic fluid through said end of the piston only during closing action of the door, whereby the piston upon telescoping action with the probe will trap hydraulic fluid in said rearward chamber and which can escape only by flowing through said restricted passage.

References Cited

UNITED STATES PATENTS

627,828	6/1899	Page	16—62
1,123,810	1/1915	Shaw	16—62
1,152,339	8/1915	Norton	16—62
1,178,688	4/1916	Stronach	16—62
2,059,385	11/1936	Morrisette	16—62
2,586,135	2/1952	Woodruff	16—51
3,426,383	2/1969	Lasier et al.	16—62

MARVIN A. CHAMPION, Primary Examiner

I. A. CALVERT, Assistant Examiner

U.S. Cl. X.R.

16—62

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,546,734 Dated January 18, 1971

Inventor(s) ROY L. POLLACK and DAVID G. ROWLEY

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 22, "fluids" should read --fluid--.

Column 3, line 7, "aplication" should read
--application--.

Column 4, line 59, after "shaped to said probe"
insert ,

SIGNED AND
SEALED
MAR 16 1971

MAR. 16, 1971

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM R. SCHUYLER, JR.
Commissioner of Patents