Feb. 1, 1949. R. G. STRONACH 2,460,369

DOOR CHECK AND CLOSER

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Fig. 1.

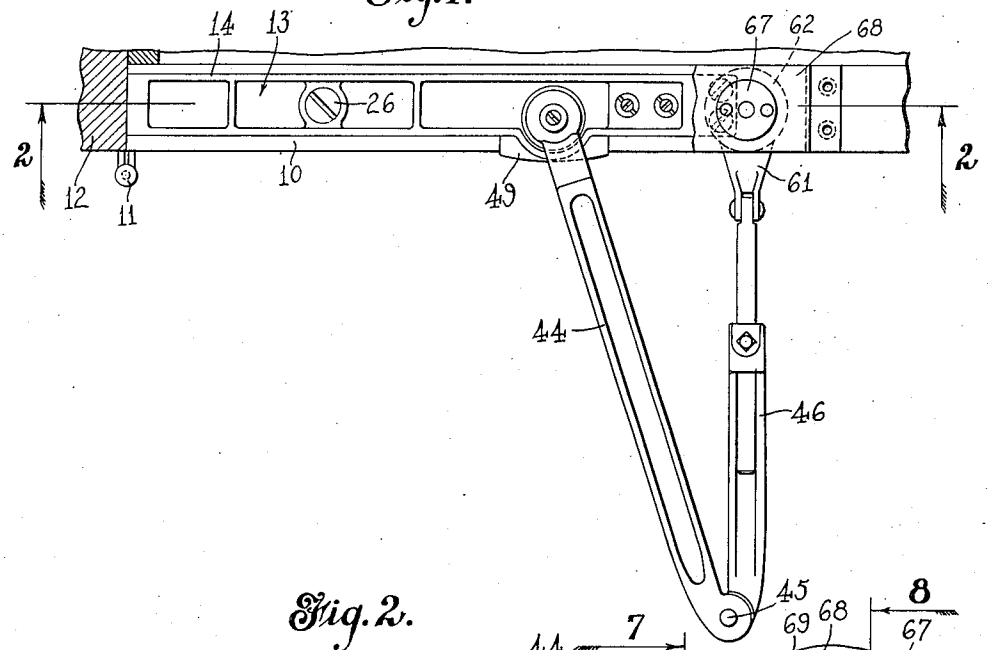
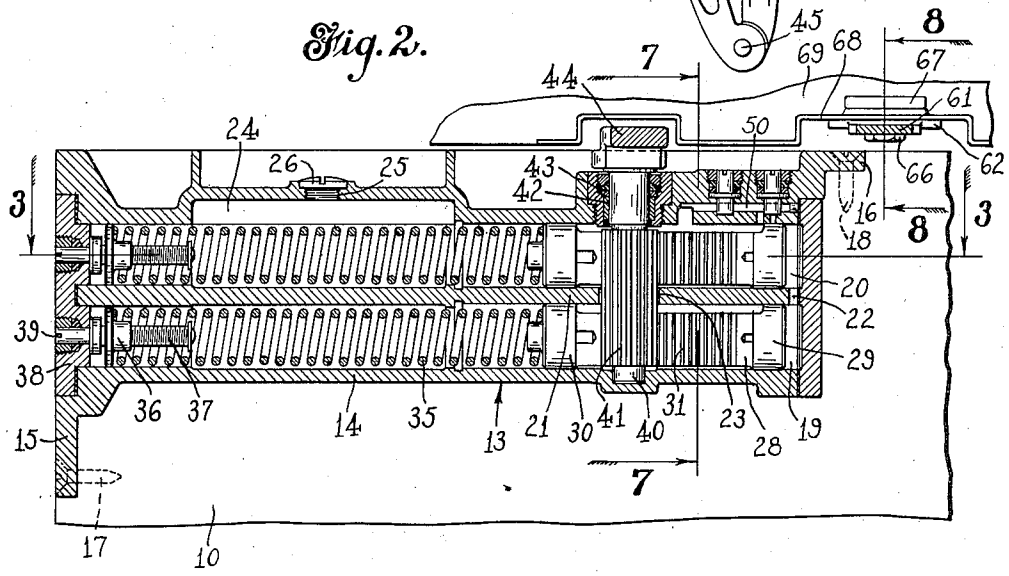


Fig. 2.



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DOOR CHECK AND CLOSER

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Fig. 3.

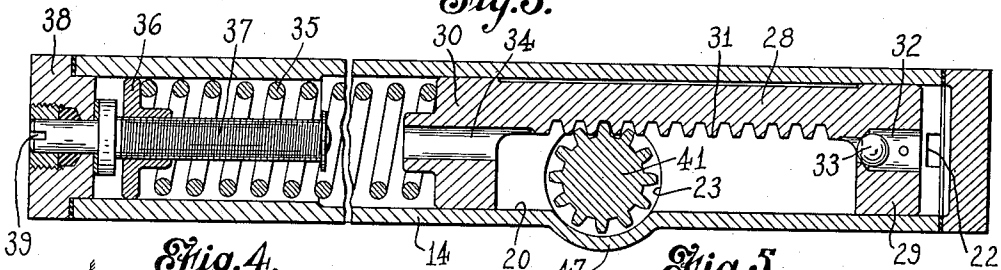


Fig. 4.

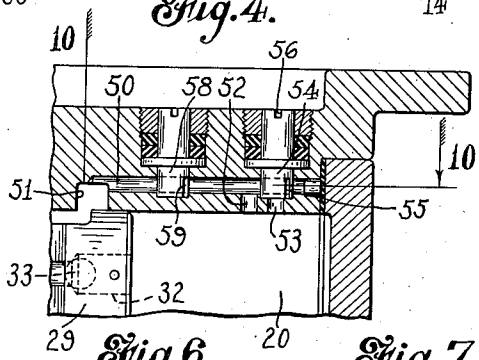


Fig. 5.

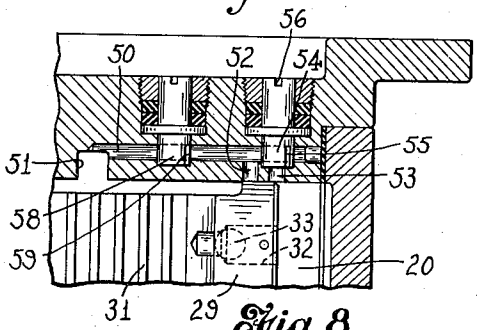
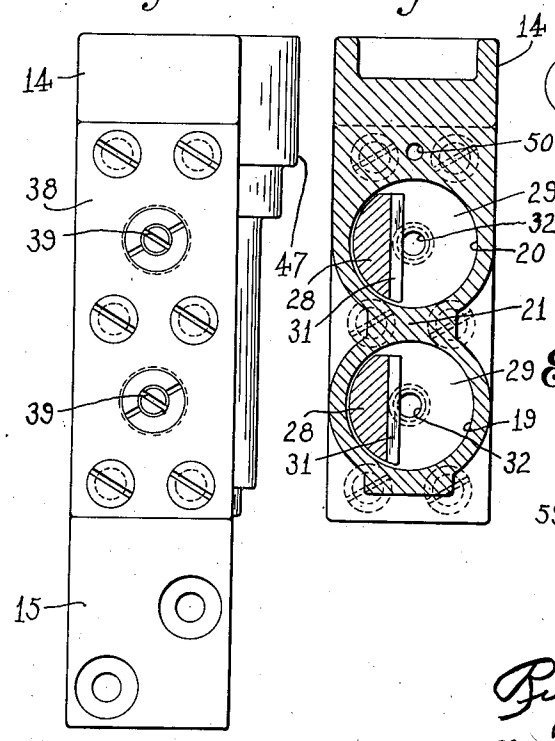


Fig. 6.

Fig. 7.

Fig. 8.



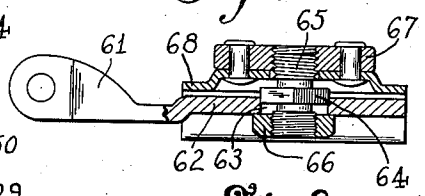


Fig. 9.

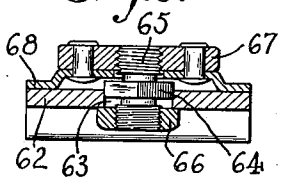
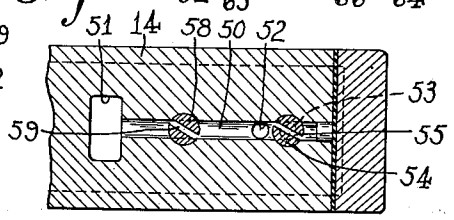


Fig. 10.



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DOOR CHECK AND CLOSER

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9 Claims. (Cl. 16—56)

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This invention relates to door check and closers, and more particularly to a device adapted to be applied to a door and so arranged that it will effect a positive closing movement of the door, while, at the same time, checking this movement so that the door will be not slammed but will be closed softly or gently.

Most devices which are now on the market to perform a similar result to that performed by that of the device of the present application consist of relatively complicated mechanisms housed in a cylindrical case of considerable size, which case is usually mounted on the door or door frame and, in some instances, the case has been concealed within the door frame above the door. When the case is mounted upon the outside of the door, it is unsightly in appearance, and its size is such that it cannot be placed within the door itself and can only be concealed within the door frame above the door with considerable inconvenience and usually not without a rearrangement of the mechanism.

I contemplate by the present invention the provision of a door check which may be mounted in a narrow elongated case which may be installed in the upper portion of the door so as to be practically concealed from view. As the case of the mechanism must be of less thickness than that of the door, it will be apparent that if a plunger-and-cylinder type mechanism is employed, the diameter of the cylinder must be relatively small. The size of the cylinder is related to the checking effort which may be obtained, and this has been considered a serious drawback to the construction of a suitable door check which may be concealed within the door itself.

In the present invention I overcome the difficulties mentioned above by constructing a relatively deep case for the device and providing in the case a plurality of cylinders, one below the other, so as to secure a suitable plunger or piston area to provide the necessary checking power. A piston or plunger is arranged in each of the cylinders, which plungers are interconnected and connected with the controlling arm, so that they will be moved when the door is opened and act in a manner similar to one plunger or piston having the combined area of the two which are provenience.

One object of the invention is to provide a new and improved door check, the mechanism of which may be housed in a relatively narrow casing so that the latter may be mounted within the door adjacent the upper edge thereof.

A still further object of the invention is to provide a door check and closer having a relatively deep and narrow case, which case shall be provided with a plurality of cylinders one below the other and a plunger in each cylinder connected with the operating arm so that both plungers will act together in bringing about the checking and closing operations.

A still further object of the invention is to provide a door check of the character described in which the cylinders will communicate with each other on both sides of the plungers or pistons, so that one set of controlling valves may be employed for both cylinders.

A still further object of the invention is to provide a door check of the character described so arranged that adjustment of the tension of the closing springs may be readily changed from the rear edge of the door without the necessity of removal of any of the parts of the casing.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a top plan view of a portion of a door having my improved door check and closer installed therein;

Fig. 2 is a vertical sectional view through the case of the door check and closer on line 2—2 of Fig. 1;

Fig. 3 is a horizontal sectional view on line 3—3 of Fig. 2;

Fig. 4 is a fragmentary sectional view of one end of the device, showing the controlling valves and the position of one of the plungers when the door is in open position;

Fig. 5 is a view similar to Fig. 4 showing the plunger in the position which it occupies when the door is approaching its closed position;

Fig. 6 is an end elevational view of the casing of the device;

Fig. 7 is a sectional view on line 7—7 of Fig. 2;

Fig. 8 is a sectional view of the mechanism for holding the door in open position taken on line 8—8 of Fig. 2;

Fig. 9 is a view similar to Fig. 8 but showing the parts in another position; and

Fig. 10 is a sectional view on line 10—10 of Fig. 4.

To illustrate a preferred embodiment of my invention, I have shown a portion of a door 10 hinged at 11 to the frame 12, the door having mortised in the upper edge thereof, and adjacent its hinged edge, the casing 13 of the device. This casing includes a body portion 14 having lugs 15

and 16 projecting therefrom at opposite corners so that it may be secured to the door by suitable fastening screws 17 and 18.

As shown in Figs. 2 and 7, this casing is relatively deep and narrow so that it may be mounted within the door between the two faces thereof in a concealed position, and, provided within this casing, are a pair of parallel cylinders 19 and 20, one above the other, the two being separated by the partition 21. It will be noted, however, that this partition is provided with an opening 22 adjacent the forward end of the case through which the cylinders 19 and 20 may communicate, and is also provided with an opening 23 which also provides communication between the cylinders. Above the upper cylinder 20 is a fluid reservoir 24 provided with a filling opening 25 which may be ordinarily closed by a screw cap 26 so that, the closer being of the fluid type, the cylinders 19 and 20 may be kept full of a suitable fluid such as oil, for example. The reservoir 24 provides for a complete filling of the interior of the casing and, being above the upper cylinder, will house or contain an excess of fluid which will flow into the cylinders as needed and maintain them full at all times. It will, of course, be understood that the fluid may flow from the upper cylinder with which the reservoir communicates to the lower cylinder through the openings 22 and 23.

Within each cylinder is mounted a plunger of identical form, each of these plungers comprising a body portion 28 having a head 29 at one end and a cylindrical spring abutment 30 at the other end, the body portion 28 of the plunger being provided with rack teeth 31 on its forward face or the face away from the adjacent wall of the cylinder. An opening 32 is provided through the plunger head 29, this opening being controlled by a ball-check valve 33 so as to permit the fluid to flow through the head in one direction but to check such flow when the fluid exerts pressure on the ball in the opposite direction. This, as will be obvious to those skilled in the art, permits the fluid to flow freely through the plunger head from one side to the other thereof when the door is opened and the plunger is moved from the position shown in Fig. 3 to that shown in Fig. 4.

An opening 34 is provided through the cylindrical abutment 30 so that the oil or other fluid within the cylinder may flow freely from the rear to the forward part of the cylinder, and against this abutment one end of the closing spring 35 is adapted to bear, the other end of this spring bearing against a collar 36 threaded upon an adjusting screw 37, the end of which projects outwardly through the end wall 38 of the casing where it is provided with a slot 39 to receive a screw driver or other tool by which it may be rotated. Rotation of the screw 37, as will be obvious, will effect adjustment of the collar 36 longitudinally of the cylinder and thereby effect adjustment of the compression spring 35 so that it will exert more or less pressure upon the plunger. It will be apparent that the screws 37 will, as shown in Figs. 2 and 6, be accessible from the exterior of the casing at the rear edge of the door when the latter is opened, so that they may be easily adjusted without the removal of any portion of the case.

Rotatably mounted in the casing and extending from top to bottom thereof is a shaft 40 carrying thereon a relatively wide pinion 41 which extends through the opening 23 in the partition 21 of the case, so that the teeth of this pinion are in engagement with the rack teeth 31 on both of the plungers. While the opening 23 is only slightly larger than the outside size of this pinion, the fluid communication between the cylinders will, of course, be provided by the space between the teeth as well as by the space at the edges of the teeth. The shaft 40 is extended through an opening 42 at the upper side of the case where it is surrounded by suitable packing 43 to prevent leakage, and on the extended end of the shaft is rigidly secured the usual operating arm 44, this arm being pivoted at 45 to one end of a link 46, the other end of which is pivoted or rotatably connected to the door frame as will be hereinafter described. It may here be noted that, as shown in Fig. 3, the width of the body portion 28 of the plunger and the pinion 41 is slightly greater than the width of the casing 13, so that the latter is provided with a slightly bulged portion 47 (Fig. 3) to accommodate these parts. If at this point the casing is too wide to be housed completely within the door, it may project through a small opening at one side of the door as shown in Fig. 1, which opening may be covered by the plate 49. This plate may, however, be relatively narrow so that it will not detract from the appearance of the installation.

As shown in Figs. 2, 4 and 5, a by-pass passage 50 is provided at the upper portion of the casing adapted to permit fluid to flow from one side of the plunger head 29 to the other when the plunger is moving forwardly or to the right as shown in these figures. This passage 50 is in communication with the cylinder 20 through the recess 51 at its rear end and through ports 52 and 53 adjacent its forward end. The effective area of the port 53 may be controlled by a valve 54 rotatably mounted in the casing and provided in its lower face with a transverse slot 55 which communicates both with the passage 50 and with the port 53. It will be apparent from Fig. 10 that this recess or slot communicates with the port 53 in any rotative position of the valve. However, the effective area of the communication between this slot and the passage 50 may be varied by rotation of the valve 54, so that the effective area of the port 53 may be varied as desired. The valve 54 extends upwardly through the casing at the top of the door and is provided with a slot 56 for the insertion of a tool by which it may be rotated.

The by-pass passage 50 may be controlled by a valve 58 similar to the valve 54 and is likewise provided with a transverse slot or opening 59, so that by rotation of this valve the effective area of the passage 50 may be regulated.

While the operation of my device will be clear to those skilled in the art from the above description, it is preferable to briefly describe it as follows: As shown in Figs. 1 to 3, the parts are in the position occupied when the door is closed. Upon the opening of the door, the arms 44 and 46 will be separated to increase the angle therebetween about the pivot pin 45 and, as the arm 44 is secured to the upper end of the shaft 40, this shaft will be rotated, causing the pinion 41 thereon, by its engagement with the rack teeth 31, to move the plungers to the left or from the position shown in Fig. 2 to that shown in Fig. 4. This movement will take place against the action of the springs 35 which will be compressed by the rearward movement of the plungers, each spring acting individually upon the plunger with which it is associated. During this opening movement, the fluid in the cylinders will flow freely past the check valves 33 from one end of each cylinder to

the other so that there will be no fluid resistance to the opening of the door.

When the door is released after being opened, the springs 35 will act against the abutments 30 on the plungers to effect the return of the plungers to the right or forward ends of the cylinders, and thereby through the racks 31 and pinion 41 effect rotation of the arm 44 which will close the door in a well-known manner. When the door is open, the plungers may be assumed to be substantially in the position occupied by the upper plunger as shown in Fig. 4, the lower plunger standing in the same position relatively to the lower cylinder. During the return of the plungers to the right, the fluid will be forced from the upper cylinder through the ports 52 and 53 and the by-pass passage 50 into this cylinder at the rear of the plunger head 29, thus allowing the plunger to move to the right under control of the adjustment of the valve 58, the fluid being by-passed from one side of the plunger to the other during this movement. Likewise the fluid in the lower cylinder will pass to the upper cylinder through the opening 22 and then be by-passed around the plungers by flowing through the opening 23 after passing through the passage 50.

When the plunger head 29 reaches a position in which it covers and therefore closes the port 52 (a position between that shown in Figs. 4 and 5), the by-passing of the fluid around the plungers may only take place through the port 53 and will, therefore, be under control of both valves 54 and 58, thus providing a slow movement of the door at this point.

When the door has moved to a further position in which it is almost closed and the latch bolt is about to strike the strike plate with which it cooperates, it is desired to effect the remainder of the closing with a snap action. Therefore, as shown in Fig. 5, the arrangement is such that any further movement of the plunger will uncover the port 52 and permit the fluid in the upper cylinder to be by-passed about the plunger through the port 53 and the uncontrolled port 52 without the fluid having to pass by the valve 58, thus at this time a quick closing or snap action is imparted to the door to insure the proper retraction and later engagement of the latch bolt.

If this snap action is not desired, the valve 54 may be adjusted to restrict the effective size of the opening 53, and the result will be a quiet or gentle closing of the door at the end of the closing movement.

It is also desirable to provide for the holding of the door in open position when desired, and provision is made to effect this result by the mechanism shown in Figs. 1, 2, 8 and 9. As shown in Fig. 1, the link or arm 46 is pivoted to a member 61 having a disk-like portion 62 provided with an opening 63 in which is mounted for slidable movement vertically the square portion 64 of a stud 65. A nut 66 is provided upon one end of the stud by which the latter may be adjusted vertically with respect to the disk 62.

The upper end of the stud 65 is threadingly connected to a nut 67 secured to a plate 68 mounted on the soffit 69 of the door frame.

As will be apparent, the stud 65 is non-rotatably secured to the member 62, although it may be adjusted vertically relatively to this member by the nut 66 so that, when the member 62 is rotated by an opening movement of the door and the swinging of the arm 46, the stud 65 will be rotated relatively to the nut 67. The threaded connection of the stud 65 with the nut 67 is so

arranged that, during an opening movement of the door, this stud will travel upwardly relatively to the nut and cause the part 62 to move upwardly from its position shown in Fig. 8 where it is spaced from the plate member 68 to the position shown in Fig. 9 where it frictionally engages this plate member and holds the door in open position against the effort of the springs 35. Adjustment of the position of the member 62 on the stud 65 by the nut 66 will, of course, determine the amount of swinging movement of the door necessary to effect the frictional engagement of the parts shown in Fig. 9, and thus determine the open position of the door.

It will be noted that, when the nut 66 has been set at the desired position, the stud 65 will be held against movement with respect to the member 62, in that the upper end of this stud is threadedly engaged with the nut 67, so that there can be no vertical movement of the stud except that which takes place due to this threaded connection and caused by the rotation of the member 62 upon movement of the door. The squared portion 64 of the stud holds it against rotational movement with respect to the member 62. Thus there will be no change in the relative position of the parts as long as no adjustment of the nut 66 is made, and the door will be held in open position at a predetermined point according to the setting of the nut 66, which point will not be altered due to continued use of the device. It will also be noted that this part of the device occupies a very small amount of space, particularly in a vertical direction, so that it lends itself to mounting in the door soffit, as shown.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the claims.

What I claim is:

1. A door closer comprising an elongated casing having a pair of parallel cylinders therein, a plunger in each of said cylinders, a spring in each cylinder urging the associated plunger toward one end of the cylinder, an arm actuated by the door in its opening and closing movements, means connecting said arm to said plungers to effect movement of both of the latter in the same direction to compress said springs when the arm is moved, said means comprising a shaft rotatably mounted in the casing to which the arm is secured, and means connecting said shaft to both of said plungers.

2. A door closer comprising an elongated casing having a pair of parallel cylinders therein, a plunger in each of said cylinders, a spring in each cylinder urging the associated plunger toward one end of the cylinder, an arm actuated by the door in its opening and closing movements, means connecting said arm to said plungers to effect movement of both of the latter in the same direction to compress said springs when the arm is moved, said means comprising a shaft rotatably mounted in the casing to which said arm is secured, rack teeth on each of said plungers, and pinion means on the shaft engaged with the rack teeth of both plungers.

3. A door closer comprising an elongated casing having a pair of parallel cylinders therein, means providing communication between said cylinders, a plunger in each of said cylinders, the wall of one cylinder being provided with a passage to permit the fluid in said cylinders to

by-pass around both of said plungers, an arm actuated by the door in its opening and closing movements, means connecting said arm to said plungers to effect movement of the latter when the arm is moved, a spring acting at one end on each of said plungers to urge the associated plunger in one direction, said springs extending lengthwise of the casing, a collar against which the other end of each spring reacts, and means extending through the end wall of the casing for adjusting said collars to adjust the tension of said springs.

4. A door closer comprising an elongated casing having a pair of parallel cylinders therein, means providing communication between said cylinders, a plunger in each of said cylinders, the wall of one cylinder being provided with a passage to permit the fluid in said cylinders to by-pass around both of said plungers, an arm actuated by the door in its opening and closing movements, means connecting said arm to said plungers to effect movement of the latter when the arm is moved, a spring acting at one end on each of said plungers to urge the associated plunger in one direction, said springs extending lengthwise of the casing, a stop member against which the other end of each spring reacts, and an adjusting member connected to each stop member and extending through the end wall of the casing to be accessible from the exterior of the casing.

5. A door closer comprising an elongated casing having a pair of parallel cylinders therein, means providing communication between said cylinders, a plunger in each of said cylinders, the wall of one cylinder being provided with a passage to permit the fluid in said cylinders to by-pass around both of said plungers, an arm actuated by the door in its opening and closing movements, each plunger comprising a body portion having rack teeth thereon, a head at one end and a spring abutment at the other end of said portion, a spring in each cylinder acting against the abutment to urge the associated plunger in one direction, and a pinion engaged with the rack teeth and actuated by said arm.

6. A door closer comprising an elongated casing having a pair of parallel cylinders therein, a plunger in each of said cylinders, an arm actuated by the door in its opening and closing movements, means connecting said arm to said plungers to effect movement of the latter when the arm is moved, said means comprising a shaft rotatably mounted in the casing to which the arm is secured, means connecting said shaft to both of said plungers, a partition between said cylinders having an opening therein through which said shaft extends, and said opening providing communication between said cylinders.

7. A door closer comprising an elongated casing having a pair of parallel cylinders therein, a plunger in each of said cylinders, an arm actuated by the door in its opening and closing

movements, means connecting said arm to said plungers to effect movement of the latter when the arm is moved, said means comprising a shaft rotatably mounted in the casing to which the arm is secured, means connecting said shaft to both of said plungers, a partition between said cylinders having an opening therein through which said shaft extends, said opening providing communication between said cylinders, said shaft being disposed at one side of the head of said plungers, and means providing communication between said cylinders at the other side of said plunger heads.

8. A door closer comprising an elongated casing having a pair of parallel cylinders therein, a plunger in each of said cylinders, an arm actuated by the door in its opening and closing movements, means connecting said arm to said plungers to effect movement of the latter when the arm is moved, said means comprising a shaft rotatably mounted in the casing to which the arm is secured, means connecting said shaft to both of said plungers, a partition between said cylinders having an opening therein through which said shaft extends, said opening providing communication between said cylinders, said shaft being disposed at one side of the head of said plungers, means providing communication between said cylinders at the other side of said plunger heads, and means providing a fluid by-pass about one of said plungers.

9. A door closer comprising an elongated casing having a pair of parallel cylinders therein, a plunger in each of said cylinders, a spring in each cylinder urging the associated plunger toward one end of the cylinder, an arm actuated by the door in its opening and closing movements, means connecting said arm to said plungers to effect movement of both of the latter in the same direction to compress said springs when the arm is moved, said means comprising a shaft rotatably mounted in the casing to which the arm is secured, means connecting said shaft to both of said plungers, the wall of one cylinder being provided with a passage to permit fluid in said cylinders to by-pass around both of said plungers, and means providing communication between said cylinders on both sides of the plungers.

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