

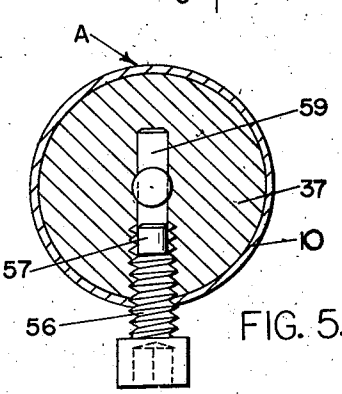
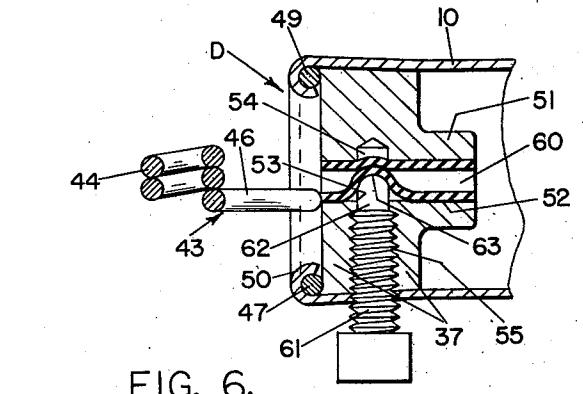
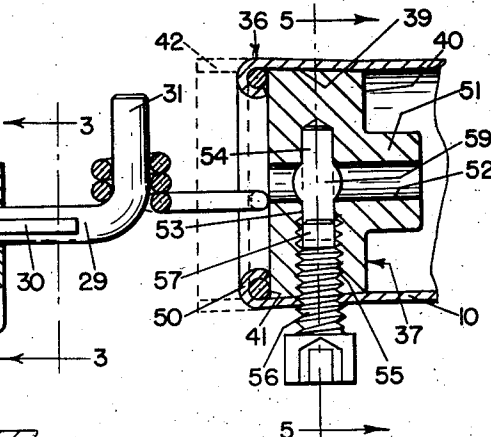
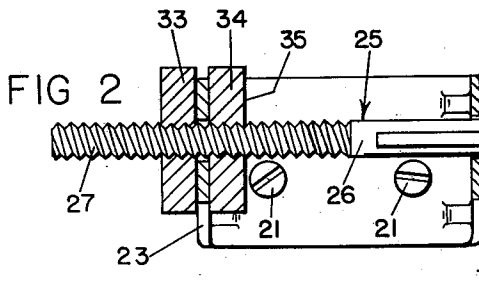
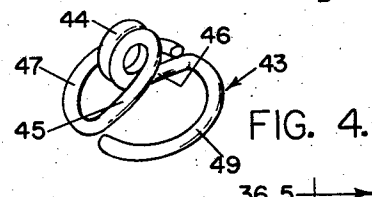
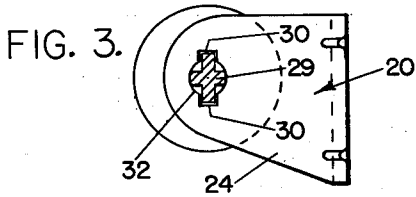
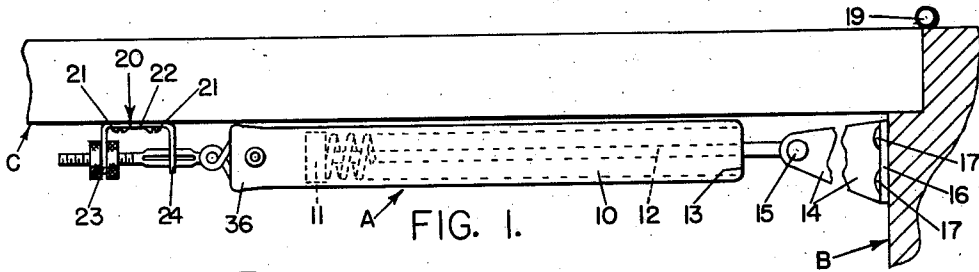
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DOOR CLOSER

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3,078,501

DOOR CLOSER

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1 Claim. (Cl. 16-66)

This invention relates to an improvement in door closers and deals particularly with an inexpensive apparatus designed for use on screen and storm doors and the like for drawing them into closed position.

Numerous door closers have been produced for closing relatively light weight doors such as screen doors, storm doors, and the like. Most of these closers are produced of light weight material so that they may be produced as economically as possible as the market is extremely competitive. Most door closers of this type comprise a cylinder which is pivotally connected to one of the two elements such as the door frame and includes a piston having a piston rod which is pivotally connected to the other member such as the door. A spring is provided for urging the piston toward position to close the door. In order to prevent the door from slamming, air is usually compressed in one end of the cylinder by the piston as the spring pulls the door closed. Some means is provided to permit a leakage of air from the end of the cylinder so that the spring may act to close the door. Various types of means have been employed to regulate the rate of flow of air from the cylinder so as to control the speed of closing of the door. Some adjustment of the speed of closing is highly desirable as the door closer might be used with a relatively light weight door or with a relatively heavy door.

The most common type of valve which is employed comprises a screw which fits with some degree of looseness in a threaded opening at the end of the cylinder. The screw may, if desired, be tapered to permit a greater escape of air as the screw is adjusted outwardly. As the screw must fit loosely in the threaded opening, in order to permit the escape of air, there is a tendency for the screw to get out of adjustment. In any event, it is difficult to accurately control the rate of flow of air through the use of a valve of the type described.

An object of the present invention resides in the provision of a door check having a novel type of valve which is easy to produce and which is extremely effective in its operation. In preferred form, this valve includes a resilient flexible member through which or around which air may flow. By distorting the shape of the resilient member, the passage through or around the resilient member may be varied in size to accurately regulate the rate of flow from the cylinder.

A feature of the present invention resides in the provision of an air valve which includes a resilient member which may be flexed or distorted through the use of a screw which bears against the resilient member to distort it to the proper degree. Due to the fact that the resilient member exerts a force upon the screw, the tendency of the screw to change position is greatly decreased. Furthermore, because of the fact that the leakage of air need not take place around the screw or between the screw and its threads, the screw may fit in the threaded opening more tightly than would otherwise be the case.

A further feature of the present invention resides in the provision of a simple and effective means of closing the end of the cylinder. The walls of the cylinder are usually formed of seamless tubing and the end of the cylinder usually comprises a cup shaped strapping which is secured to the end of the tubing to form a closure therefor. In the present structure, I employ a preformed

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plug which is slightly tapered with the large diameter end of the plug of somewhat greater diameter than the internal diameter of the tube. As this plug is forced into the end of the tube, the tube is enlarged in diameter by the plug. As a result, the plug becomes wedged firmly in the end of the cylinder forming a tight connection in conjunction therewith in an extremely simple assembly operation.

A further feature of the present invention resides in the manner of anchoring the plug end of the cylinder to a hinge connection. As the tapered plug is forced into the tube, it is forced somewhat past the end of the tube. A pivot bearing member having a ring-shaped base is inserted into the projecting end of the tube to rest against the plug. The cylinder is then rolled to spin the end of the tube over the ring-shaped base of the attachment member. Thus, the spinning of the end of the tube serves as a means of anchoring the attachment member in place and also of insuring the retention of the plug in the end of the tube.

A feature of the present invention resides in the fact that through the provision of a solid tapered plug in the end of the tube, an air tight joint is insured between the inner wall of the tube and the outer wall of the plug. A thin walled tubing of the type usually employed is not always entirely cylindrical and may be slightly out of round when received or might be bent slightly out of round during handling. This is also true of the cup-shaped end closures which are often used in door closers of the type in question. As a result, as the cup-shaped cylinder end is applied to the tube, an air tight connection is not always produced unless some sort of resilient sealing ring is employed. In the present arrangement, as the plug is forced into the tube, it is expanded throughout its entire area and any imperfections in the tube or in the plug do not effect the seal.

A further feature of the present invention lies in the provision of a novel adjustable connection between one of the elements such as the door and the cylinder end. A bracket is provided which is attached to the door, an adjustable member is slidably supported by the bracket, the adjustable member providing a pivot to which the cylinder end is connected.

These and other objects and novel features of the present invention will be more clearly and fully set forth in the following specification and claim.

In the drawings forming a part of the specification: FIGURE 1 is a top plan view of a door closer diagrammatically shown connected to a door and a door frame.

FIGURE 2 is a sectional view through the end of the door closer showing the arrangement of parts therein.

FIGURE 3 is a sectional view through a portion of the bracket, the position of the section being indicated by the line 3—3 of FIGURE 2.

FIGURE 4 is a perspective view of the attaching member for connecting the cylinder end to a pivot.

FIGURE 5 is a sectional view through the end of the cylinder and the valve, the position of the section being indicated by the line 5—5 of FIGURE 2.

FIGURE 6 is a sectional view through the end of the cylinder showing a modified form of valve arrangement.

The door closer is indicated in general by the letter A and is shown connecting a door frame B and a door C. The door closer A includes a cylinder 10 which slidably supports a piston 11. The piston 11 is connected to a connecting rod 12 which extends from one end 13 of the cylinder through a suitable bearing not illustrated in the drawings. In usual practice, the piston rod 12 is either loose in its bearings or the end 13 of the cylin-

der is provided with air openings to prevent the compression of air at this end of the cylinder as the piston is pulled toward it.

The piston rod 12 is pivotally connected to a mounting bracket 14 by a pivot 15. The bracket 14 is provided with anchoring flanges such as 16 which may be secured to the door frame B by screws or other suitable means as indicated at 17. The axis of the pivot 15 is usually vertical or in any event parallel to the axes of the hinges 19 which are employed for hingedly connecting the door C to the frame B.

A generally U-shaped bracket 20 is secured to the door C by screws 21 or the like. The bracket 20 includes a base 22 and parallel end flanges 23 and 24. The bracket 20 is designed to accommodate the adjustable pivot member 25 best illustrated in FIGURE 2 of the drawings. The member 25 includes an elongated shank 26 having an externally threaded end portion 27 and a generally cylindrical adjoining portion 29 which is provided with opposed laterally extending flanges or keys projecting therefrom. The cross sectional shape of the shank portion 29 is best illustrated in FIGURE 3 of the drawings.

The end of the shank portion 29 is bent at substantially right angles to provide a pivot 31. This pivot is designed for connection with the cylinder in a manner which will be later described in detail.

As is indicated in the drawings, the flange 24 of the bracket 20 is provided with an aperture 32 which is shaped to accommodate the shank portion 29 with its projecting flanges or keys 30. This arrangement is provided to prevent the adjustment member 25 from rotating relative to the bracket and for holding the pivot end 30 with its axis substantially parallel to the base plate 22 of the bracket 20. Adjustment nuts 33 and 34 are threaded on the threaded portion 27 of the shank 26 on opposite sides of the flange 23, the flange 23 being provided with a cylindrical aperture 35 therethrough to accommodate the threaded shank portion.

The end 36 of the cylinder 10 opposite that through which the piston rod 12 extends accommodates a tapered plug 37. The taper of the plug may be relatively slight as, for example, on the order of two degrees. The taper of the peripheral surface 39 of the plug is exaggerated in FIGURE 2 of the drawings to better illustrate the arrangement. The small diameter end 40 of the plug 37 is of a size to snugly engage within the end of the tube. The large diameter end 41 of the plug 37 is of an outer diameter which is greater than the inner diameter of the tube forming the cylinder 10. As a result, as the plug is forced into the tube, the tube is increased in diameter, so that the inner surface of the tube wall tightly engages the outer surface of the plug to provide an air tight joint. The plug 37 is inserted into the cylinder 10 beyond the extremity thereof providing an end portion 42 indicated in dotted outline in FIGURE 2 which projects somewhat beyond the plug. The bearing member 43 best illustrated in FIGURE 4 of the drawings is inserted into the end 42 of the cylinder to rest against the large diameter end 41 of the plug.

The bearing support or bearing member 43 is formed as best illustrated in FIGURE 4 of the drawings. This member includes a helically wound center portion 44 which in the form illustrated comprises two convolutions. The ends of the helical portion indicated at 45 and 46 extend outwardly in opposite directions from one side of the helical member 46, the ends of the arms 45 and 46 being spaced apart a distance substantially equal to the inner diameter of the extended portion 42 of the cylinder 10. The ends of the arms 45 and 46 are bent to provide semi-circular portions 47 and 49 which are arranged in a common plane and when combined together form substantially a circular ring. The outer diameter of the ring thus formed will fit into the extended portion 42 of the cylinder 10. This extended portion is then rolled

or spun inwardly as indicated at 50 to anchor the base ring formed by the portions 47, 49 against the end of the plug 37.

The plug 37 is provided with a central boss 51 extending inwardly toward the center of the cylinder and an axial passage 52 extends through this boss and through the plug from one end thereof to the other. A transverse bore 53 intersects the bore 52 at substantially right angles, the axis of the bore 53 intersecting the axis of the bore 52. The bore 53 extends across the bore 52 to form a socket 54. The other end of the bore 53 is internally threaded as indicated at 55.

A compression screw 56 having a cylindrical end 57 is used in conjunction with the threaded bore 55. A cylindrical plug 59 of rubber or other similar resilient material fits snugly within the bore 53 and intersects the passage 52 to enter the socket 54. When the compression screw 56 is threaded into the bore 53, the cylindrical end 57 engages the end of the plug to compress the plug in an axial direction. This axial compression creates a tendency for the plug to expand in a radial direction. As the ends of the plug are confined within the bore 53 and the socket 54 but are not confined at the portion intersecting the bore 52, the center portion of the plug will expand as indicated in FIGURE 2 of the drawings to completely close the passage through the bore 52 if desired. By varying the degree of tightness of the screw 56, the size of the bulged center portion 59 may be changed to increase or decrease the size of the plug and the space between the center portion of the plug and the walls of the bore 52. Thus, the passage through the bore 52 through which air may escape may be varied and a very accurate control of the air flow is obtained.

An advantage of the particular arrangement illustrated lies in the fact that the resilient plug 59 exerts a resilient force against the end of the screw 56 thus holding this screw from rotation. As a result, the screw tends to remain in adjustment to a greater extent than would otherwise be possible.

In FIGURE 6 of the drawings I disclose a modified form of construction which is illustrated in general by the letter D. Due to the fact that the cylinder 10, the plug 37, the bearing support 43 and the general arrangement of parts illustrated in FIGURE 6 are identical to the similar elements shown in FIGURE 2, these elements have been given the same identifying numerals. The valve illustrated in FIGURE 6 of the drawings is different from that previously described in that the bore or passage 52 which extends through the boss 51 and plug 37 in the construction C accommodates a tube or sleeve 60 which fits snugly against the walls of the passage. A clamping screw 61 is threaded into the threaded opening 55 and is provided with an elongated shank 62 having a rounded extremity 63. As the screw 61 is threaded into the aperture 53, the rounded end 63 of the screw 61 engages the wall of the tube 60 and compresses the wall together. By varying the extent to which the screw 61 is tightened, the opening through the tube 60 may be varied in size to vary the flow of air through the tube.

Due to the fact that a portion of the tube may be flexed into the socket 54 when the screw 61 is threaded inwardly, the entire passage through the tube may be closed if desired. In this way, the escape of air from the cylinder may be readily regulated.

The structure shown in FIGURE 6 does not have all of the advantages of the previously described construction as the resilient tube is somewhat more fragile than the solid resilient plug. However, the two structures do have some of the same advantages and either structure is operable.

The operation of the closer is believed obvious, as the door C is swung open, the piston 11 moves toward the end 13 of the cylinder, compressing the spring 65 therein. The expansion of the spring 65 pushes the piston 11 back

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toward the plug 37. Air compressed within the cylinder between the plug 36 and piston 11 is allowed to escape through the passage 52 at a rate controlled by the valve described.

In accordance with the patent statutes, I have described the principles of construction and operation of my improvement in door closers, and while I have endeavored to set forth the best embodiment thereof, I desire to have it understood that changes may be made within the scope of the following claim without departing from the spirit of my invention.

I claim:

A door closer including an elongated cylinder, a plug engaged within said cylinder to form an end closure therefor, a bearing support including a circular member within an end of said cylinder adjoining said plug, and an in-turned flange on the end of said cylinder extending over said circular member to hold the same anchored to said cylinder, an L-shaped member including a pivot end pivotally engaged in said bearing support and an elongated shank connected to said pivot end, a bracket through

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which said shank extends, and threaded means for holding said shank in adjusted relation to said bracket.

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