May 5, 1964 B. A. QUINN 3,131,420

DOOR CLOSER

Filed April 24, 1961

FIG. 1

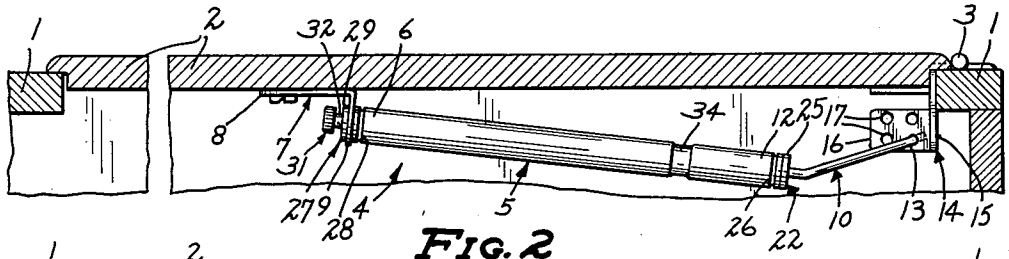


FIG. 2

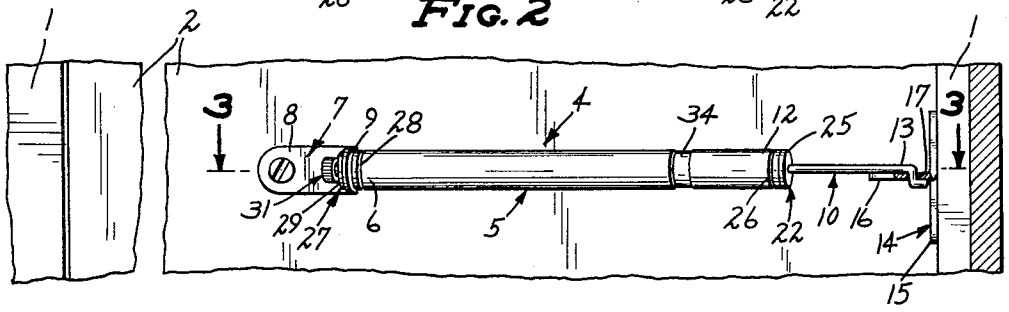


FIG. 3

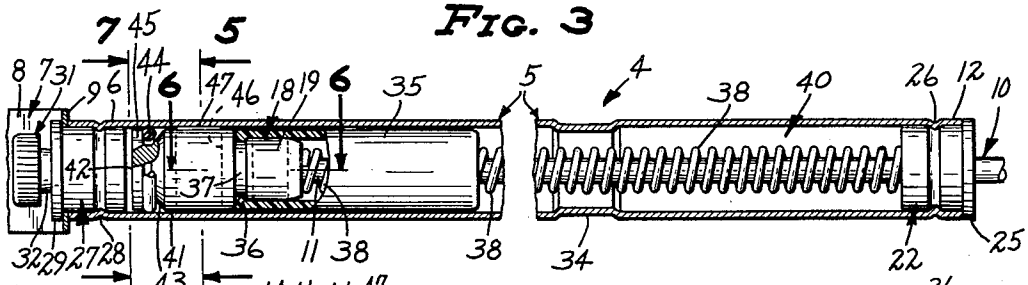


FIG. 4

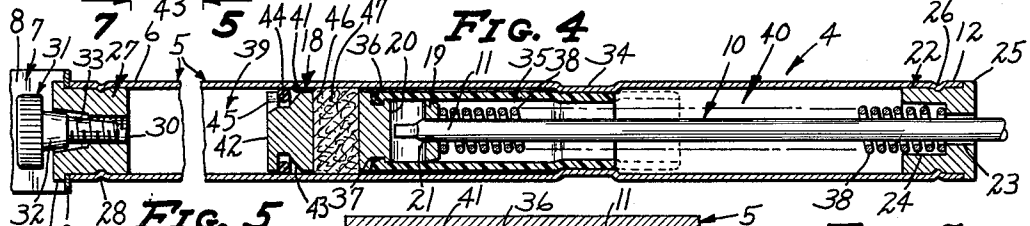


FIG. 5

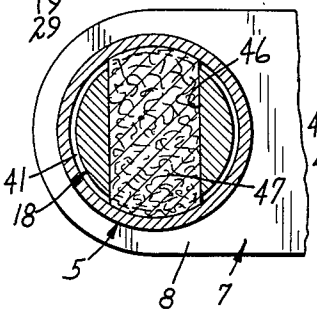


FIG. 6

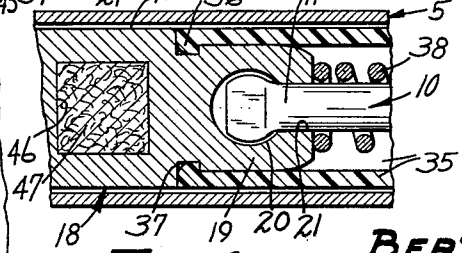
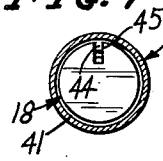


FIG. 7



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DOOR CLOSER

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This invention relates generally to door closers, sometimes referred to in the art as door checks, and more particularly it relates to improvements in door checks of the type which are controlled by fluid pressure means.

An important object of this invention is the provision of a door check which is constructed with a novel type of friction control means for holding the door to which it is attached in an extended open position.

Another object of this invention is the provision of a door check which, in addition to having the above described novel friction control means, is further constructed so as to provide an extremely efficient checking of the movement of the door to which it is attached between the open and closed positions thereof.

Another important object of this invention is the provision of a door closer or door check which has the advantage over the prior art of being so designed and constructed as to permit the use thereof in door closing situations in which the requirement of low cost is so much a necessity that previously it has not been at all commercially feasible to employ previously known constructions of door checks.

Other objects of this invention reside in the provision of a door check which can be produced at an extremely low cost, which is highly efficient in its operation, which is simple in design, and which is also rigid and durable in construction.

The above and still further objects and advantages of this invention will become apparent from the following detailed specification, appended claims and attached drawings.

Referring to the drawings, which illustrate the invention, and wherein like reference characters indicate like parts or elements throughout the several views:

FIG. 1 is a view in top plan of my invention, and showing the same connected in its operative position to a door and supporting structure, said door and supporting structure being shown in section;

FIG. 2 is a view in elevation of my invention as illustrated in FIG. 1, some parts being broken away;

FIG. 3 is a view in section taken on the line 3—3 of FIG. 2, some parts being broken away;

FIG. 4 is a view similar to FIG. 3, but showing alternative positions of some parts of my invention;

FIG. 5 is a view in transverse section taken on the line 5—5 of FIG. 3, some parts being broken away;

FIG. 6 is a view in section taken on the line 6—6 of FIG. 3; and

FIG. 7 is a view in transverse section taken on the line 7—7 of FIG. 3.

Referring to the drawings, and particularly FIGS. 1 and 2 thereof, a conventional door frame is shown as comprising opposed vertically extending door jambs 1, and a door 2 is hingedly connected, one of the hinges being shown at 3, to one of the door jambs 1. The door check or door closer of the present invention is represented in its entirety by the reference numeral 4, the same being primarily intended for relatively light use, such as with a cabinet door, represented at 2.

The door check 4 comprises an elongated tube or cylinder, represented generally by the reference numeral 5, which is connected at its outer end 6 for limited hinging movement with respect to the door 2, said connection being secured by a flexible bracket 7 having a base portion 8 which is secured to the door 2 and a laterally extending flange portion 9 which is secured to the cylinder 5 in a manner which will be described hereinafter. The door check 4 further comprises an elongated plunger rod 10 which has its inner end 11 telescopically extended into the inner end 12 of the cylinder 5 for longitudinal reciprocating movements with respect to said cylinder 5. The outer end 13 of the plunger rod 10 is adjustably secured, by means of a bracket 14, to the same door jamb 1 to which the door 2 is hingedly connected. The bracket 14 comprises a base plate 15 rigidly secured to the door jamb 1 and a laterally extending flange portion 16 which defines a plurality of spaced apertures 17, the offset or deformed outer end 13 of the plunger rod 10 being selectively received in a given one of the apertures 17.

As seen particularly in FIGS. 3 and 4, a piston represented generally by the reference numeral 18, is co-axially disposed within the cylinder 5 and rigidly connected to the inner end 11 of the plunger rod 10 for sliding movement within the compression chamber portion of the cylinder 5. One end 19 of the piston 18 is diametrically reduced and defines a diametrically extending bore 20 and an axially extending aperture 21 which opens into the bore 20. The inner end 11 of the plunger rod 10 is received within the aperture 21 of the piston 18 and is then upset or deformed as shown particularly in FIGS. 4 and 6 so as to secure the piston 18 to said inner end 11 of the plunger rod 10. As seen particularly in FIGS. 3 and 4, the inner end 12 of the cylinder 5 is provided with an end wall plug 22 which defines an axially opening aperture 23 and an enlarged recess 24 through both of which the plunger rod 10 is slidably received. The end wall plug 22 defines a diametrically outwardly extending flange portion 25 which abuts against the end edge of the cylinder 5, and the end wall plug 22 is secured within the cylinder 5 by a radially inwardly deformed bead 26. The outer end 6 of the cylinder 5 is also provided with an end wall plug 27 which is inserted through the apertured lateral flange portion 9 of the bracket 7 and which is secured within the cylinder 5 by a radially inwardly deformed bead portion 28, as seen particularly in FIGS. 3 and 4, the end wall plug 27 defining a marginal flange portion 29 which abuts against the lateral flange portion 9 of the bracket 7 so as to secure the outer end 6 of the cylinder 5 to the door 2. It is noted that the end wall plug 27 defines a screw threaded central aperture 30 which receives a screw element 31. The end wall plug 27 and the screw element 31 define cooperating conical portions 32, 33 respectively which together provide an adjustable air outlet passage from the interior of the cylinder 5.

The cylinder 5 is formed or diametrically reduced so as to define intermediate its opposite ends 6, 12 an annular radially inwardly formed restriction portion 34. Also, an elongated generally tubular friction element 35 is secured, as at 36, within an annular recess 37 defined by the piston 18. Preferably, the friction element 35 is formed of a flexible plastic material, such as polyethylene, and is adapted to cooperate with the restriction portion 34 defined by the cylinder 5. Referring particularly to FIGS. 3 and 4, in response to movement of the door 2, the plunger rod 10 and the piston 18 are movable with respect to the cylinder 5 between a retracted closed-door position, which is illustrated in FIG. 3, and an extended opened-door position, which is illustrated in FIG. 4. Also as shown in FIG. 4, upon movement of the flexible friction element 35 to a position adjacent the deformed restriction portion 34 of the cylinder 5, frictional engagement is made between the restriction portion 34 and the friction element 35 so as to hold the plunger rod 10 and

the piston 18 in the above described extended opened-door position thereof. In this position, the frictional engagement between the restriction portion 34 and the friction element 35 imparts a slight deformation to the engaged portion of the friction element 35 and constitutes the door holding means axially spaced from the piston 18 and compression chamber portion of the cylinder 5 in which the piston moves. My novel door closer 4 further comprises a coiled compression spring 38 interposed between the piston 18 and the enlarged recess 24 of the end wall plug 22 in generally concentrically disposed relationship about the plunger rod 10. The compression spring 38 urges the plunger rod 10 and the piston 18 toward the retracted closed-door position thereof shown in FIG. 3, whereby upon disengagement between the restriction portion 34 of the cylinder 5 and the friction element 35, the plunger rod 10 and the piston 18 are moved to said retracted closed-door position.

It is noted that the piston 18 divides the interior of the cylinder 5 into a pair of longitudinally spaced chambers, one thereof being represented by the reference numeral 39 and being defined intermediate the piston 18 and the end wall plug 27, and the other thereof being represented by the reference numeral 40 and being defined intermediate the piston 18 and the end wall plug 22. Referring particularly to FIGS. 3 and 4, the piston 18 is of substantially smaller diameter than the inner diameter of the cylinder 5, whereby to define therewith an annular passage 41. Adjacent its other end 42, the piston 18 is formed to provide a radially outwardly opening circumferential groove or channel 43 in which is received an annular elastic sealing member or O-ring 44. It is noted that the O-ring 44 has sealing engagement with the inner cylindrical wall of the cylinder 5, and the channel 43 is formed of sufficient axial width to permit limited axial movement of the piston 18 relative to the O-ring 44. The piston 18 is further formed adjacent its end 42 to define a small recess 45 which extends from the end 42 of the piston 18 to the channel 43, the recess 45 communicating with the channel 43 radially inwardly of the O-ring 44.

As illustrated particularly in FIGS. 3 and 4, the frictional sealing engagement of the O-ring 44 with the interior wall surface of the cylinder 5 causes the O-ring 44 to remain stationary until the same is engaged by one side or the other of the channel 43 upon axial movement of the piston 18. The O-ring 44 operates as a valve to control the flow of air from the chamber 40 to the chamber 39 during reciprocatory movements of the piston 18. For example, during opening movements of the door 2, the plunger rod 10 and the piston 18 move toward the extended opened-door position thereof shown in FIG. 4, and the O-ring 44 engages the side of the channel 43 adjacent the end 42 of the piston 18 so that air is permitted to flow from the chamber 40 into the chamber 39 whereby when the door 2 is opened, the movement thereof being against the bias of the coiled compression spring 38. When the plunger rod 10 and the piston 18 approach their extended opened-door position, the flexible friction element 35 engages the restriction portion 34 of the cylinder 5 so as to hold the door in said position against the bias of the compression spring 38. As an example, the full line position of the flexible friction element shown in FIG. 4 represents an approximate 90° open position of the door 2, and the dotted line position thereof shown in FIG. 4 represents a further opened position of the door 2 approximating 135°. Upon manual closing movement of the door 2, the flexible friction element 35 is moved with respect to the friction portion 34 until disengagement is accomplished therebetween, and thereafter the closing movement of the door 2 is accomplished by the coiled compression spring 38. With further reference to the check valve formed by the O-ring 44, upon closing movement of the door 2, and resulting movement of the plunger rod 10 and the piston 18 from the extended opened-door position thereof toward the retracted closed-door position thereof, the initial movement of the piston 18 with respect to the O-ring 44 causes the O-ring 44 to engage the other side of the channel 34 adjacent the end 19 of the piston 18. Such movement of the O-ring 44 and engagement thereof with the piston 18 and the inner wall surface of the cylinder 5 upon closing movements of the door 2 effects a seal between the chambers 39, 40 whereby to compress the air previously introduced into the chamber 39 and force the same out through the aperture defined intermediate the screw element 31 and the end wall plug 27 so as to check the closing movement of the door 2. It it noted that the screw element 31 may be adjusted with respect to the end wall plug 27 so as to adjust the checking action upon closing movements of the door 2.

As shown particularly in FIGS. 5 and 6, a diametrically extending aperture 46 is formed in the piston 18 and is provided with a pervious and lubrication-soaked material 47 so as to provide means for lubricating the inner wall surface of the cylinder 5. It is also noted that the lateral flange portion 16 of the bracket 14 is provided with a plurality of apertures 17 so as to permit adjustable securement therewithin of the deformed outer end 13 of the plunger rod 10, such adjustment being desirable with respect to various possible relative mounting positions of the door 2 with respect to the door jamb 1. It is also noted that the plunger rod 10 is slightly angularly formed outwardly of its reception within the cylinder 5 so as to permit further opening movement of the door 2. It should be understood that although this invention has been illustrated with a pneumatically controlled door check or door closer, it is apparent that the novel features of this invention could be applied with equal effectiveness in combination with other types of door checks such as hydraulically controlled door checks or door closers. By way of example, it is noted with respect to the restriction portion 34 of the cylinder 5 that it has been determined that satisfactory operation of the door closer 4 is obtained when the rolled inner diameter of the restriction portion 34 is from .010 inch to .016 inch less than the outer diameter of the flexible friction element 35.

Having specifically described this invention, it is believed that the operative simplicity thereof is easily understandable without further comment. This invention has been thoroughly tested and found to be completely satisfactory for the accomplishment of the above and other objects; and while I have shown and described above a preferred embodiment thereof in which the principles of the present invention have been incorporated, I wish it to be specifically understood that the same may be modified without departure from the scope and spirit of the appended claims.

What I claim is:

1. In a door closer, an elongated cylinder, an elongated plunger rod having a spring coiled therearound telescopically extended into said cylinder from one end thereof, a piston carried at the inner end of said rod within said cylinder and having means frictionally engaging the cylinder wall to provide therewith a compression chamber on movement of said rod in said cylinder, said cylinder having a relatively narrow circumferentially contracted portion adjacent said one end in axially spaced relation to said piston in said cylinder, and a flexible friction holding member connected to one end of said piston to extend axially thereof within said cylinder in radial spaced relation thereto and to said rod, said holding member being axially movable with said piston into frictional holding engagement with said restricted portion of said cylinder axially spaced from said piston to hold said piston and rod against movement in said cylinder under the action of said coiled spring.

2. The structure of claim 1 wherein said flexible friction holding member comprises a tubular sleeve extend-

ing axially from said piston in said cylinder and surrounding said plunger rod and spring.

3. The structure of claim 2 wherein said tubular sleeve is formed of flexible plastic material adapted to be circumferentially contracted and held by engagement with the restricted cylindrical wall of said cylinder.

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