

EUROPEAN PATENT APPLICATION

②¹ Application number: 88108149.1

⑤¹ Int. Cl.4: **E05F 3/10**

②② Date of filing: 20.05.88

③ Priority: 06.07.87 US 70024

④ Date of publication of application:
11.01.89 Bulletin 89/02

⑧ Designated Contracting States:
DE FR GB IT

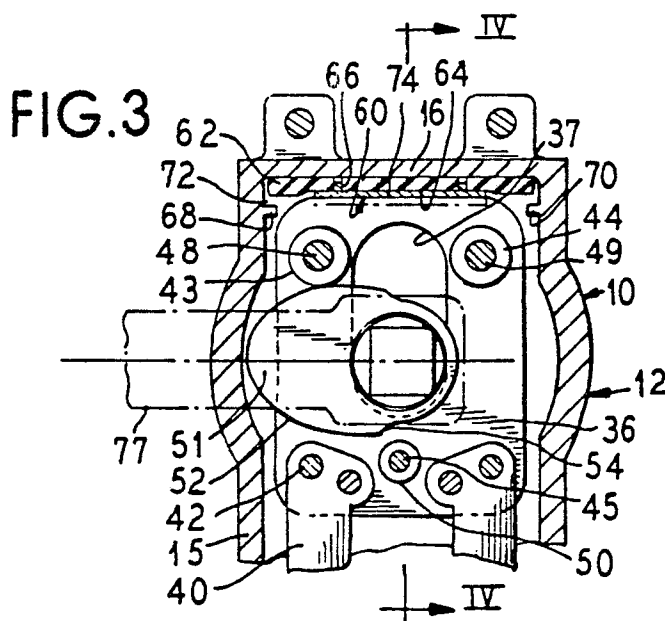
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⑤4 Door closer.

(57) An improved door closer is provided which has a back checking arrangement (60) including a resilient cushion bar (62) and a metallic shield (64) which is engaged by a sliding cam plate (36) during a final few degrees of opening of the door to provide an increasing resistance against further opening of the door. The cam plate (36) preferably engages the cushion bar shield approximately 4 degrees prior to a full open position of the door.



"DOOR CLOSER"

The present invention relates to closers for doors and more particularly to an automatic door closer with a back checking device.

There are currently available several types of door closing mechanism which provide a means for regulating the opening movement of a door and to prevent an overextension of the door opening commonly referred to as back checking. For example, U.S. Patent 4,064,589 discloses a door closer in which an adjustable valve 132 is provided to regulate the back checking of the door which provides an adjustable shock absorber for the door as it reaches the fully opened position. This patent also discloses the use of a cushioning pad 157 to cushion a rearward movement of the carrier plates against the rear wall of the cam housing upon abrupt opening of the door.

U.S. Patent 3,246,362 discloses a door closer which relies on a compression of springs 31 as a back checking restraint and also relies on engagement between a cam 51 and cam follower rollers 43, 44, and 45 to provide a stop at a full open position of the door.

The present invention provides an improved means for back checking the opening of the door in a door closer of a type described above in which there is a cam plate which slides longitudinally within the body of the door closer as the door is open and closed. A cushion bar fabricated of a resilient material is provided at a rear wall of the housing and is covered by a metallic shield which is engaged by the cam plates when the door is opened to within a few degrees of a full open position. Such a full open position generally is either 90 degrees or 105 degrees relative to the plane of the door jam.

When the door is opened to within the last few degrees of its permitted arc of travel, preferably approximately 4 degrees, the cam plates will engage the shield and further opening of the door will begin compression of the cushion bar, which is in a form of a pad of resilient material. As the door is continued to be opened through its last few degrees of travel, resistance to such travel is increased due to compression of the cushion bar thus providing an effective back checking of the door movement.

This cushion bar arrangement provides the function of a back check valve without requiring expensive machining of the door closer body for the acceptance of a fluid-type valve and the necessary porting of hydraulic fluid as is required by the use of a reverse check valve such as that disclosed in U.S. Patent 4,064,589 discussed above.

The present invention can be utilized in any

door closer in which the cam plates slide within the door closer body and have a position close to a wall of the closer body.

ON THE DRAWINGS

FIG. 1 is a top view of a door closer embodying the principles of the present invention which is enclosed within a door header.

FIG. 2 is a partial sectional view of a door closer embodying the principles of the present invention showing the position of the cam plates when the door is nearly in the full open position.

FIG. 3 is a partial sectional view of the door closer in the full open position.

FIG. 4 is a partial side sectional view taken generally along the lines IV-IV of FIG. 3.

The present invention consists of an improved door closer and is illustrated in an embodiment of the spring actuated, hydraulic-pot type, such as that disclosed in U.S. Patent 3,246,362, which disclosure is incorporated herein by reference. The present invention provides for an improved back checking arrangement to provide a positive back checking function without the complexity and cost of a fluid-type valve.

A door closer embodying the principles of the present invention is shown generally at 10 in FIGS. 1-4, FIG. 1 illustrating the closer 10 mounted in a concealed manner in the header portion of a door frame and illustrating the closed, nearly full open and full open positions of the door.

FIGS. 2-4 show the closer in more detail where it is seen that the closer has a housing or body 12 formed of top and bottom walls 13 and 14, side walls 15, and a rear end or back wall 16, the other end wall being provided by a pair of plug members 17. The entire hollow portion within the housing forms a reservoir for a supply of oil or other hydraulic fluid. A central partition 18 extends partially in from one end, the partition and the side walls 15 forming a pair of hollow cylinders 19 for a pair of pistons 20.

The bottom wall 14 is provided with a threaded opening in which is engaged a threaded cover plate 21, the plate having a boss 22 with a central opening 23. Extending through the opening is the spindle or door pivot member 24, this member having a non-circular end portion 24a for attachment to a door such as for reception in a non-circular hole in a door hinge arm 20. The member 24 also includes a cylindrical portion 25 journaled in a ball bearing 26, a pair of shoulder or collar portions 27 and 28, and an end cylindrical portion

29 journaled in a ball bearing 30. An annular oil seal 39 is provided around the portion 25.

The closer is provided with a pair of coiled springs 31, one end of each bearing against one of a pair of internal wall portions 32, the other end bearing against one of the pistons 20. Means are provided for operably connecting the springs to the spindle member 24 and as shown in the drawings, these means may include a pair of spaced cam plate members 35 and 36, each provided with a slot 37, 38 within each of which is received the appropriate one of the shoulders 27 and 28. A piston rod 40 is connected at one end to each of the pistons 20 by means of a pin 41. The other ends of the rods 40 are secured to the plates 35 and 36 by means of pins 42. The plates 35 and 36 are further spaced apart by means of three cam follower rollers 43, 44 and 45 mounted for rotation on respective shafts 48, 49 and 50. A cam 51 is carried on a spindle member 24 between the shoulder portions 27 and 28, the cam having a cam surface 52 with a pair of hold-closed recesses 54. Valve means 55 are provided in the central partition 18 defining the cylinders 19 to regulate the door closing and latching speeds as is discussed in greater detail in U.S. Patent 3,246,362. FIG. 2 shows two separate valve members utilized for regulating the closing and latching speeds, but the present invention can also be utilized in single valve closers.

The present invention provides an improvement in regulating the back checking of the door closer, that is, regulating the amount of travel of the door in the opening direction.

The back checking arrangement provided by the present invention is illustrated generally at 60 and comprises a cushion bar 62 which is in the form of a pad of elastomeric material which is held against the rear wall 16 of the housing and a metallic shield 64 which overlies the cushion bar on a side opposite the rear wall 16 and which is held in place on the cushion bar by rivets 66. A pair of short, opposed walls 68, 70 project inwardly from the side walls 15 of the closer body to provide a pocket 72 in which the cushion bar and shield assembly is captured. Separate retaining means are not required to hold the cushion bar and shield in place.

The thickness of the cushion bar is selected such that as the door is moved to an open position, and as rotation of the cam 51 riding on follower rollers 43 or 44 causes the cam plate members 35 and 36 to move rearwardly, a rear edge or face 74 of the plates will engage the shield 64 when the door reaches an opening angle α of approximately four degrees less than a full open position for the door. Such a nearly full open position is illustrated at 76 in FIG. 1. As the opening of the door contin-

ues, the continued rearward movement of the cam plates 35 and 36 will cause the bar 62 to compress thus increasing the resistance to further opening of the door. This resistance will increase through the final four degrees of opening until full compression occurs at the full open position, illustrated at 77 thus preventing the door from opening any further.

Since the cam plates 35 and 36 are metallic, the metallic shield is provided both to distribute the forces presented by the rear faces 74 of the cam plates across a larger surface area of the cushion bar as well as to prevent wear of the cushion bar by engagement with the plates. Since the cushion bar and shield are relatively loosely held in the pocket 72, this back checking assembly can be readily removed and replaced if excessive wear does occur.

Thus, it is seen that there is provided an improved door closer which has an effective back checking arrangement, which provides the functions of a back check valve without requiring the machining and cost of a fluid-type valve but which does provide a positive back checking function and which provides an increasing resistance to opening during the final few degrees of opening of a door. Such a back checking arrangement can be utilized in any door closer in which there is a sliding or moving member which can engage the resilient cushion bar during a final few degrees of opening movement.

As is apparent from the foregoing specification, the invention is susceptible of being embodied with various alterations and modifications which may differ particularly from those that have been described in the preceeding specification and description. It should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of my contributions to the art.

The features disclosed in the foregoing description, in the claims and/or in the accompanying drawings may, both separately and in any combination thereof, be material for realising the invention in diverse forms thereof.

Claims

1. A door closer comprising a housing, at least one member movable within said housing, a cam within said housing which, when connected to a door, rotates in response to an opening and closing movement of said door to drivingly engage said member to move said member during an opening movement of said door, and back checking means positioned within said housing and engageable by said member during a final few degrees of opening

of said door to provide an increasing resistance to opening of said door during said final few degrees of opening.

2. A door closer according to claim 1, wherein said back checking means comprises a resilient cushion bar compressible by said movement of said member during said final few degrees of opening.

3. A door closer according to claim 2, wherein said housing includes a back wall and said member moves in a rearwardly direction during an opening movement of said door, said back checking means being positioned adjacent to said rear wall of said housing.

4. A door closer according to claim 3, wherein a pocket is formed in said housing adjacent to said back wall to provide a space for retaining said cushion bar adjacent to said back wall.

5. A door closer according to claim 2, wherein a metallic shield is secured to said cushion bar on a side facing said member, whereby said member will engage said shield upon rearward movement.

6. A door closer according to claim 1, wherein said member engages said back checking means approximately 4 degrees prior to a full open position of said door.

7. A door closer according to claim 6, wherein said full open position of said door is 90 degrees from a full closed position.

8. A door closer comprising a housing, a spindle member rotatably mounted in said housing for securing said closer to a door, a cam plate slidably mounted within said housing about said spindle member, a first cam carried by said spindle member, said cam having a cam surface engageable with said cam follower for linear movement of said plate upon rotation of said cam, means for back checking the opening of the door, said means including a resilient cushion bar engageable by said cam plate during a final few degrees of opening of the door to provide an increasing resistance to opening of said door during said final few degrees of opening.

9. A door closer according to claim 8, wherein said cushion bar is positioned adjacent a rear wall of said housing and said cam plate moves rearwardly in response to an opening of said door to provide said engagement between said cam plate and said cushion bar.

10. A door closer according to claim 9, wherein a pocket is formed in said housing adjacent to said back wall to provide a space for retaining said cushion bar adjacent to said back wall.

11. A door closer according to claim 9, wherein a metallic shield is secured to said cushion bar on a side facing said member, whereby said member will engage said shield upon rearward movement.

12. A door closer according to claim 8 further including valve means for regulating the closing speed of said door.

13. A door closer according to claim 12, wherein said valve means comprises two valves for regulating both a closing speed and latching speed of said door.

14. A door closer comprising a housing having a back wall, at least one member movable longitudinally within said housing, a cam within said housing which, when connected to a door, rotates in response to an opening and closing movement of said door to drivingly engage said member to move said member in a rearward direction during an opening movement of said door, back checking means comprising a resilient cushioning bar with a metallic shield attached thereto positioned adjacent to said back wall with said shield on a side of said bar facing away from said wall, and a pocket formed in said housing adjacent to said back wall to provide a space for retaining said back checking means adjacent to said back wall, said back checking means being engageable by said member during a final few degrees of opening of said door to provide an increasing resistance to opening of said door during said final few degrees of opening.

15. A door closer according to claim 14, wherein said member engages said back checking means approximately 4 degrees prior to a full open position of said door.

FIG.1

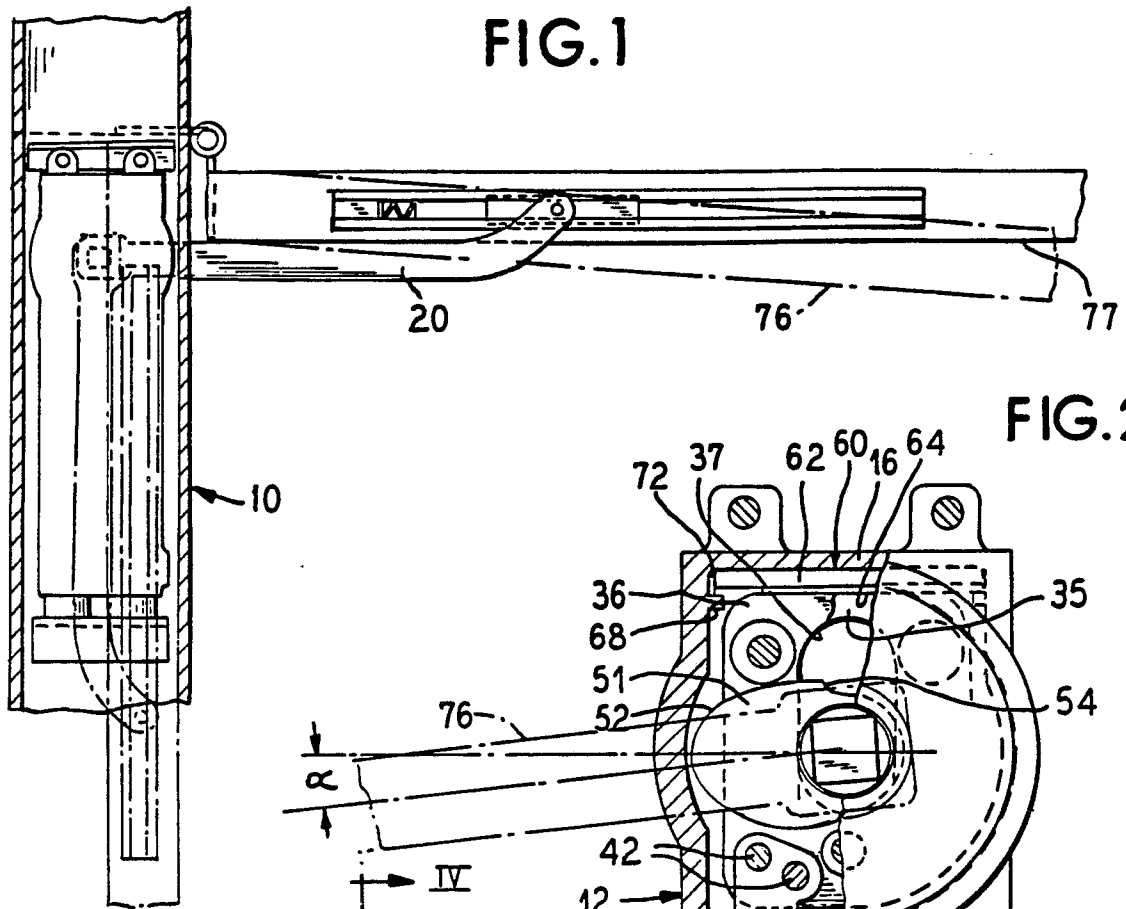


FIG.2

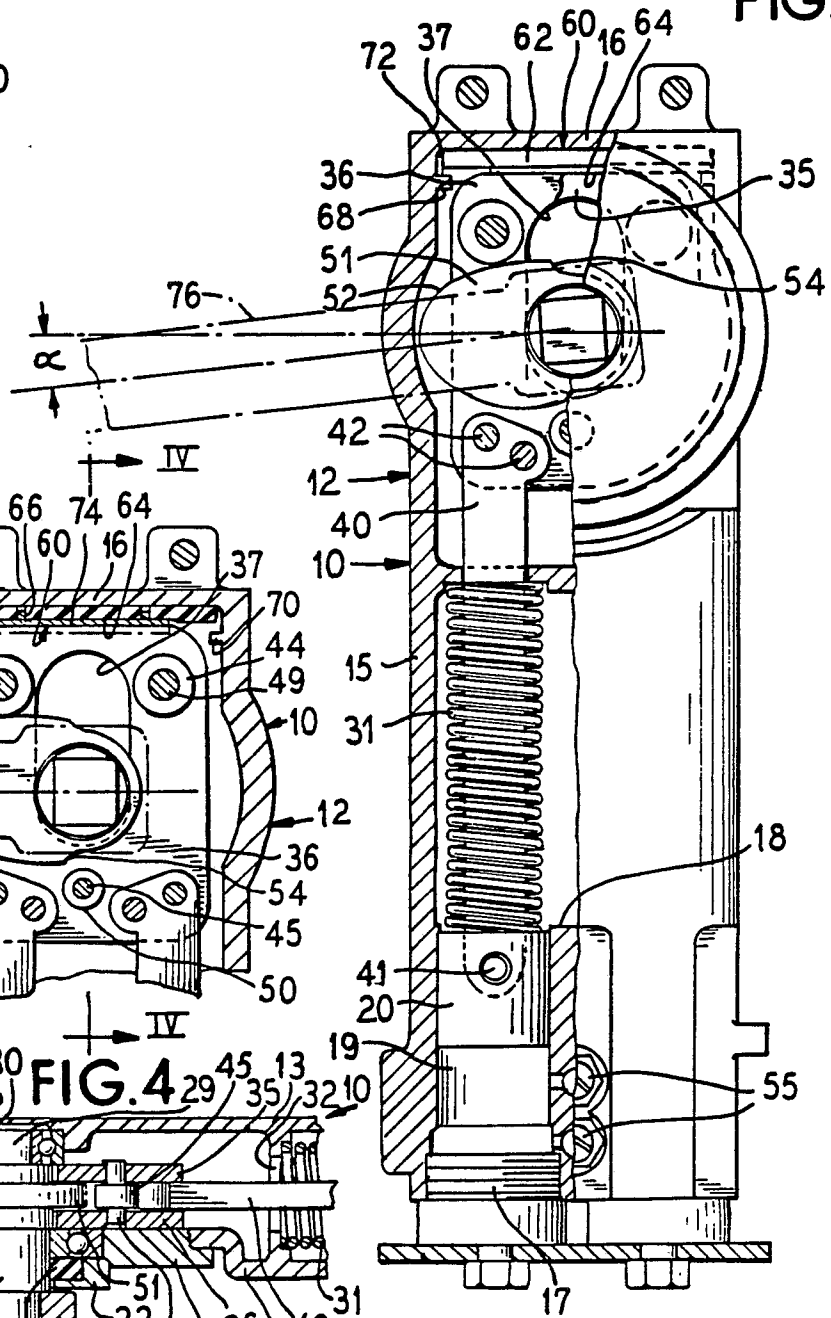


FIG.3

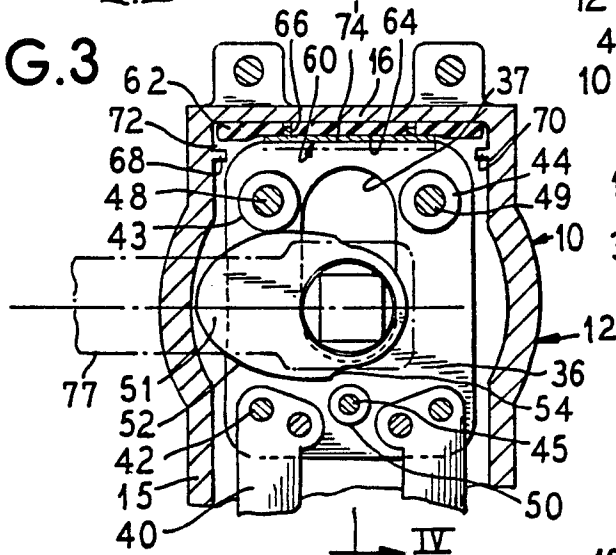
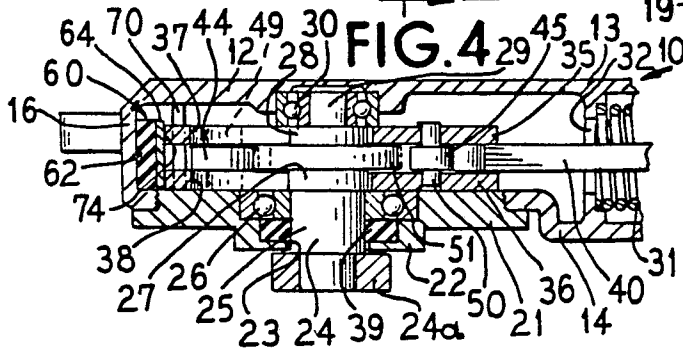


FIG.4





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D	US-A-3 246 362 (JACKSON) * Whole document *	1-4,8-10	E 05 F 3/10
Y		12,13	
A		14	
Y	DE-A-1 934 912 (DÖRKEN & MANKEL KG) * Page 5, paragraph 2 - page 6, paragraph 1 *	1-4,8-10,12,13	
A,D	US-A-4 064 589 (BEJARANO) * Figures 1,2; column 3, line 62 - column 4, line 19; column 4, lines 53-59; column 7, lines 3-6 *	1,3,4,7-10,12-14	
A	US-A-2 735 132 (WARTIAN) * Figure 1; column 2, lines 44-49 *	1,2,8,12	
A	FR-A-2 165 398 (DORMA-BAUBESCHLAG GmbH & CO. KG) * Claim 1 *	1,7	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			E 05 F F 16 F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19-09-1988	Examiner KISING A.J.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			