

Oct. 18, 1960

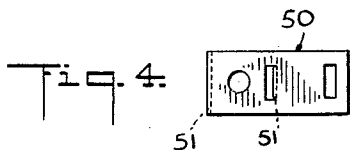
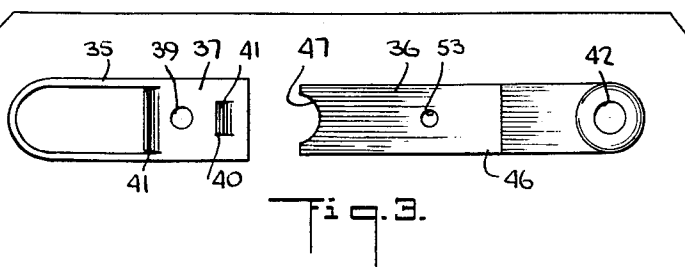
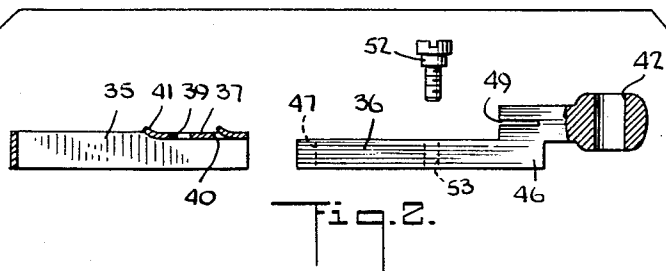
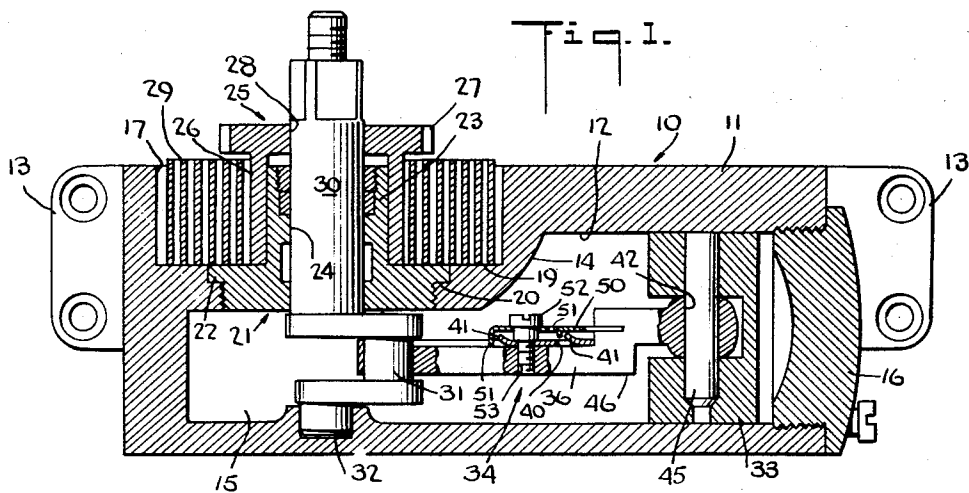
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2,956,302

DOOR CLOSER

Filed May 28, 1958

2 Sheets-Sheet 1



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2,956,302

## DOOR CLOSER

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Filed May 28, 1958, Ser. No. 738,351

6 Claims. (Cl. 16—59)

This invention relates to door closers, and, more particularly, to that class of door closers that employ checking means including a piston operable in a cylindrical bore and connected to a door through the medium of a rotatable spindle.

Door closers of the class described are usually formed with a horizontal cylindrical casing for the piston and a vertically extending spring housing disposed above the piston casing for enclosing a portion of the spindle and a spring for effecting closing of the door. The industry has long been faced with the problem of reducing the overall height of such closers, and, if possible, eliminating the vertical housing altogether. It will be appreciated by those skilled in the art that in the solution of this problem it is desirable that the spring itself be located within the casing in which the piston reciprocates.

However, the provision of means in the casing to support the spring so restricts the spindle opening that it is no longer possible to insert the usual assembly of the spindle, connecting rod and piston into the casing through that opening.

We have conceived by our invention, an effective solution to the problem presented, whereby we provide for the support of the spring within the casing and assemble the piston, connecting rod and spindle in operative condition within the casing with ease and facility.

In essence, our invention resides in the basic concept of providing for the utilization of means whereby the spindle and piston are inserted separately into the casing and are subsequently connected for operation through a connecting rod. While we have chosen to describe our novel concept in connection with door closers of the class described, it is conceivable that others skilled in the art, upon familiarizing themselves with our present contribution, may adapt the same to closers of various constructions. It is therefore important that the annexed claims be construed so as not to limit our concept to any particular type of door closer.

As a feature of our invention, we provide a connecting rod that is so constructed as to permit entry of the piston into the bore of the casing and insertion of the spindle into an opening in the casing communicating with the bore, after which the assembly of the piston, connecting rod and spindle may be effected.

As a further feature of the invention, we provide connecting means controlled through the opening into which the spindle is inserted for retaining the piston, connecting rod and spindle in assembled relation.

As a further feature of our invention, we provide a cranked connecting rod that enables us to effect connection of the connecting rod and spindle at a lower zone in the casing than the connection between the connecting rod and the piston. This feature contributes the double advantage of permitting maximum space within the casing for the spring, while also obviating the need to reduce the size of the piston.

We have thus outlined rather broadly the more im-

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portant features of our invention in order that the detailed description thereof that follows may be better understood, and in order that our contribution to the art may be better appreciated. There are, of course, additional features of our invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which our disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of our invention. It is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of our invention, in order to prevent the appropriation of our invention by those skilled in the art.

An illustrative embodiment of the invention has been chosen for the purpose of illustration and description and is shown in the accompanying drawings forming a part of the specification.

In the drawings:

Fig. 1 is an elevational sectional view of a door closer in accordance with the present invention;

Fig. 2 is an exploded elevational view, partly in section, of the connecting rod of Fig. 1;

Fig. 3 is a plan view similar to Fig. 2;

Fig. 4 is a plan view of a locking member used in one form of our invention;

Fig. 5 is a sectional elevational view of a modified form of a door closer in accordance with the present invention;

Fig. 6 is a sectional plan view of the modified form of our invention shown in Fig. 5;

Fig. 7 is an exploded plan view of the piston, connecting rod and spindle shown in Figs. 5 and 6; and

Fig. 8 is an elevational view similar to Fig. 7.

Referring to Fig. 1 of the drawings, there is shown a door closer 10 that includes a casing 11 formed with exterior mounting brackets 13 and with an internal longitudinal bore 12 stepped as at 14 and merged with a chamber 15 of considerably less height than the bore 12. A cap 16 is screw threaded into the end of the bore 12 so as to seal the same. The casing 11 is further formed with an opening 17 that communicates with the chamber 15 and that has a pair of annular shoulders 19 and 20.

As shown, a bearing member 21 is disposed in threaded engagement with a portion of the inner surface of the opening 17 and has an annular flange 22 abutting the shoulder 20. This bearing member 21 is formed with an annular upstanding portion 23 and a central through bore 24. A second bearing member 25 having a depending annular skirt 26 is telescoped over the upstanding portion 23 of the bearing member 21 so that the skirt 26 is in bearing relation with the outer surface of that upstanding portion. The bearing member 25 is formed with a series of gear teeth 27 at its upper perimeter, and with a central aperture 28 of the same diameter as that of the through bore 24.

Surrounding the skirt 26 of the bearing member 25, we utilize a coiled torsion spring 29 that is supported on the shoulder 19 of the opening 17 and that has its outer end connected to the casing 11 and its inner end connected in a conventional manner to the skirt 26 of the bearing member 25.

A spindle 30 formed with a crank 31 adjacent its lower end extends through the aperture 28 of the bearing member 25 and through the bore 24 of the bearing member 21. A conventional type of closer arm, such as the arm 54 in Fig. 5, is keyed to the spindle 30, with teeth 55 on the arm interlocked relatively to teeth 27 on bearing member 25 so that the arm, spindle and member will rotate together. The lower extremity of the crank 31, Fig. 1, is supported in a cup bearing 32 formed in the casing at the bottom of the chamber 15. The crank 31 is connected to a piston 33 disposed for reciprocating

movement in the bore or chamber 12 through a connecting rod 34.

It will be seen from the description thus far that it was necessary to severely limit the height of the chamber 15 in order to arrange the torsion spring 29 within the overall dimensions of the casing. In fact, the height of the chamber is such that it is impossible to assemble the piston, the connecting rod and the spindle outside of the casing and to then insert this assembly into the casing through the opening 17 in the well-known manner.

In order to provide for easy assembly of the operating parts, we contribute a connecting rod so formed whereby to permit entry of the piston into the bore or chamber 12 and of the spindle 30 into the opening 17, as well as means for assembling the spindle, connecting rod and piston together within the casing. In this connection, we have chosen to illustrate in Figs. 1, 2 and 3, a connecting rod 34 consisting of two essential parts 35 and 36. The part 35 is a U-shaped member, the end of the legs opposite the bight of which are connected by a crosspiece 37 that is integral with the legs. This crosspiece is pierced at 39 and is slotted at 40. We prefer to form one edge of the slot 40 and the inner edge of the crosspiece itself as curved detent portions 41, to which we shall refer again.

The other part 36 of the connecting rod is formed with a through bore 42 by which it is pivotally connected to the piston 33 through a pivot pin 45. This part 36 is offset as at 46 and has its end opposite the bore 42 contoured as at 47 for engagement with the crank 31 of the spindle 30. The part 36 is also provided with a slot 49 in its crank portion for reception of a flat spring-steel locking member 50 having a depending projection 51 at its free end and also intermediate its ends. As will be seen in Fig. 1 projections 51 are spaced to correspond with the spacing of detent portions 41 on the rod part 35.

We shall now describe the manner in which we assemble our novel closer. As we have already indicated, we separately insert the spindle 30 and piston 33 into the casing 11. However, before we do that, we slip the connecting rod part 35 over the lower end of spindle 30 and arm of crank 31. The bight of part 35 can then lie in bearing relation to crank 31. Also, we assemble the other rod part 36 to piston 33 through the insertion of pin 45. Then, we insert spindle 30 with its crank 31 and rod part 35 through the spring opening 17, and past shoulder 30 into the chamber 15. That is possible because the shoulder 20 forms a relatively large opening, and because rod part 35 then is loose on crank 31. Next, we insert piston 33 with its rod part 36 into the bore 12. Then, by access through opening 17 to the rod parts 35, 36, and by moving piston 33 and spindle 30 as may be necessary, we have control that will enable us to assemble the rod parts 35, 36 to one another. More particularly, we can so manipulate parts 35, 36 that the flat plate 37 of part 35 overlies the part 36. While so doing, the locking member 50 which is assembled in slot 49 will be snapped into position with its depending projections 51 in opposed relation to the curved portions 41 of the plate 37 to lock those parts together. A screw 52 is inserted into a suitable aperture in the locking member 50, through the aperture 39, and into a threaded bore 53 in the part 36 so as to retain the parts in assembled relation.

It will be understood that the bearing members 21 and 25 and the spring 29 are assembled in the casing after the piston, connecting rod and spindle are fully installed and assembled. In this way, as will be apparent to those skilled in the art, the spindle crank 31, the piston 33 and the connecting rod parts 35 and 36 may be so disposed within the casing during assembly, that the screw 52 and locking member 50 may readily be controlled through the opening 17, prior to the installation of the bearing members and spring, as the throw of the crank 31 is sufficient to allow the outer end portion 37 of the rod part 35 containing the aperture 39 and the portion 46 of the

rod part 36 containing the threaded bore 53 to be brought into a position underlying the opening 17 by rotating the crank from the position shown in Fig. 1.

In the modification illustrated in Figs. 5 and 6, we show the same door closer casing 11 in which is mounted the spindle 30, the piston 33, the bearing members 21 and 25, as well as the torsion spring 29, all of which have already been described. In Fig. 5, we illustrate the manner in which a main operating arm 54 is mounted at the upper end of the spindle 30 and interconnected with the bearing member 25 through teeth 55.

In Figs. 5 to 8, we have shown a modification of the connecting rod which again is constructed of two parts, 56 and 57. The part 56 is similar to the part 35 in that it is formed as a U-shaped member, the ends of the legs opposite the bight of which are connected by a cross piece 59 that is integral with the legs. This cross piece is pierced at 60 in the same manner that the cross piece 37 is pierced at 29. However, in this modification, we have not provided the detents that were formed in the cross piece 37. Instead, the cross piece 59 is downwardly flared around the opening 60, as shown in Figs. 5 and 8.

The other part 57 of the connecting rod is formed with a through bore 61 by which it is connected to the piston 33 through the pivot pin 45. As the end of the part 57 through which the bore 61 extends is not as wide as the opening in the piston 33 in which the end of the part 57 is received, a spacing collar 33a is provided to take up the excess space. The part 57 is also offset as at 62 and has its end opposite the bore 61 contoured as at 64 for engagement with the crank 31 of the spindle 30. This part 57 is further provided with a threaded bore 65 in its offset portion for the reception of a screw 66 which passes through the aperture 60 in the part 56 so as to hold the two parts 56 and 57 in assembled relation. The bore 65 is countersunk to receive the flared portion of the cross piece 59 surrounding the opening 60.

The piston 33, spindle 30 and connecting rod are assembled in the same manner as has been described in connection with the connecting rod 34, that is, the part 56 of the connecting rod is looped over the spindle so that its bight is in bearing relation with the crank 31. The spindle is then inserted into the opening 17 in the casing and at the same time, the part 57 of the connecting rod is connected to the piston 33 which is inserted into the bore 12 of the casing. The end of the connecting rod part 57 opposite the piston is brought into bearing contact with the crank 31 of the spindle and the cross piece 59 of the part 56 is brought into overlying relation with the offset portion of the part 57 so that the bores 60 and 65 are in registry for reception of the screw 66. Again, the parts may be so positioned that the screw is controlled through the opening 17 in the casing. The remainder of the door closer may then be assembled in the conventional manner.

From the foregoing description, it will be seen that we have contributed a novel door closer with reduced overall dimensions and providing means whereby the spindle and piston are inserted separately into the casing and are subsequently connected for operation through a connecting rod. It will further be seen that the means for controlling the connecting rod are accessible through the opening in the casing into which the spindle is inserted.

We believe that the construction and operation of our novel invention will now be understood by those persons skilled in the art.

We now claim:

1. In a door closer of the class described, a casing having a cylindrical bore and an opening, a piston disposed in said bore for reciprocating movement, a spindle mounted for rotation in said casing and formed with a crank, a first part of a connecting rod mounted on said piston and having an end contoured for engagement with said crank, a second part of a connecting rod carried by

said crank and having an end adjacent said first part of said connecting rod, and means controlled through said opening through which said spindle is inserted into said casing for connecting said first and second rod parts to one another so that said second part will hold the contoured end of the first part engaged with the crank.

2. In a door closer of the class described, a casing having a cylindrical bore and an opening, a piston disposed in said bore for reciprocating movement, bearing means in said casing, a spindle formed with a crank and adapted for insertion into said opening and to be supported at each side of said crank in said bearing means, a first part of a connecting rod mounted on said piston and having an end contoured for engagement with said crank, a second part of a connecting rod carried by said crank and having an end adjacent said first part of said connecting rod, and means controlled through the opening through which said spindle is inserted into said casing for connecting said first and second rod parts to one another so that said second part will hold the contoured end of the first part engaged with the crank.

3. In a door closer of the class described, a casing having a cylindrical bore and an opening, a piston disposed in said bore for reciprocating movement, a spindle mounted for rotation in said opening and formed with a crank, a connecting rod formed in two parts, the first part pivotally mounted on said piston and having an end contoured for engagement with said crank, the second part of said connecting rod carried by said crank for pivotal movement and having an end adjacent said first part of said connecting rod, said rod parts having inter-engaging means, and means controlled through the opening in said casing into which said spindle is inserted for retaining said inter-engaging means in engagement and said connecting rod parts together so that said second part will hold the contoured end of the first part engaged with the crank.

4. In a door closer of the class described, a casing having a cylindrical bore and an opening, a piston disposed in said bore for reciprocating movement, a bearing formed in said casing, a spindle extending into said casing through said opening and having an end supported for rotation in said bearing, said spindle formed with a crank, a connecting rod formed in two parts, the first part pivotally mounted on said piston and having an end contoured for engagement with said crank, the second part of said connecting rod carried by said crank for pivotal movement and having an end adjacent said first part of said connecting rod, said parts having inter-engaging means, and means controlled through the opening in said casing through which said spindle is inserted for retaining said parts together so that said second part will hold the contoured end of the first part engaged with the crank.

5. In a door closer of the class described, a closer cas-

ing, a piston in said closer casing, a spindle having a crank mounted to rotate in the casing, said casing having an opening through which said crank is inserted into assembled position in the casing, a connecting rod through which the throw of said crank effects sliding of the piston in the casing, said connecting rod including a part carried by said piston and inserted with said piston into the casing, a separate part of the connecting rod carried by the crank and inserted with said crank through said opening into the casing, securing means for connecting outer end portions of said rod parts in rigid relation to one another, the throw of said crank being sufficient to bring the outer end portion of said separate rod part into a position underlying said opening whereby the outer end portion of the other rod part may also be brought into a position underlying said opening and into assembled relationship with said outer end portion of said separate rod part, and said opening being of a size to provide substantial clearance about said spindle when said spindle is assembled in said casing whereby to provide access for manipulating and installing said securing means upon said outer end portions of said rod parts when said outer end portions are in said position underlying said opening.

6. In a door closer of the class described, a closer casing, a piston in said closer casing, a spindle having a crank mounted to rotate in the casing, said casing having an opening through which said crank is inserted into assembled position in the casing, a connecting rod through which the throw of said crank effects sliding of the piston in the casing, said connecting rod including a part carried by said piston and inserted with said piston into the casing, a separate part of the connecting rod carried by the crank and inserted with said crank through said opening into the casing, securing means for connecting outer end portions of said rod parts in rigid relation to one another, the throw of said crank being sufficient to bring the outer end portion of said separate rod part into a position underlying said opening whereby the outer end portion of the other rod part may also be brought into a position underlying said opening and into assembled relationship with said outer end portion of said separate rod part, said opening being of a size to provide substantial clearance about said spindle when said spindle is assembled in said casing whereby to provide access for manipulating and installing said securing means upon said outer end portions of said rod parts when said outer end portions are in said position underlying said opening, and removable bearing means for closing said clearance after manipulation and installation of said securing means.

#### References Cited in the file of this patent

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