

Sept. 15, 1959

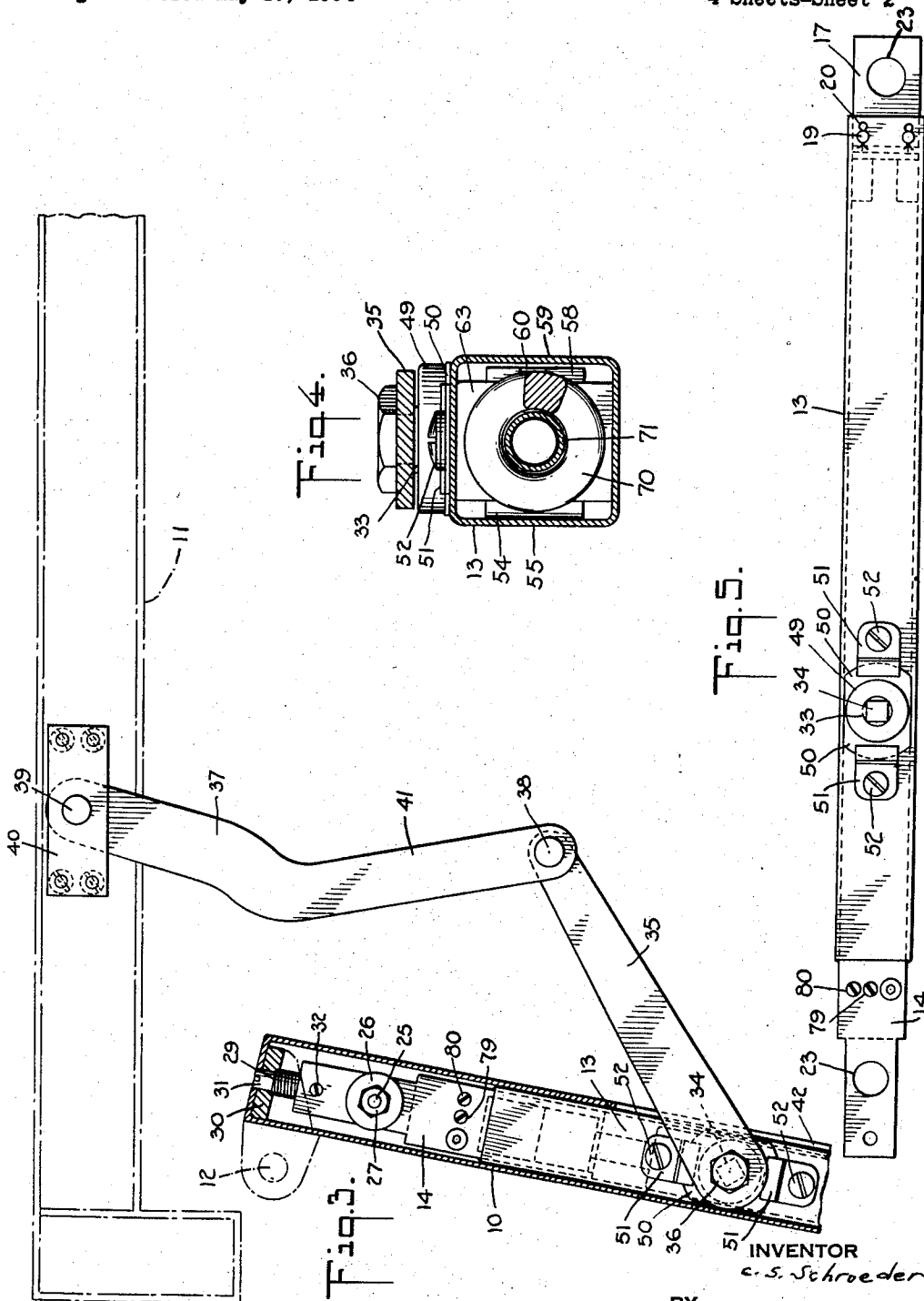
C. S. SCHROEDER

2,903,733

ARM ADJUSTMENT FOR CONCEALED DOOR CLOSER

Original Filed May 10, 1954

4 Sheets-Sheet 2



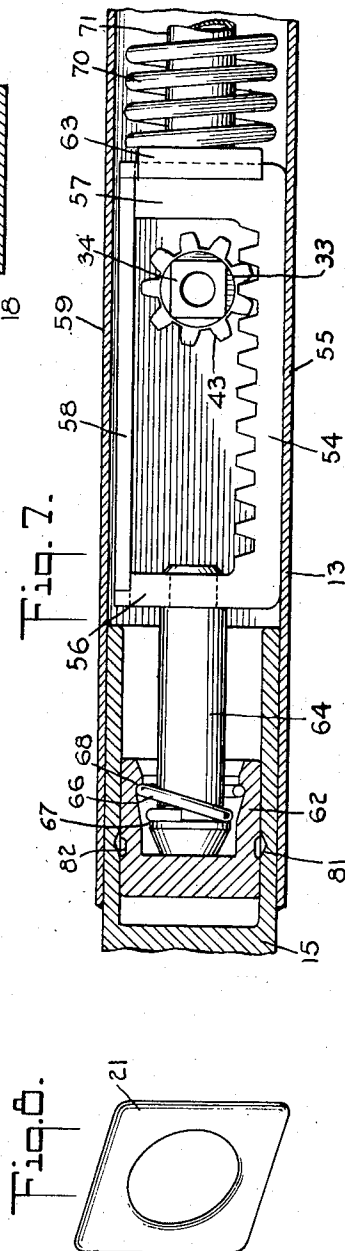
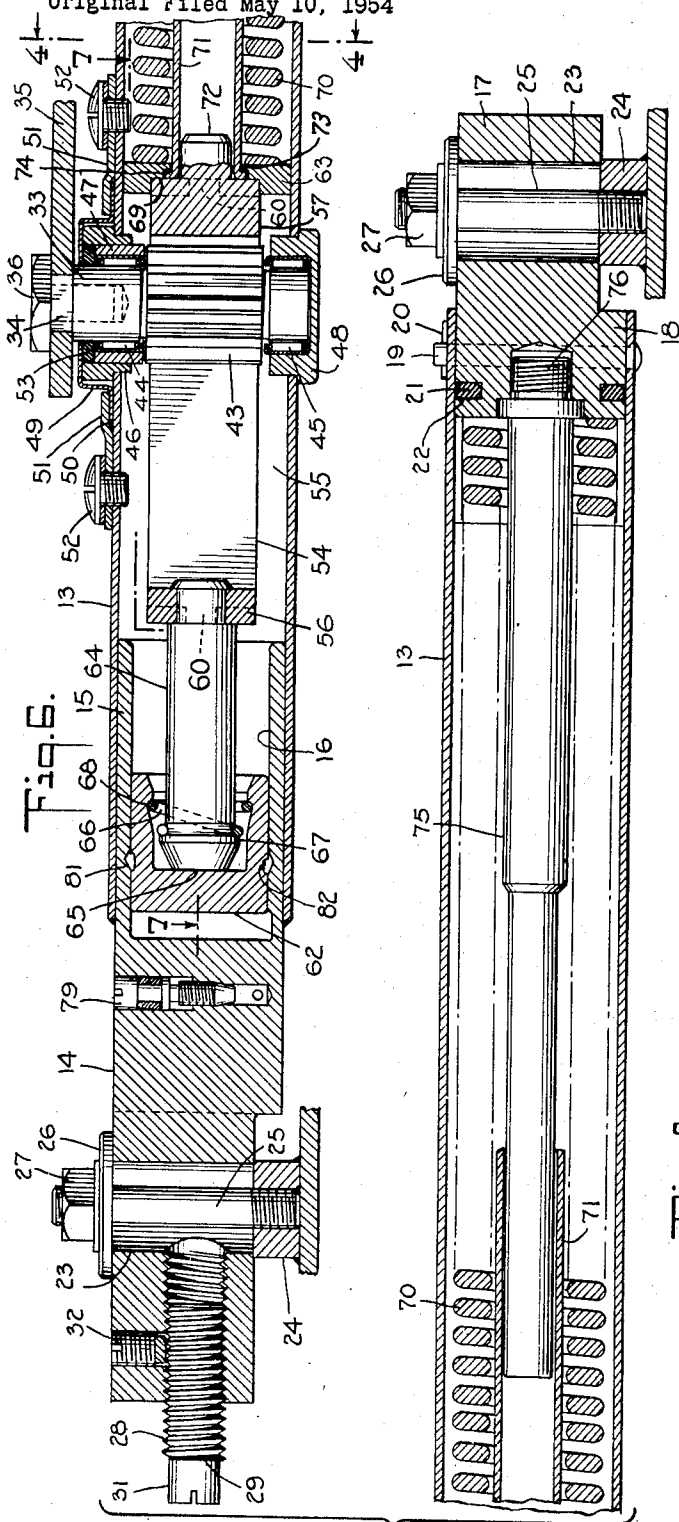
INVENTOR
C. S. Schroeder
BY *Att. Golden*
ATTORNEY

C. S. SCHROEDER

ARM ADJUSTMENT FOR CONCEALED DOOR CLOSER

Original Filed May 10, 1954

4 Sheets-Sheet 3



INVENTOR
C. S. Schroeder
BY *A. H. Golden*
ATTORNEY

Sept. 15, 1959

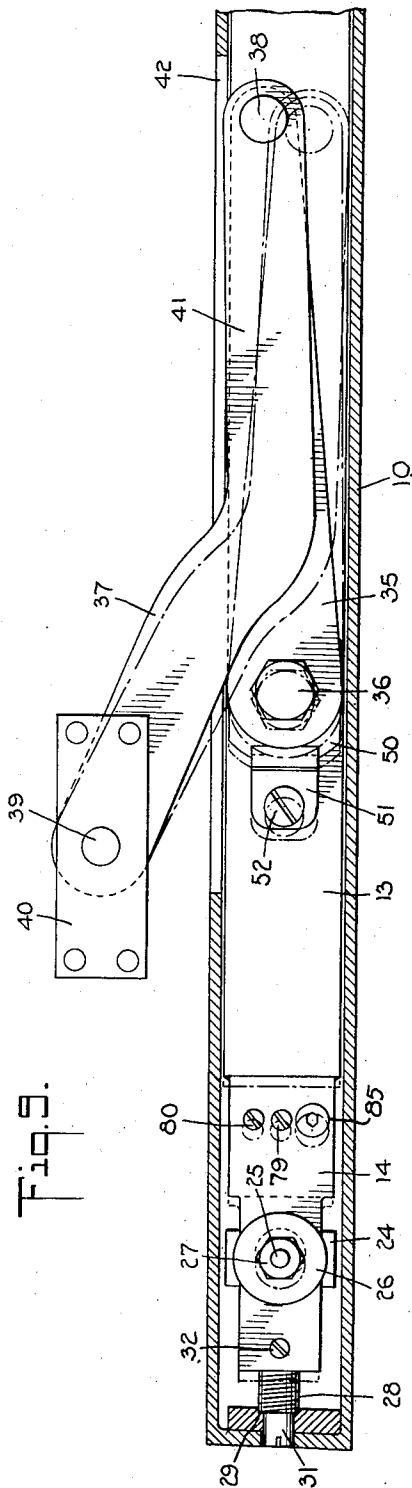
C. S. SCHROEDER

2,903,733

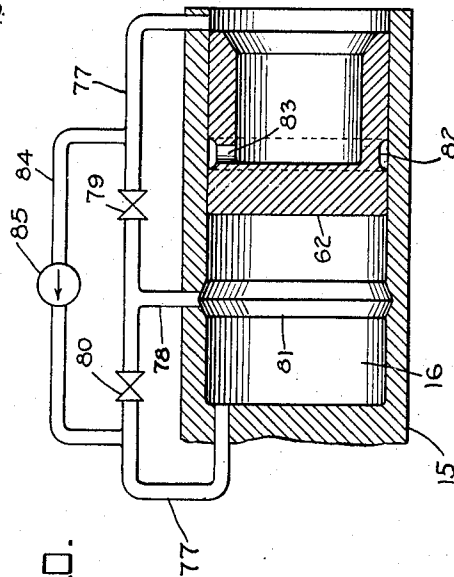
ARM ADJUSTMENT FOR CONCEALED DOOR CLOSER

Original Filed May 10, 1954

4 Sheets-Sheet 4



三



F. 29.10.

INVENTOR
C. J. Schroeder

BY

A. R. Golden
ATTORNEY

1

2,903,733

ARM ADJUSTMENT FOR CONCEALED DOOR CLOSER

Charles S. Schroeder, Wynnewood, Pa., assignor to The Yale & Towne Manufacturing Company, Stamford, Conn., a corporation of Connecticut

Original application May 10, 1954, Serial No. 428,398.
Divided and this application April 26, 1955, Serial No. 504,041

6 Claims. (Cl. 16—49)

This application is a division of my application Serial No. 428,398, filed May 10, 1954. In that application, I describe a novel door closer that is very slender and well adapted to be mounted within a hollow upper rail of a door. Notwithstanding the slender form of the door closer, I do not sacrifice the effectiveness of the closer mechanism, and I actually enable this mechanism to function with a high degree of efficiency. It is possible, therefore, to utilize my door closer successfully on a door having an upper rail that is exceedingly slender, with the closer concealed within the rail. Moreover, the door closer of my above-mentioned application is connected to the door frame through a linkage that is concealed when the door is in closed position, thereby enhancing further the appearance of the door. I claim in this application the extremely novel means that enable me to utilize this concealed linkage.

The mechanism of my novel door closer is of the type having a shaft rotating in a closer casing, with an arm fixed relatively to the shaft outside the casing. The arm is connected to the door frame through a link, so that the shaft rotates as the door moves between open and closed positions. Through my invention, I can adjust the door closer arm to lie in aligned relation to the casing of the closer when the door is closed. The arm will then be concealed, and the link also will be concealed between the door and door frame.

As an important feature of my invention, I utilize for adjusting the arm of the door closer a longitudinal movement of the closer casing relatively to the hollow upper rail of the door. For the particular purpose, I equip the casing with an adjusting means that is engaged between one end of the casing and a part on the door, and that acts through the casing to move the axis on which the closer arm rotates. By moving the arm axis in this way, with the arm connected to the door frame through the link, I adjust the position the arm occupies relatively to the casing when the door is closed. In more detail, I prefer to utilize for the adjusting means a screw that is arranged to be accessible at the edge of the door. Through this screw, I am able very readily to adjust the closer arm to occupy a position aligned with the rail of the door when the door is in closed position.

I have thus outlined rather broadly the more important features of my invention in order that the detailed description thereof which follows may be better understood, and in order that my contribution to the art may be better appreciated. There are, of course, additional features of my 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 my disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my 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 my inven-

2

tion, in order to prevent the appropriation of my invention by those skilled in the art.

Referring now to the drawings:

Fig. 1 is a plan view showing my novel door closer installed in a door.

Fig. 2 is a front view of Fig. 1, with the door rail in section.

Fig. 3 is similar to Fig. 1, but shows the door in open position.

Fig. 4 is a cross-section of the closer on the line 4—4 of Fig. 6.

Fig. 5 is a plan view of the door closer with the closer arm removed.

Fig. 6 is a longitudinal section of my closer.

Fig. 7 is a section on the line 7—7 of Fig. 6.

Fig. 8 shows the sealing ring that I utilize at one end of my door closer.

Fig. 9 is similar to Fig. 1, but illustrates different adjusted positions of the door closer.

Fig. 10 illustrates diagrammatically the dashpot of my door closer.

To enable my invention to be really understood, I illustrate in Figs. 1, 2, and 3 a portion of a door having an upper rail 10 that is very slender, with a preferred form of my novel door closer mounted within this rail 10. I show the closer connected to the door frame 11, and I indicate at 12 the pivot member on which the door rotates relatively to the frame. The upper door rail 10 is open at its top, being formed as a channel, but because of its very limited width and depth offers little space in which to mount the closer. I form the door closer to fit rather closely within the space in the rail 10, and for the particular purpose, I utilize as a main portion of the closer casing an elongated narrow tube 13 that is square in section, as best seen in Fig. 4.

Referring particularly to Fig. 6, I equip the square tube 13 at one end with a member 14, this member having a square portion 15 fitting within the tube 13 and welded to it whereby to close this end of the tube. I form the portion 15 of the end member with a longitudinal bore 16 to serve as a dashpot cylinder, which I shall describe in due course. I provide also an end member 17 having a square portion 18 fitting within the opposite end of the tube 13. I make the end member 17 removable in order to facilitate the assembly of the door closer, and to secure this member to the tube 13 I prefer to utilize vertical cross pins 19, Figs. 1 and 6, these pins being retained by cotter pins 20. To seal the end member 17 relatively to the tube 13, I utilize a resilient ring 21, Figs. 6 and 8. This ring 21 is formed with a square periphery whereby to conform to the inner surface of the square tube 13, and has a circular opening whereby to be mounted in a circular groove 22 in the end member 17. Through this construction, I enable the end member 17 to be very readily assembled and disassembled relatively to the closer, while at the same time enabling the square tube 13 to be completely sealed.

In my invention, I utilize the opposite end members 14, 17 of the closer casing for mounting the closer in the door rail 10. The end member 14 in the particular arrangement is positioned at that end of the rail that is toward the door pivot 12. As well shown in Fig. 6, I form each end member 14, 17 with a rather large vertical bore 23. Upon the bottom inner surface of the door rail 10, I mount a pair of transverse bars 24 that are spaced to correspond with the vertical bores 23, and these bars 24 are considerably wider than the bores 23, as clearly indicated in Fig. 1, whereby to enable the end members 14, 17 of the casing to seat upon these bars. Each bar 24 has a vertical stud 25 to be positioned in the corresponding bore 23. As best seen in Fig. 6, the studs 25 have a diameter much smaller than the bores 23 so

that the closer casing can be adjusted in a longitudinal direction in the door rail. I equip the studs 25 with washers 26 that are larger than the bores 23, and with nuts 27 adapted to draw the washers 26 against the upper surfaces of the end members 14, 17 to hold the door closer seated on the bars 24 in the door rail.

Upon the end member 14 of the door closer I provide a screw 28 that extends in longitudinal relation to the closer. This screw 28 is formed with a shoulder 29 in opposed relation to a vertical part 30 on the pivoted edge of the door, as well shown in Fig. 1, whereby the screw 28 seats on that part of the door. A slotted end 31 on the screw 28 is then positioned in an opening through the edge of the door so that the screw is easily accessible. Thus, by rotating the screw 28, the closer casing can be shifted longitudinally on the seating bars 24 relatively to the door rail 10. The nuts 27 can be somewhat loosened on the studs 25 if this is necessary to permit the adjustment of the closer. I prefer to equip the end member 14 with a set screw 32 for holding the screw 28 in adjusted position.

Because my door closer can be adjusted longitudinally on its mounting in the door rail 10, I am able to arrange in a novel way the linkage that connects the closer to the door frame, as I shall now explain. Referring particularly to Figs. 1, 2, and 3, the tubular casing 13 of the closer has a vertical pinion shaft 33 through which the closer acts, and this pinion shaft 33 has a square upper end 34 upon which a closer arm 35 is secured by a screw 36. A link 37 is pivoted at one end of the arm 35 by a pivot 38, and is adapted to be pivoted at its opposite end to the door frame 11, thereby causing the pinion shaft 33 to rotate with the opening and closing movements of the door. For pivoting the link 37 to the door frame 11, I show a pivot 39, Figs. 1, 2 and 3, mounted on the frame through a bracket 40, but the details of this pivot and its mounting on the frame 11 are not important to an understanding of my invention. Referring particularly to Fig. 2, it will be observed that I make the pinion shaft 33 relatively short, with the closer arm 35 and the link 37 rather closely juxtaposed to the flat upper surface of the tubular casing 13. When the door closer is mounted in the door rail 10, the closer together with its arm 35 and link 37 are actually below the upper edge of the rail, as best seen in Fig. 2, with the link 37 positioned at the lower side of the door frame 11 on the pivot 39.

Moreover, I arrange the closer arm 35, and a major part 41 of the link 37 as well, to be aligned with the door rail 10 when the door is in closed position as shown in Fig. 1. Of course, when the door opens, the closer arm 35 and link 37 move out of aligned relation to the door rail, as in Fig. 3, and to permit this movement I cut away a narrow edge part 42 on one side of the rail 10, as best seen in Fig. 2. The aligned arrangement of the arm, link, and door rail naturally depends upon the relation between the axis of the pinion shaft 33 and the axis of the pivot 39 on the door frame when the door is closed, and any change in this relation will cause a change in the position of the closer arm 35. This may be best understood from a consideration of Fig. 9, in which I illustrate the closer arm 35 in two different positions corresponding to different positions of the pinion shaft 33. Actually, because of the extremely slender form of the door rail 10, the position of the shaft 33 relatively to the pivot 39 is quite critical. To enable me to establish easily the proper relation between the shaft 33 and pivot 39, I utilize the longitudinal adjustment of the door closer, that I have already described. Thus, once the door closer is assembled in the door rail 10, with its link 37 pivoted to the door frame 11, I can utilize the screw 28 to adjust the closer casing longitudinally and thereby to shift the axis of the shaft 33. By adjusting the shaft axis to a particular position relatively to the axis of the pivot 39 on the door frame, as

clearly shown in Fig. 9, I cause the closer arm 35 to occupy a position aligned with the casing 13 of the door closer when the door is closed. The entire door closer, excepting for a small part of the link 37, is then within the upper rail 10 of the door. Through the novel construction that I have described, I enable the closer arm and link to act when the door closer is mounted within a slender door rail and I am able, furthermore, to conceal the closer when the rail is extremely slender.

The mechanism that I utilize in my novel door closer includes a pinion 43 fixed upon the pinion shaft 33, Figs. 6 and 7, and preferably formed integrally with the shaft. Because of the square shape of the casing 13, I am able to make the pinion 43 relatively large. I mount the shaft 33 to rotate in the casing 13 through needle bearings 44, 45 encircling the shaft above and below the pinion 43, and I utilize a particular mounting for the upper needle bearings 44 to enable the relatively large pinion 43 to be assembled in the casing 13. Thus, I support the upper needle bearings 44 through a bushing 46, Fig. 6, fixed in a wide opening in the flat upper side of the casing 13. This bushing is nearly as wide as the casing 13, and has a large bore through which the pinion 43 can be inserted into the casing. When the pinion 43 is in assembled position, a spacer sleeve 47 is inserted into the large bore in the bushing 46 to hold the upper bearings 44. To support the lower bearings 45, I utilize merely a cup member 48 fixed in an opening in the lower flat side of the casing 13.

In order to cover the upper bearings 44 and to close the large opening in the bushing 46, I utilize a cap 49, well shown in Figs. 4, 5, and 6. This cap 49 has a central opening through which the pinion shaft extends, and is practically as wide as the casing 13 whereby to seat upon the flat top of the casing 13 around the bushing 46. Projecting outwardly from opposed sides of the cap 49, I form a pair of lugs 50, and these lugs 50 are adapted to engage under clips 51 secured to the upper surface of the casing 13 by screws 52, thereby holding the cap seated on the casing. I do, incidentally, prefer to utilize the cap 49 to retain a resilient O-ring 53 to seal completely the opening in the bushing 46.

A rack 54 extends in the relatively narrow space between the pinion 43 and one flat side 55 of the square casing 13, and is meshed with the pinion so as to move longitudinally as the pinion rotates. The rack 54 has transverse end portions 56, 57 well shown in Fig. 7, and I reinforce the rack through a plate 58 attached integrally to these end portions 56, 57 to extend intermediate the pinion 43 and the opposed flat side 59 of the casing 13. For attaching the plate 58, I prefer to utilize tongues 60, Fig. 6, that are on the opposed ends of the plate. Because the opposed sides 55, 59 of the casing 13 are flat, I am able to make the rack 54 and reinforcing plate 58 relatively wide in a vertical direction, with the rack 54 arranged to slide on the casing side 55 over a wide flat surface. In this arrangement, the pinion 43 and casing side 55 hold the rack 54 relatively to one another, and by the particular form of the rack the reinforcing plate 58 is then out of contact with both the pinion and the opposed flat side 59 of the casing.

Actually, the rack 54 is out of contact also with the top and bottom sides of the casing 13, as shown in Fig. 6, and to support the rack in this relation I utilize a cup-shaped piston 62 in the dashpot cylinder 16 at one end of the rack, and a guide member 63 in the casing 13 at the opposed end of the rack. Fixed on the end portion 56 of the rack is a piston rod 64 extending axially into the cup-shaped piston 62, and the end of this rod 64 has a surface 65 seated against an inner surface in the piston 62. Thus, when the fluid in the dashpot cylinder 16 opposes movement of the piston 62, as will presently be described, the piston acts positively through the end surface 65 on the rod 64 to control the action of the door closer. A spiral spring 66 encircles the rod 64 and is

engaged between a shoulder 67 on the rod 64 and a groove 68 in the inner surface of the piston 62 whereby to hold the rod and piston assembled to one another. The spiral spring 66 by yielding enables the rod 64 and rack 54 to have a certain lateral movement relatively to the piston 62.

I form the guide member 63 as a block having a sliding fit between the top and bottom of the square casing 13, but somewhat narrower than the casing, as well shown in Fig. 4. In one face of the guide member 63 is a horizontal groove 69, Fig. 6, in which the end portion 57 of the rack 54 is positioned. Thus, the guide member 63 supports the corresponding end of the rack 54, but does not control the transverse position of the rack. Of course, the rack 54 is engaged with the flat side wall 55 of the casing 13, but this wall 55 offers no support to the rack in a vertical direction. It will be seen, therefore, that the rack 54 floats in the casing 13 on the guide member 63 and piston 62.

For actuating the rack 54 in a door closing direction, I utilize a coil spring 70, Fig. 6, pressing at one end against the guide member 63 and at its opposed end against the closure member 17 of the casing. Actually, this coil spring 70 is seated on the guide member 63 and holds this member in assembled relation to the end portion 57 of the rack. To guide the spring 70 in the square tubular casing 13, I mount upon the rack a spring guide 71. This spring guide 71 is preferably tubular in form and is assembled loosely at one end upon a stud 72 formed integrally with the end portion 57 of the rack. In this arrangement, the tube 71 extends through an opening 73 in the guide member 63 and is held relatively to the rack through a flange 74 extending between the rack and guide member. As will be clearly understood from Fig. 6, the tubular guide 71 extends axially within the coil spring 70 and holds the spring out of contact with the flat sides of the casing 13. To support the coil spring 70 throughout its length, I prefer to equip the end casing member 17 with a rod 75, this rod having a threaded connection 76 with the end member 17 and extending into telescoping relation with the tubular spring guide 71.

Those skilled in the art will understand that fluid in the dashpot cylinder 16 controls the door closing movement of the piston 62. For the purposes of this disclosure, I show diagrammatically in Fig. 10 the means whereby I control this fluid. Thus, I equip the dashpot cylinder 16 with a passage 77 leading from the end of the cylinder to the interior of the casing 13. I provide also a passage 78 leading from an intermediate point in the cylinder 16 to an intermediate point in the passage 77. I equip the passage 77 with a needle valve 79 between the passage 78 and the interior of the casing, and also with a needle valve 80 between the passage 78 and the end of the cylinder 16. The inner surface of the cylinder 16 has a circular groove 81 through which the passage 78 communicates with a circular groove 82 in the piston 62 when the piston is in an intermediate position in the cylinder, this groove 82 being in communication with the interior of the casing 13 through an opening 83 in the piston. I show at 84 a passage with a check valve 85 that allows the fluid to pass freely from the casing to the cylinder 16 when the piston 62 moves in a door opening direction, the check valve 85 being closed during the door closing movement, as will be understood.

I believe that I need not discuss in further detail the inner mechanism of my door closer. For the purpose of the present application, it is important to realize merely that I have conceived a door closer that can be mounted within a door rail, and that has between the closer and door frame a linkage that can be concealed even when the door rail is exceedingly slender. The novel structure that I contribute for the purpose enables me to effect a very precise adjustment of the door closer arm, whereby the arm will be in aligned relation to the slender door

rail when the door is in closed position. Notwithstanding the narrow shape of the door rail and the critical nature of the adjustment, I can adjust the closer arm very easily and without disassembling parts of the door or closer. I believe, therefore, that the very considerable value of my invention will be appreciated by those skilled in the art.

I now claim:

1. In a door closer of the class described having a closer casing adapted to be mounted in a hollow upper rail of a door, a closer arm mounted for rotation on an axis passing through said casing, a link pivoted to one end of the closer arm, and means for pivoting the link to a door frame whereby the closer arm will rotate on said axis relatively to the door as the door moves between open and closed positions, seating means on which the closer casing is seated when mounted on the door, means holding the casing on said seating means for movement relatively thereto, said casing being movable on its seating means for moving the axis of rotation of the closer arm relatively to the point at which the link is pivoted to the door frame by said pivoting means, and means extending between the closer casing and a part of the door when the closer is mounted on the door for moving the casing on said seating means whereby to adjust relatively to the casing the angular position the closer arm occupies when the door is closed.

2. In a door closer of the class described, an elongated closer casing of the type adapted to be mounted in a hollow upper rail of a door, a closer arm mounted on said casing to rotate on a vertical axis that is intermediate the sides of the hollow upper door rail, a link pivoted to one end of the closer arm and adapted to be pivoted to the door frame to cause the closer arm to rotate relatively to a position aligned with the closer casing during the opening and closing movements of the door, seating means formed with surfaces on which the closer casing is seated when mounted in the door rail, said surfaces positioned lengthwise of the door rail whereby to enable the casing to move on said surfaces for adjusting the vertical axis of the closer arm relatively to the point at which the link is pivoted to the frame, and means for holding the closer casing stationary relatively to its seating means with the closer arm axis in adjusted position whereby the arm is in aligned relation to the casing when the door is closed.

3. In a door closer of the class described, an elongated closer casing of the type adapted to be mounted in a hollow upper rail of a door, a closer arm mounted on said casing to rotate on a vertical axis that is intermediate the sides of the hollow upper door rail, a link pivoted to one end of the closer arm and adapted to be pivoted to the door frame to cause the closer arm to rotate relatively to a position aligned with the closer casing during the opening and closing movements of the door, seating means formed with surfaces on which the closer casing when mounted in the door rail is adapted to slide lengthwise of the door rail, a screw bearing between the closer casing and a part of the door whereby rotation of the screw moves the casing on said surfaces, said casing when so moved by the screw adjusting the vertical axis of the closer arm relatively to the point at which the link is pivoted to the frame, and means for holding the closer casing stationary relatively to its seating means with the closer arm axis in adjusted position whereby the arm is in aligned relation to the casing when the door is closed.

4. In a combination of the class described, an elongated door closer casing, means mounting said casing in a channel in the upper edge of a door for longitudinal movement relatively thereto, a vertical shaft mounted on said closer casing for rotation on an axis that is intermediate the sides of said channel, an arm mounted at one end to said shaft for rotation on the shaft axis, a link pivoted to the other end of said arm and pivoted

7

also to the door frame whereby to rotate the arm relatively to a position aligned with the closer casing during the opening and closing movements of the door, an edge part of the door extending transversely at one end of said channel, a screw engaged between said door closer casing and said edge part of the door for moving the casing on its mounting whereby to move the shaft axis in a direction lengthwise of the channel, and said screw by so moving the casing and shaft axis adjusting said closer arm into a position aligned with the channel in the upper edge of the door when the door is closed.

5. In a door closer of the class described, an elongated closer casing, means for seating the casing in a hollow upper rail of a door, a closer arm rotating on an axis passing through said casing, a link pivoted to an end of said closer arm, means for pivoting the link to a door frame whereby the closer arm will rotate on its axis relatively to the door when the door moves between open and closed positions, said arm and a major part of said link lying between the sides of said hollow door rail and in alignment with the casing when the door is in closed position, and means for interconnecting the closer casing and part of the door for moving the casing longitudinally on the means for seating the casing in the hollow rail to adjust the closer arm into a position between the sides of the hollow rail and in alignment with the casing when the door is closed.

6. In a door closer of the class described, an elongated

8

casing of the type adapted to be mounted in a channel in the upper rail of a door, means for mounting said casing in said channel for longitudinal movement relatively thereto, a vertical shaft mounted on said closer casing for rotation on an axis that is intermediate the sides of said channel, an arm mounted at one end on said shaft for rotation on the shaft axis, a link pivoted to the other end of said arm and adapted to be pivoted also to the door frame whereby to rotate the arm relatively to a position aligned with the closer casing during the opening and closing movements of the door, an edge part of the door extending transversely at one end of said channel, a screw engageable between said door closer casing and said edge part of the door for moving the casing on its mounting means whereby to move the shaft axis in a direction lengthwise of the door channel, and said screw by so moving the casing and shaft axis adjusting the position said arm occupies relatively to the door when the door is closed.

References Cited in the file of this patent

UNITED STATES PATENTS

2,003,669	Potter	June 4, 1935
2,220,967	Lasier	Nov. 12, 1940
2,544,252	Carlson	Mar. 6, 1951
2,723,416	Schlage	Nov. 15, 1955