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DOOR CLOSER CENTERING STOP

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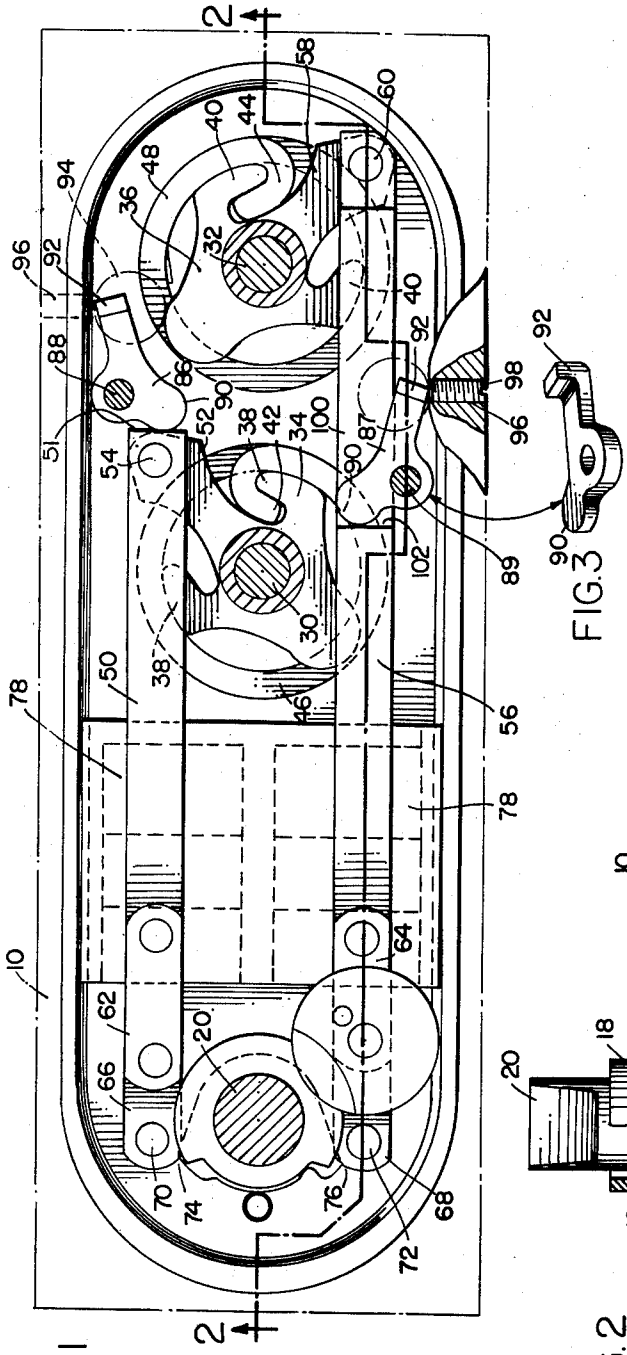


FIG. 1

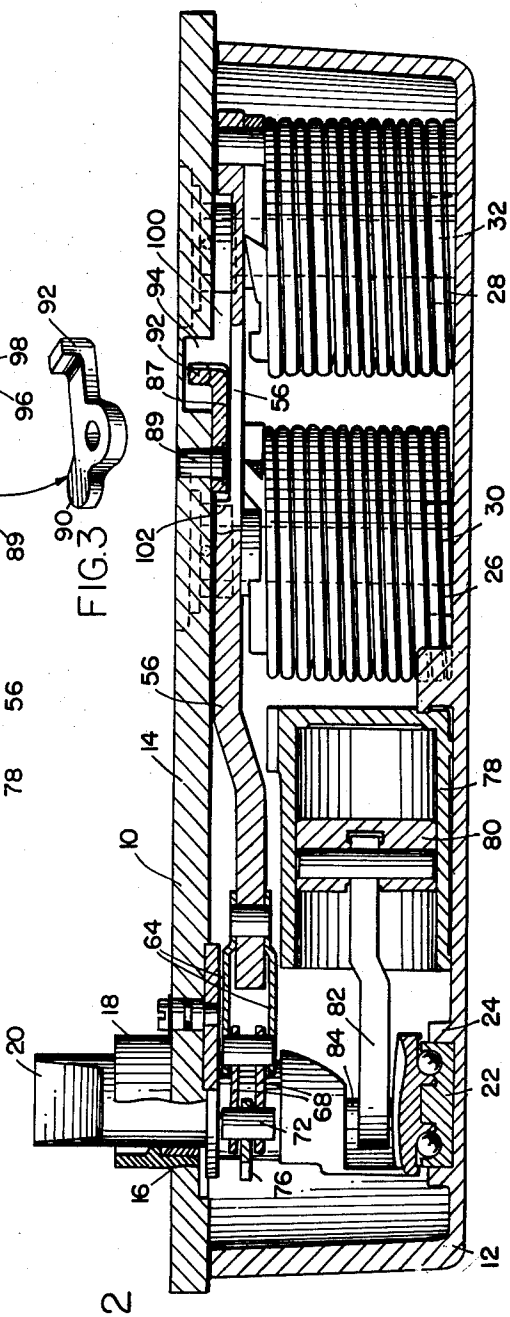


FIG. 2

FIG. 3

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DOOR CLOSER CENTERING STOP

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This invention relates to door control apparatus and more particularly to improved centering means for a double-acting floor check.

Prior to the present invention, it was difficult to adjust double-acting floor checks after assembly to assure an accurate return to center position in the operation of spring-return actuated double-acting swinging doors. Attempts have been made in the past to provide a remedy for this problem, but these attempts have not been wholly satisfactory for the reason that the structures devised usually required removal of the cover or floor plate to effect an adjustment in the internal mechanism of the floor check and the adjusting means employed was not as positive in its action and as resistant to wear as is desired in devices of this kind.

With this in mind, a primary object of the invention is to provide an improved door centering means which may be conveniently adjusted to compensate for varying backswing characteristics of a swinging door, and particularly wear and looseness in the operating mechanism, without the need for removing the cover plate of the floor check.

A further object of the invention is to provide a device of the type described which is more positive and direct in its action, and is not subject to distortion or displacement incident to normal use of the door.

A further object of the invention is to provide readily adjustable centering means for double-acting swinging doors which is characterized by simplicity and convenience in form and operation and by improved functional characteristics which provides immediate action in both directions of door swing.

Other and further objects, advantages and features of the present invention will be apparent to those skilled in the art from the following description, taken in conjunction with the accompanying drawings in which similar reference characters relate to similar parts and in which:

Figure 1 is a plan view of a floor check, with the cover plate removed, embodying centering means made in accordance with the present invention;

Fig. 2 is a vertical sectional view taken substantially on line 2—2 of Fig. 1; and

Fig. 3 is a view in perspective of a centering link made in accordance with the present invention.

Referring now to the drawing and more particularly to Figs. 1 and 2, the centering apparatus of the present invention is illustrated in association with a floor check of conventional type. This floor check, indicated generally by reference numeral 10, comprises a casing 12 which preferably is cast of grey iron, a cover plate 14 apertured at 16 for reception of a bearing 18, and a door spindle 20 journalled in the bearing 18 and resting on a ball thrust bearing 22 positioned within the casing 12 in an annular boss 24. Also formed in the bottom wall of the casing 12 in spaced relation on its longitudinal axis are annular bosses 26 and 28 in which are journalled stub shafts 30 and 32. Secured to the upper ends of the shafts 30 and 32 are levers 34 and 36 which are provided with oppositely disposed hook portions 38 and 40, respectively,

for engaging inturned ends 42 and 44 of torsion springs 46 and 48 mounted within the casing 12 in surrounding relation to the stub shafts 30 and 32 respectively. Torsion is exerted on the spring 46 in a counterclockwise direction, as viewed in Fig. 1, by means of a link arm 50 pivotally secured to shank 52 of the lever 34 at 54, while torsion is exerted on the spring 48 in a clockwise direction, as viewed in the same figure, by means of a link arm 56 pivotally secured to shank 58 of the lever 36 at 60. The levers 34 and 36 are each provided with two hook portions so that they may be freely interchangeable for clockwise or counterclockwise rotation. The link arms 50 and 56 are connected, by means of intermediate links 62 and 64 to draw links 66 and 68 pivoted at 70 and 72 respectively to crank throws 74 and 76 (see Fig. 2) keyed to the spindle 20.

In operation, rotation of the lever 34 is afforded by swinging the door in such a direction, as viewed in Fig. 1, that the spindle 20, on which the door is mounted, is turned in a counterclockwise direction thus pulling on the link arm 50. When the door is swung in the opposite direction, as viewed in the same figure, turning the spindle 20 in the clockwise direction, the lever 36 is rotated in a clockwise direction by means of the link arm 56. In either case the respective torsion spring is tensioned, or wound, and immediately upon release of the door acts to unwind thereby pulling upon the respective connecting links to return the spindle 20 and the door to the normal centered position.

To retard the backswing of the door, however, hydraulic dash-pot cylinders 78 are mounted side by side within the casing 12 and are provided with pistons 80 having connecting rods 82 connected to crank throws 84 which are keyed to the spindle 20. These dash-pots, which are well known in the art, cushion the backswing of the door.

According to the present invention, adjustable means are provided for limiting the backswing of the door, under the action of the torsion springs, so that its final resting or center position can be located with a high degree of accuracy. To this end, stops 86 and 87 are pivotally mounted on stub shafts or pivots 88 and 89, respectively, mounted in the cover plate 14. Each of the stops 86 and 87 is preferably in the form of a bell crank lever, as shown in Fig. 3, having one arm provided with an arcuate edge 90 arranged to lie in the path of travel of the respective links 50 and 56, while the other arm is provided with an upstanding lug 92 (see Fig. 2) which is arranged to lie within a recess 94 suitably formed and located in the undersurface of the cover plate 14.

The stops 86 and 87 are located adjacent respective margins of the cover plate, as shown, and each stop is of the opposite hand of the other so that engagement by the respective link will tend to swing the lugs 92 outwardly on their respective pivots. Threaded passages 96 open into the adjacent side surface of the cover plate 14 and communicate with the recesses 94. In these passages 96 are received set screws 98 for engaging the lugs 92 and thereby varying the angular position of the respective arcuate edges 90 to thus determine the limit position of the link arms 50 and 56 as they are pulled by their respective torsion springs. The transverse shoulder formed by the square end 51 of the link 50 abuts the arcuate surface 90 of the stop 86 to limit its rearward movement and the link 56 is provided on its upper surface with a longitudinal recess 100 forming a transverse shoulder 102 which, in the limit position of the link 56, abuts against the arcuate edge 90 of its associated stop 87, which lies in the path of travel of this link. The recess 100 provides clearance for the stop 87 so that the link 56 can reciprocate without interference otherwise.

In operation, as the door is swung clockwise about its

axis, as viewed in Fig. 1, the spindle 20 is also rotated in a clockwise direction and the link arm 56 is drawn to the left, thus winding and exerting tension on the spring 48. When this occurs, the links 62 and 66, on the opposite side, are pivoted outwardly since the link arm 50, being in abutment with its associated stop 86, is unable to move to the right in response to the movement of the crank 74. So also, when the door is swung about its pivot in the opposite direction, the spring 46 is twisted, and the links 64 and 68 are permitted to pivot outwardly to afford this movement. When the door is released in either direction, its return to closed position under the unwinding action of the torsion springs is retarded by one of the hydraulic cylinders 78, as will be understood, so that there is little or no shock on the respective stop member when engaged by the end of the respective links 50 or 56.

By the present arrangement, the set screws 98 may be adjusted independently to compensate for varying conditions on each side of the door mechanism, such as, for instance, wear in the various link pivots or looseness in the link assemblies. Since the screws 98 are readily accessible without opening the floor check the apparatus may be easily and conveniently adjusted after assembly for perfect center position; and, as door backswing conditions vary after installation and in the course of use, further adjustment in the field is readily had merely by inserting a screwdriver or other tool in the slot of one of the screws 98 and varying the amount of protrusion into its associated recess 94 to adjust the respective stop member and properly set the rest position of the particular link 50 or 56.

The main advantages of this invention reside in the simplicity of the centering adjustment means; its ready accessibility for both factory and field adjustment without opening the door-check casing; and the fact that the improved centering means is not susceptible to appreciable wear.

It will be apparent that this invention may be embodied in devices which differ in many respects and details from the particular embodiment disclosed. All modifications which do not go beyond the scope of the invention will readily suggest themselves to those skilled in the art. It is, therefore, not intended that the invention be limited to the exact construction shown and described, but only to the inventive concept as defined in the appended claims.

I claim:

1. In a door closer comprising a casing having a cover plate and a spindle rotatably mounted therein and projecting through an opening in said cover plate for pivotally mounting a door, crank means on said spindle, a torsion spring within said casing axially parallel with said spindle, and a link arm adjacent and parallel with said cover plate for operatively connecting said spring and crank means whereby said spring is tensioned upon rotation of said spindle in one direction, a transverse shoulder on said link arm on the side adjacent said cover plate and facing in the direction of the return movement of said arm under the action of said spring to turn said spindle in the opposite direction, and adjustable means for coaction with said shoulder to limit the return movement of said link arm, the last named means comprising a bell-crank pivotally mounted on the under side of said cover plate and having an arm extending into the path of said shoulder for engagement thereby, a second arm on said bell-crank extending substantially parallel with the margin of said cover plate, and adjustable means on said cover plate for engaging said second arm to vary the angular position of said bell-crank.

2. In a floor check for swinging doors having a casing, a cover plate for said casing, a hinge spindle rotatably mounted within said casing and projecting through an opening in said cover plate for pivotally mounting a door, crank means mounted on said spindle, a torsion spring disposed within said casing, and link means connecting said spring to said crank means for effecting tension in said spring when said spindle is turned in one direction, the improvement comprising adjustable means for independently limiting the backswing of said door under the action of said spring, said means including a bell-crank pivotally mounted on the undersurface of said cover plate and having one arm extending into the path of said link means for engagement therewith to limit the return movement of said link when the door is swung to closed position, said bell-crank having an upstanding lug on its other arm received in a recess in said cover plate, and said cover plate having a threaded aperture opening laterally into said recess for reception of a set screw for engaging said lug and varying the angular position of said bell-crank.

3. In a floor check for double-acting swinging doors having a casing, a cover plate for said casing, a hinge spindle rotatably mounted within said casing and projecting through an opening in said cover plate for pivotally mounting a door, angularly opposite crank means mounted on said spindle, a pair of torsion springs disposed within said casing, a pair of link means connecting said springs to respective ones of said crank means for selectively effecting tension in said springs when said spindle is turned in one direction or the other, and a pair of hydraulic cylinders having piston means connected to opposite ones of said crank means for retarding the backswing of said door, the improvement comprising adjustable means for independently limiting the backswing of said door in each direction, said means including a pair of bell-cranks pivotally mounted on the undersurface of said cover plate and each having one arm extending into the path of a respective link means for engagement therewith to limit the return of said links when the door is swung to closed position, each of said bell-cranks having an upstanding lug on its other arm received in a respective recess in said cover plate, and said cover plate having a threaded aperture opening laterally into each of said recesses for reception of a set screw for engaging said lug and varying the angular position of the respective bell-crank.

4. In a double-acting swinging door floor check having a casing, a cover plate for said casing, a hinge spindle rotatably mounted within said casing and projecting through an opening in said cover plate for pivotally mounting a door, a pair of cranks mounted on said spindle each having a pair of angularly opposite arms, a pair of torsion springs disposed within said casing on axes parallel with said spindle, a pair of links connecting said springs to the respective arms of one of said cranks for selectively effecting tension in said springs when the door is opened in one direction or the other, and a pair of dash-pots having piston rods connected to the respective arms of the other of said cranks for retarding the backswing of said door, the improvement comprising adjustable means for independently limiting the backswing of said door in each direction, said means including a pivotally mounted stop member arranged in the path of travel of each of said links, said stop members each being in the form of a bell-crank having an arcuate edge at the end of one arm for engagement with a respective link in the direction of its longitudinal movement and an upstanding lug on its other arm receivable in a recess formed in said cover plate, and externally accessible set screws in said cover plate for engaging said lugs respectively to vary the angular stop position of each of said links.

5. In a double-acting swinging door floor check having a casing, a cover plate for said casing, a hinge spindle rotatably mounted within said casing and projecting through an opening in said cover plate for hingedly mounting a door, a pair of cranks on said spindle each having a pair of angularly opposite arms, a pair of torsion springs disposed within said casing on axes parallel with said spindle, a pair of links connecting said springs

to the respective arms of one of said cranks for selectively effecting tension in said springs when the door is opened in one direction or the other, each of said links having a transverse shoulder thereon facing in the direction toward the respective one of said springs, and a pair of hydraulic cylinders each having a piston rod connected to a respective one of the arms of the others of said cranks for retarding the backswing of said door, the improvement comprising adjustable means for independently limiting the backswing of said door in each direction, said means including a pivotally mounted stop member arranged beneath said cover plate in the path of travel of each of said links, said stop members each having a crank arm engageable with the shoulder of a respective link and a second arm having an upstanding lug receivable in a recess formed in said cover plate, and externally accessible set screws in said cover plate for engaging said lugs respectively to vary the angular positions of said stop members and thereby adjust the limit of the return movement of said links.

6. In a double-acting swinging door floor check having a casing, a cover plate for said casing, a hinge spindle rotatably mounted within said casing and projecting through an opening in said cover plate for hingedly mounting a door, a pair of cranks on said spindle each having a pair of angularly opposite arms, a pair of torsion springs disposed within said casing on axes parallel with said spindle, a pair of links connecting said springs to the respective arms of one of said cranks for selectively effecting torsion tension in said springs when the door is opened in one direction or the other, said links including a first link for one of said springs and a second link for the other of said springs, said second link having on the top surface thereof a recess defining a shoulder, and a pair of dash-pots having piston rods connected to the respective arms of the other of said cranks for retarding the backswing of said door, the improvement comprising adjustable means for independently limiting the backswing of said door in each direction, said means including a pivotally mounted stop member arranged in the path of travel of each of said links, said stop members each being in the form of a bell crank having one arm terminating with an arcuate end edge, one of said stop members having its said arm positioned to be engaged by the free end of said first link and the other stop member having its said arm positioned for engagement by the shoulder of said second link, each of said stop members having a second arm and an upstanding lug thereon receivable in a respective recess formed in said cover plate, and externally accessible set screws in said cover plate for respectively engaging said lugs to vary the angular positions of said stop members, said set screws being received in threaded apertures opening into the respective recesses from opposite side faces of said cover plate.

7. Adjustable centering apparatus for double-acting swinging door floor checks having a casing, a cover plate for said casing, a hinge spindle rotatably mounted within said casing and projecting through an opening in said cover plate for hingedly mounting a door, a pair of cranks on said spindle each having a pair of angularly opposite arms, a pair of torsion springs disposed within said casing on axes parallel with said spindle, a pair of links connecting said springs to respective arms of one of said cranks for selectively effecting torsion tension in said springs when the door is opened in one direction or the other, said links being directly beneath and parallel with said cover plate, and a pair of dash-pots having piston rods connected to respective arms of the other of said cranks for retarding the backswing of said door, the improvement comprising adjustable means for independently limiting the backswing of said door in each direction, said means including a pair of bell cranks rotatably mounted on the undersurface of said cover plate and each disposed with an arm extending into the path of a respective link, each of said links having a transverse shoulder thereon engageable with the said arm of a respective bell-crank, each said bell-crank having a second arm and an upstanding lug thereon projecting into a respective recess formed in said cover plate, said cover plate having a threaded aperture opening from a respective side face thereof into each of said recesses for reception of a set screw engageable with the respective lug for varying the angular position of the respective bell-crank and thus adjusting the limit of the return movement of the respective one of said links.

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