Feb. 9, 1960 M. CARLSON 2,923,962

BREAK-AWAY DOOR CONTROL MECHANISM

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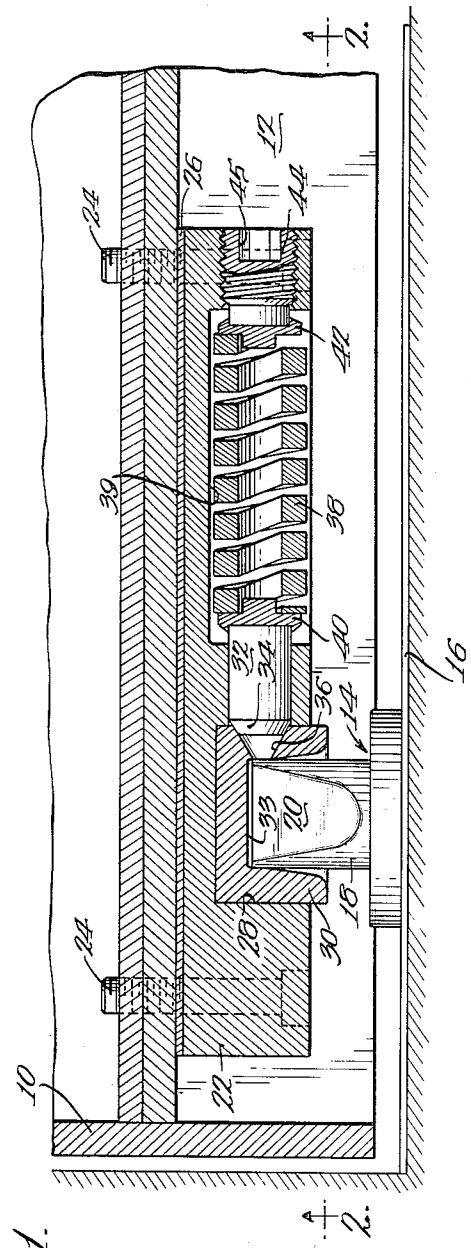

Fig. 1.

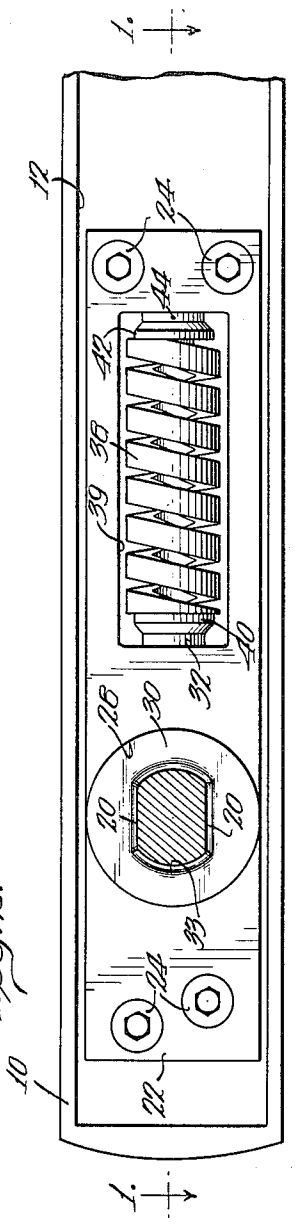

Fig. 2.

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BREAK-AWAY DOOR CONTROL MECHANISM

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1 Claim. (Cl. 16—55)

The present invention relates to what I refer to as a "break-away door control mechanism." As used, this term refers to a mechanism incorporated in or used with a door check or door operator, which permits the door to break away sharply and swing in the direction opposite to that of its normal motion, under emergency conditions.

One of the objects of the present invention is to provide a novel mechanism which normally operates in such fashion as to keep a swinging door under the control of a conventional door control mechanism but which, under emergency conditions breaks away sharply so as to permit the door to swing relatively freely.

Still another object of the invention is to provide a novel door control mechanism having the above characteristics, which permits an inwardly swinging door to swing freely outwardly under conditions of excessive pressure against the door on the inside surface thereof, such as may occur during panic within the building.

Yet another object is to provide a novel accessory for use with a door control mechanism of the flush type which prevents people from being trapped within a building by a door which normally swings inwardly only.

Still another object is to provide a novel accessory having the above characteristics, which is adapted for use with a single action door control.

Still another object is to provide a novel mechanism for use with a flush type door control which accomplishes the above and which enables the door control to hold the door either in the normal closed position or alternatively in an open position so as to obtain ventilation when desired.

Yet another object of the invention is to adapt a single action door control for operation with a break-away door stop.

Still another object is to provide a novel device having the above characteristics, which permits a controlled normally inwardly swinging door to be opened in the outward direction after which it remains open until manually re-set so as to be under the control of the door control.

Other objects and advantages will become apparent from the following description of a preferred embodiment of my invention.

In the drawings, in which similar characters of reference refer to similar parts throughout the several views,

Fig. 1 is a longitudinal vertical sectional view through the adaptor of the present invention shown with the adaptor associated with a swinging door and a door of known construction; and

Fig. 2 is a bottom view of the mechanism of Fig. 1, the spindle of the door control being shown in transverse section.

In recent years, particularly in public buildings, the use of center-hung swinging doors has become increasingly common. Such doors because of the top and bottom central pivot arrangement can swing either inwardly or outwardly so far as the pivots are concerned, but ordinarily are provided with some sort of flush mounted door control which also provides the bottom pivot and which limits movement of the door. Ordinarily, after the door has been pushed open it is returned to closed position by the door control and the most commonly used type of control mechanism has a built in stop to limit closing movement of the door to about five degrees outwardly of a position of alignment with the door jamb. The door jamb usually has some sort of door stop, and since the tendency of the door control mechanism is to swing the door five degrees or so beyond a position of alignment, the door is limited in its return movement by the door stop.

This arrangement admirably suits the purpose of providing for the operation of swinging doors which swing in one direction only. Usually, at the entrance to a building, the doors must swing inwardly because outwardly-swinging doors would interfere with pedestrian traffic in front of the building. The problem associated with the use of doors of this type is that under conditions of panic within the building, people in an attempt to get out may not be able to swing the doors inwardly to open position, because of crowding at the building entrance.

The present invention is primarily a safety mechanism which releases the doors for outward swinging movement automatically in such emergencies.

In my copending application, Serial No. 564,394, filed February 9, 1956, for "Break-Away Door Stop," I have illustrated and described an improved door stop which ordinarily limits outward movement of a swinging door to a position in alignment with the door jamb, but which under excessive loading on the interior surface of the door will break away sharply so as to permit the door to swing outwardly. A device of that character satisfactorily serves the purpose of preventing people from being trapped within a building by an inwardly swinging door, providing the door control mechanism is of the double-action type; that is, a door control of the type which permits swinging of the door in either direction. Door control mechanisms of this double action type, however, are more expensive and more complicated than single action door controls and ordinarily are not used excepting under conditions where it is desired to have the door swing in both directions during normal use.

The present invention adapts a single action door control, that is, one which swings through approximately 90 degrees, for use with a break-away door stop so as to accomplish the same purpose as a break-away door stop when used with a double action door control. The safety mechanism can also be used with a single action door control if no door stop is used, if the single action door control is so adjusted as to center the door in closed position with relationship to the door jamb on the basis of the stop mechanism built into the control itself.

It will be appreciated that the above remarks are directed both to door checks and to automatic door operators which swing the door open by rotating the lower door pivot. For those interested further, examples of door checks and automatic door operators of the flush type form the subject matter of my U.S. Patents Nos. 2,603,818, issued July 22, 1952, 2,595,187, issued April 29, 1952, and 2,739,808, issued March 27, 1956.

Referring to the drawings, I have indicated the lower corner of a swinging door at **10**. This door may be considered as being of well known construction and has a downwardly opening slot **12** formed in a channel member at its lower edge. Near the rearward edge of this door a door control mechanism, indicated generally at **14**, has the major portion thereof recessed into the

floor so that the only portion showing is a dress plate 16, substantially flush with the floor, and an upstanding spindle 18. This spindle also serves as the lower pivot for supporting and journaling the door for swinging movement.

The upper end of the spindle 18 is flattened as at 20 on opposite sides, these flat spots being tapered toward each other at the top. Ordinarily an operating arm is secured within the channel 12 and has a recess or socket in the lower face thereof substantially complementary in shape to the upper end of the spindle 18 so that when the arm is secured within the bottom channel 12, and the socket therein is slipped over the upper end of the spindle 18 with the spindle at the top of the door also being appropriately connected, any swinging movement of the door is communicated in the form of rotational displacement to the spindle 18.

The mechanism beneath the floor connected to the spindle 18 acts through a spring loaded means to return the spindle to the at-rest position, with the door closed, under the restraint of some checking mechanism, usually hydraulic in character.

According to the teaching of the present invention, there is a generally rectangular arm 22 which is secured in the door channel 12 by means of cap screws 24, vertical positioning of the door being accomplished by the use of a shim 26 of appropriate thickness. This arm has a cylindrical cavity 28 which extends upwardly from the lower surface thereof well toward the top of the arm, this cavity being considerably larger in diameter than the the diameter of the spindle 18. A cylindrical cup-shaped member 30 fits the cavity 28 so as to be freely rotatable therein, and the lower surface of this cup-shaped member has a socket 33 therein which is substantially complementary to the upper end of the spindle 18. With the socket 33 fitted over the end of the spindle 18, therefore, and with the cup-shaped member 30 seated in the cavity 28 and with the door in place, the door is free to rotate without turning the spindle 18.

Toward the right, as seen in Fig. 1, that is, toward the free edge of the door, the arm 22 is drilled horizontally through to the cavity 28 so as to provide a sliding fit for a generally cylindrical plunger 32. The end of the plunger 32 which is toward the spindle 18 is shaped to frusto-conical contour, as indicated at 34, and this end seats within a conical cavity 36 in the side wall of the cup-shaped member 30 when all of the parts are oriented as they should be with the door closed. Although it is not critical, a satisfactory apex angle for the conical nose 34 is about 60 degrees.

Further toward the free edge of the door, that is, toward the right of Fig. 1, a comparatively heavy coil spring 38 is so arranged within a slot 39 in the arm that one end bears against a spring base 40 which in turn is seated aganist the base end of the plunger 32 while the opposite end of the spring bears against a spring base 42 backed up by a threaded abutment 44 extending into the right hand end of the arm 22. The outward end of the spring abutment 44 has a hexagonal socket 45 therein, to permit adjustment by an Allen wrench of the compressive force of the spring 38 and hence the force tending to hold the tapered nose of the plunger in the socket 36.

So long as the plunger 32 is seated in the socket 36, no rotational movement as between the arm 22 and the cup-shaped member 30 is possible. On the other hand, torque applied to one of these members relative to the other, if sufficient, will act to wedge the nose 34 of the plunger 32 out of the socket 36, thereby permitting the arm 22 to turn about the cup-shaped member 30. There will be appreciable restraint under these conditions because of the frictional engagement of the flat end of the plunger 32 against the cylindrical surface of the cup-shaped member 30. This frictional restraint is sufficient to retain the door in any position to which it is pushed, but will hardly be noticed by anyone attempting to swing the door.

Although the optimum pressure exerted by the spring 38 and plunger 32 will vary, depending upon the particular circumstances, including the angle of the nose 34. I have found that a satisfactory adjustment for most purposes is one at which the arm breaks free at a relative torque as between the door and spindle 18 of about 150 foot-pounds.

It will be appreciated that when this advice is used with a single action door control adjusted so as to center the door relative to the jamb without the use of a separate door stop, the door will operate in the customary manner so as to swing freely inwardly, but not outwardly so long as the force applied to the inner face of the door produces less than 150 foot-pounds of torque upon the spindle 18. At a higher reverse torque, the plunger 32 will be wedged out of the recess 36 and the door will break free so as to swing outwardly substantially without noticeable restraint.

The preferred arrangement, as previously suggested, is to use this device with the door control mechanism so adjusted that it tends to return the door to a position approximately five degrees beyond alignment with the door jamb and then to use a break-away door stop of the type previously mentioned to limit closing movement of the door to a position in alignment with the door jamb.

When this arrangement is used, an excessive loading upon the interior surface of the door will cause the break-away door stop to release, thereby permitting free outward swinging movement of the door so far as the door stop is concerned. After the door has swung approximately five degrees, the spindle 18 of the door control mechanism will reach the limit of its movement and thereafter the arm 22 will break free of the cup-shaped member 30, so as to permit the door to continue its outward swinging movement. By using this arrangement, the two break-away mechanisms break in succession and therefore the force required to overcome their resistance is successive rather than additive. Furthermore, once the door stop has broken away, the inertia of the moving door will tend to carry it through the second phase of the break-away cycle, so that although two separate break-away mechanisms are used, their total inhibiting effect upon outward swinging movement of the door is no more than one and is well within safe limits so far as providing an emergency exit from the building is concerned.

Ordinarily a single action door control will permit a door to be opened slightly more than 90 degrees. With the mechanism just described, the door can be pushed open to the limit of its normal movement and after the spindle 18 will no longer rotate, an additional force against the door will cause the plunger 32 to be wedged out of the recess 36, thereby permitting the door to be swung beyond this position until it is restrained against further movement by an adjacent wall. Once the door has been opened to this extent, if it is then released, the door control mechanism will return the door toward closed position about 90 degrees, thereby leaving the door partly open for ventilation. Under some conditions, as soon as the door has been opened enough to break the mechanism, the return spring in the door control will rotate the spindle 18 to the position it normally assumes with the door closed, against the restraining effect of the flat end of the plunger 34 bearing against the cylindrical surface of the cup 30. Thereafter the door may be moved manually to any desired position to obtain ventilation without rotating the spindle 18.

If operation is as first described, that is, if the return spring in the door control is not quite strong enough to rotate the spindle to closed position after the mechanism has broken free, much the same effect can be obtained by jerking the door suddenly in an opening direction so that the tendency of the door control return spring to rotate

the cup member 30 relative to the arm 22 is supplemented by the inertia of the door control mechanism. Once this method has been used to open the door more than necessary, the door can simply be pushed in the closing direction to the desired position.

In any event, the door at any time can be returned to the control of the door control mechanism by swinging the door in the proper direction until the spindle 18 reaches the end of its travel and thereafter in the same direction until the nose 34 snaps into the socket 36.

From the above description of a preferred embodiment of my invention it will be apparent that modifications may be made in the structure disclosed while still obtaining the benefit of the invention and that therefore the scope of this invention is determined by the scope of the accompanying claim.

Having described my invention, what I claim as new and useful and desire to secure by Letters Patent of the United States is:

A swinging door control safety device for a flush type door control mechanism operating to supply a torque to return a door to closed position after opening thereof in one direction and having a vertical rotatable spindle,

comprising an arm adapted for attachment in a recess in a horizontal edge of the door so as to swing therewith, a member journaled for rotation about a vertical axis in said arm, said member having means for attachment to said spindle so that said member rotates with said spindle, spring loaded detent means in said arm having a portion thereof seated in a socked formed in said member for locking said member to said arm for rotation therewith whereby the door attached to said arm when opened and then released is swung to closed position by the door control mechanism, said spring loaded detent means and the socket being formed to provide tapered mutually engaging portions to form torque responsive camming surfaces therebetween to wedge said detent means out of said socket to release said arm for rotation relative to said member when said door is pushed from closed position in an opposite opening direction.

References Cited in the file of this patent

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