Nov. 24, 1931. L. C. NORTON 1,833,121

CONTROL MEANS FOR DOOR CLOSERS

Original Filed Aug. 28, 1926

Fig. 1.

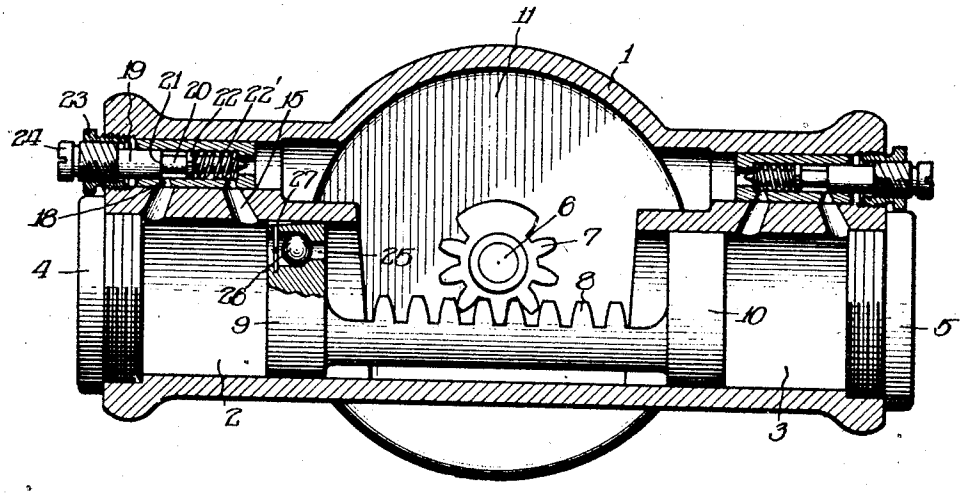
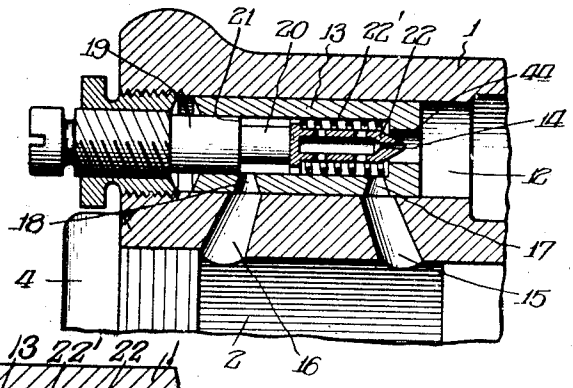


Fig. 2.



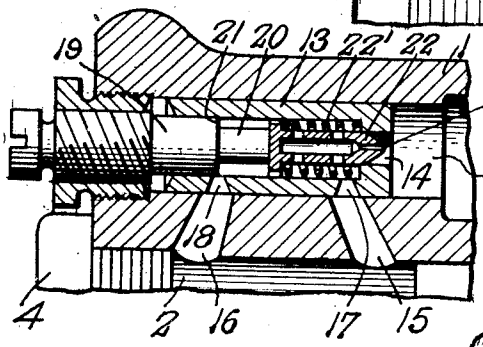


Fig. 4.

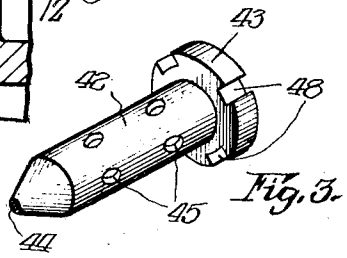


Fig. 3.

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UNITED STATES PATENT OFFICE

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CONTROL MEANS FOR DOOR CLOSERS

Original application filed August 28, 1926, Serial No. 132,108. Divided and this application filed February 13, 1928. Serial No. 253,917.

My invention relates to improvements in regulating means for fluid controlled door checks, and more particularly to door checks of the closer type which operate to force the door closed and control its movement during the closing operation.

My invention has special adaptation as a regulating means for fluid operated door checks of a type to be positioned between a door frame and a door, connected by pivoted links in a manner to convert swinging movement of the door to oscillatory movement of a spindle mounted in the door check, the latter being connected to suitable mechanism to convert the oscillatory movement to a reciprocatory movement of a double-headed piston. The piston is in a position to slide in a fluid cylinder, the latter being provided with a by-pass in communication with the cylinder through suitable ports, the by-pass and ports being controlled by regulating means for restricting the passage of fluid in a manner to control the movement of the piston as desired. Door checks of this type, for convenience in installation, that is, to render them capable of operation whether applied to a left-hand or right-hand swinging door, are provided with double pistons and double cylinders, each set having separate control means and being oppositely disposed so as to be effective as a fluid control, one set when the piston is moved in one direction, as applied to a door of one hand, the other set when it is moved in the opposite direction, as applied to a door of the other hand, but only one cylinder of the door check operating on a particular installation. When the door check is applied to a particular door, the regulating means for the cylinder and piston, to be effective for controlling the closing operation, is adjusted in a manner to restrict the ports to effect the desired control of the closing action, the opposite control means being left open in a manner to permit the free flow of fluid in order that the check will offer no resistance to the opening movement of the door.

In order to prevent any retarding action on the suction stroke of the operating piston, that is, when the door is being opened, a passage through the piston head is provided having a one-way check valve therein, the valve opening in a direction to pass fluid with comparatively no resistance when the piston is moved in the direction caused by the opening of the door, and thus no reliance is placed on the restricted ports to pass fluid at this time.

In controlling the closing action of doors, it has been found desirable to provide for two speeds, first, a comparatively rapid speed which brings the door to a substantially closed position, which will hereinafter be termed the general speed, thus preventing undesirable drafts through the open doorway for unnecessarily long periods, and secondly, a very slow speed for the last few inches of its swing, hereinafter termed the latch speed, to effect an easy and quiet engagement at the latch. To this end, it has been the practice to provide two distinct fluid passages, controlling each to give the desired fluid resistance, fluid ports being so positioned in the cylinder relative to the piston travel that the piston movement, and in turn the door, is controlled in a manner to give the desired closing movement.

In order to eliminate a plurality of adjustments for the various ports, it has been proposed to provide a single regulating screw so positioned relative to the by-pass and the ports and so constructed that it is possible to regulate the two fluid passages in one operation. Regulating devices of this type are disclosed in patents issued to L. C. Norton, No. 868,357, patented October 15, 1907, and No. 1,152,339, patented August 31, 1915, and over which my invention is an improvement. The regulating screw shown in Patent No. 868,357 is provided with a reduced portion at its outer end in a manner to form a shoulder intermediate its length, the surface of the shoulder being provided with grooves adapted to cooperate with one of the ports to regulate the same in the manner of a spigot valve, varying the port size from a completely closed to a completely open condition by movement of the screw through a 180° arc. It is to be noted that the position of the shoulder relative to the end of the pin is such that the second port which is the one to be effective to control

the latch speed of the door, is regulated before the end of the pin is in a position to restrict the by-pass, or in other words, the general speed of the door is determined.

The Patent No. 1,152,339, discloses an improvement of the pin just described inasmuch as it effects, by the regulation of a single screw, an adjustment of the port controlling the general speed of the door before the second port is adjusted, this being accomplished by positioning the shoulder further back on the shank of the screw so that on inward movement the end of the screw will cooperate with a portion of the by-pass to effect an adjustment of the first port before the shoulder has come into a postion to effect its adjustment. The restriction of the by-pass is accomplished by introducing the end of the pin, which is provided with a V-groove, into a restricted portion of the by-pass to obstruct all fluid flow except through the groove, the amount of fluid permitted to pass being determined by the size of the groove effective at a given position in the screw. In this device, the screw is provided with extremely fine threads adjacent its head which engage in a threaded bushing positioned in the outer end of the by-pass, the gradual pitch permitting the screw to be advanced until the proper by-pass adjustment is effected and then permit the screw to be further turned within the limits of 180° to effect an adjustment of the second port without substantially affecting the first. This type of pin is a distinct advance over that disclosed in the other patent described for the reason that it permits a more accurate adjustment at the time of installation although the two pins act substantially the same having once been set in a regulated position. The advantages of regulating the port controlling the general speed of the door first can be readily seen when it is understood that the carpenters installing door checks of this type use the trial method, that is, they permit the door to swing shut, at the same time turn the screw down to the position where the desired controlled movement is had, and inasmuch as the latch speed of the door is contingent upon the general speed, it is obviously advantageous to adjust the general speed first.

In practice it has been found that carpenters will not take the time to turn down this type of screw in order to properly adjust the door check and it is, therefore, highly desirable to provide a door check which may be adjusted by slight turning of a regulating screw, i. e., one or two revolutions, or less, and to this end it is one of the purposes of my invention to provide a regulating device which will embody all the advantages disclosed in the above described patents and yet eliminate the necessity for the extremely fine pitch threads which are a necessary element in the patented devices.

I have found further that the speed of doors through the first part of the closing movement, or the general speed, need not be controlled beyond the point of establishing a fixed speed for all doors, and therefore, another purpose of my invention is to provide a device for adjusting the latch speed and for establishing a predetermined general speed in one operation, the general speed being the same for all doors.

These and other objects are accomplished by means of the arrangement disclosed on the accompanying sheet of drawings, in which—

Figure 1 is a cross-sectional view, cut on a horizontal plane, showing a door check embodying my improved control means.

Figure 2 is an enlarged cross-sectional elevation of a control device constructed in accordance with my invention, and

Figure 3 is an enlarged perspective view of the valve plug employed in my control device.

Figure 4 is a view similar to Figure 2, showing the parts in adjusted position to control the general and latch speeds of the door.

The various novel features of the invention will be apparent from the following description and will be particularly pointed out in the appended claims.

This application is a division of my Patent No. 1,770,250 dated July 8; 1930, entitled Control means for door closers.

Referring to the drawings, one type of door check to which my invention may be applied is disclosed in Figure 1, which embodies a suitable casting 1, provided with oppositely disposed cylinders 2 and 3, the outer ends of which are closed by screw plugs 4 and 5. Centrally disposed and mounted in suitable bearings within the casing is a spindle 6 which is attached by pivoted link mechanism to either the door or door frame depending upon which of these elements the check device is mounted on in a manner to cause the relative movement between the door and frame to oscillate the spindle 6. On the inner end of spindle 6 is a gear 7 mounted to mesh with the rack 8 having on its outer ends pistons 9 and 10 in a position to slide in oppositely disposed cylinders previously mentioned. The large portion of the casing 1, shown at 11, is provided to house suitable spring means attached between the housing and the spindle in a manner to impart a spring force to the spindle so as to close the door, the showing of which, however, has been omitted in the drawings.

The structure and operation of the two checking cylinders at opposite sides of the device are the same and, therefore, for purposes of description, only one side will be described.

Cylinder 2 is provided with a by-pass duct 12 having a bushing 13 positioned therein for the purpose of providing a more accurate fit

for the adjusting screw, the bushing being restricted as at 14 at its inner end so as to receive the plug in a manner to effect an adjustment to be described later. The by-pass duct is connected to the cylinder by ports, such as shown at 15 and 16, the bushing likewise being provided with openings 17 and 18 to complete the communication between the cylinder and the interior of the bushing, the two ports in a single cylinder being so positioned relative to the travel of the piston that one of said ports, such as shown in Figure 1 at 15, becomes effective prior to the remaining port adjustment of the first named port effecting the movement of the general speed of the door whereas the adjustment in the last named port controls the latch speed.

Positioned in the by-pass duct 12 is an adjusting screw 19 which is provided with a reduced end 20 having a diameter less than that of the bore of the bushing in which it fits, but further provided with an enlarged portion exactly fitting the bore of the bushing and presenting a shoulder 21. The reduced end of the screw 19 is in contact with the plug 22, which is pressed outwardly by the coil spring 22' away from the reduced opening 14 in the bushing, the screw, however, acting to cause the plug to substantially fill the opening 14 when it is forced inwardly against the spring, the plug in such position permitting a restricted passage of fluid through its central opening 44.

It will be noted that the plug 22 comprises a barrel portion having a taper at one end and a flanged head at its opposite end. The head serves as a guide fitting in the bore in the bushing, whereas, the barrel portion fits the opening 14. Fluid is permitted to pass the plug by means of the ports and grooves 44, 45 and 48 provided therein, and as shown in Figure 3. The bushing shown at 23 is screwed into the cylinder well and is internally threaded to receive the regulating screw, the threaded engagement of which is preferably of double or triple threads to provide a relatively steep pitch in order that a single revolution of the regulating screw may cause its advance an amount equal to the diameter of the port controlling the latch speed. The head of the regulating screw may be provided with any suitable means to receive a tool, a slot 24 adapted to receive the screw driver being the means shown in the drawing.

A passage 25 having a one-way check valve 26 positioned therein is provided in the piston head 9, in a manner to permit fluid to pass through the piston when the piston is moving away from the cylinder end, but to prevent any passage of fluid during movement in the opposite direction, that is, on the working stroke. The purpose and operation of the groove 27 on the piston is fully set forth in my co-pending application where I have claims thereto, therefore, no further reference will be made to this subject matter in the present application.

In operation, to effect the desired adjustment for the various movements of the door to which the check is applied, the adjusting screw on the closing side of the check is turned a small amount in a direction to cause it to advance sufficiently to move the plug 22 into the restricted opening in the bushing, after which time the shoulder 21 is in a position to pass over the second port opening so as to effect a regulation thereof for further inward turning of the pin. Due to the uniform size of the opening 44 in the plug, further inward movement of the adjusting screw and plug will have no changing effect on the passage of fluid therethrough and consequently no effect on the general speed of the door, the general speed of the door being a constant after the plug has once been introduced into the opening 14. By first determining the general speed the latch speed can be immediately determined thereafter within the range of one revolution of turning the regulating screws, this being due to the steep pitched threads which produce an axial movement of the screw for one revolution thereof sufficient to cause the shoulder 21 to pass completely over the port opening 18. When the closing side of the door check has been thus regulated, the regulating means on the opposite side of the door check is screwed outwardly to its extreme outer position to provide an unobstructed passage for the fluid through the various ports in order that there will be no resistance to the opening movement of the door. An exception to this last statement may be practiced, however, when a back check is desired, or, in other words, when it is desirable to check the door at an extreme opened position, in which case the plug may be entirely removed and the screw introduced in a manner to entirely or partially close the latch speed opening 18 so as to give the desired back checking action. It will be obvious that the spring causes the plug to unseat when the screw is moved outwardly as when the ports are adjusted to open position.

The above detailed description and disclosures in the drawings will be a preferred embodiment of my invention which are given by way of illustration, but it is my intention to include all modifications that fall within the scope of the appended claims.

I claim:

1. In a door check, the combination of a cylinder having a by-pass duct with a reduced portion and two ports connecting said by-pass duct and said cylinder, a valve bias to open position in said duct having a portion adapted to fit within and completely occupy said reduced portion of said duct and provided with a restricted orifice of uniform size

therethrough, a regulating screw in said duct adapted for inward movement to seat said valve and then to cooperate with one of said ports to regulate the size thereof, the threads on said screw being such that the screw will advance in one revolution an amount equal to the diameter of the regulated port.

2. In a door check, the combination of a cylinder having a by-pass with a reduced portion and two ports connecting said by-pass and said cylinder, a plug provided with a reduced opening in said by-pass duct and having a portion adapted to fit within and completely occupy said reduced portion of said by-pass duct, spring means for holding said plug normally out of said last named portion, and a regulating screw in said duct having a portion adapted to cooperate with one of said ports to regulate the size thereof and adapted on inward movement to move said plug into said reduced portion against said spring pressure and upon further movement to regulate the size of said port.

3. In a door check, the combination of, a cylinder having a by-pass duct comprising a valve chamber and a restricted opening at one end of said valve chamber, and two ports connecting said by-pass duct and cylinder, a plug having a uniform opening therethrough in said valve chamber, adapted to occupy and completely fill said restricted opening and having means for normally urging said plug out of said restricted opening, and a regulating screw in said valve chamber having a portion for regulating one of said ports, and adapted to contact said plug for urging said plug out of its normal position into said restricted opening when said screw is in position to present said portion in regulating relation with said port.

Signed at Los Angeles, California, this 6th day of February, 1928.

LEWIS C. NORTON.