Nov. 7, 1950 S. G. NØRBALLE 2,528,904

CLOSING DEVICE FOR DOORS

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Fig. 3

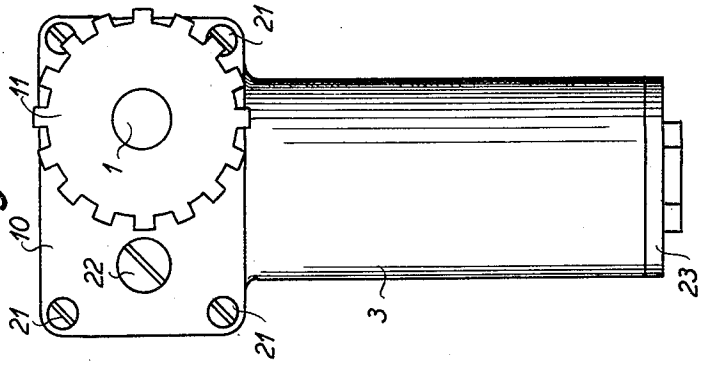


Fig. 2

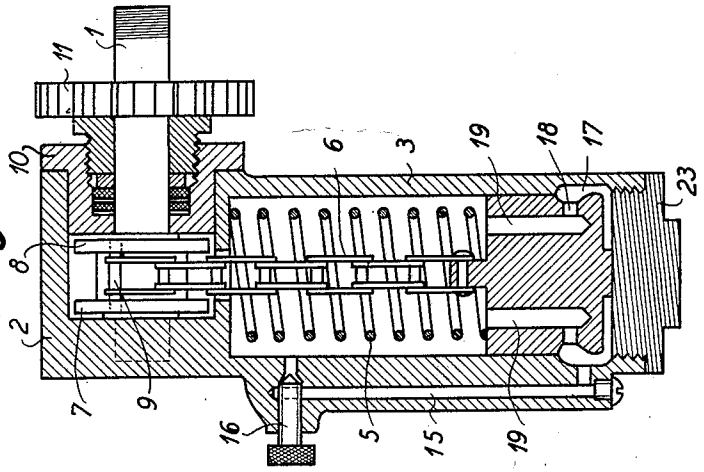
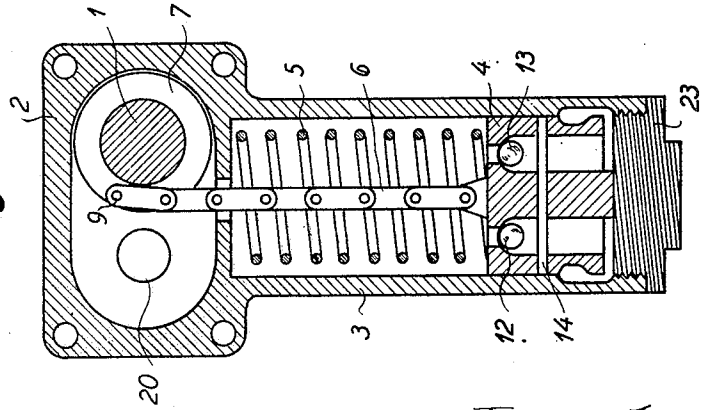


Fig. 1



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Fig. 5

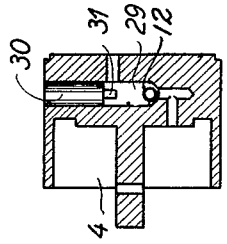
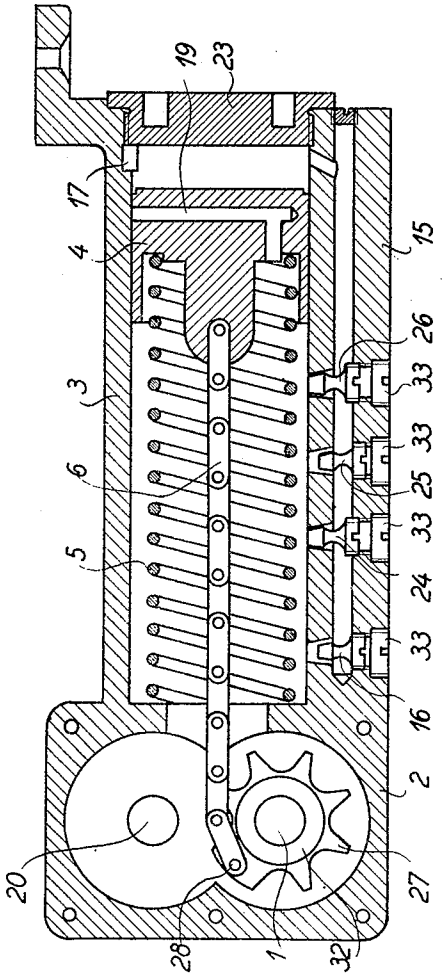


Fig. 4



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CLOSING DEVICE FOR DOORS

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Application May 23, 1946, Serial No. 671,785
In Denmark March 9, 1945

4 Claims. (Cl. 16—55)

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The present invention relates to a closing device for doors provided with a spring-loaded closing lever and oil-brake, and it is especially characterized thereby that the pivot of the closing lever by means of a chain is connected with a compression spring engaging the piston of the brake-cylinder and located in the brake-cylinder, which spring tends to force the piston towards the bottom of the cylinder.

In door closers of the ordinary type the pivot of the closing lever is actuated by a spiral spring of leaf type or by a compression spring surrounding the pivot and tending to give it a turning moment in the same way as a spiral spring. Such door closers are subject to frequent breakdowns, especially by fractured springs, the spring breaking, for instance, at the ends where it is attached to the pivot or to a fixed point in the casing of the pivot, or the springs will become worn and relaxed when used for any length of time. In the present invention an exceedingly great security against spring wear and spring breakage is attained, especially by means of the compression spring inserted between the end of the brake cylinder and the piston, so that a door closer according to the invention will last indefinitely. At the same time the door closer is of especially simple construction permitting of cheap mass production. By the invention the use, for instance, of a crank on the pivot of the closing lever is obviated, such cranks being known in door closers provided with an oilbrake consisting of a cylinder and piston, in which also the piston will have to be constructed in a correspondingly complicated manner. As the brake piston in a door closer according to the invention compresses the spring directly, the closing lever requires adjustment only at the pivot, for instance in known manner by means of a pawl and a pawl wheel attached to the pivot, so as to make the closing lever assume the most expedient position when the door closer is mounted, whereas in door closers of related types in addition to this adjustment the crank must also be made to assume the correct position.

According to the invention the door closer may be constructed in such a way, that the pivot of the closing lever is placed at one end of an oil-tight casing with one end of the pivot resting in a bearing in the bottom of the said casing and with the other end projecting through a cover on the casing, whereas at the other side of the bottom of the casing another bearing is provided to take the lower end of the pivot, so that the pivot of the closing lever may be moved from

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one side of the casing to the other while at the same time the cover of the casing is turned 180° around the pivot. In this way the same door closer may be used either on doors closing to the left or on doors closing to the right, inasmuch as it is possible without difficulty to place the pivot at either side of the casing.

In the following the invention is explained in detail under reference to the drawing in which

Fig. 1 shows a section of the door closer at right angles to the pivot of the closing lever,

Fig. 2 shows a section of the door closer at right angles to the cross-section shown in Fig. 1,

Fig. 3 shows the door closer from the outside in the position shown in Fig. 1,

Fig. 4 shows an amended embodiment in longitudinal cross-section, and

Fig. 5 a longitudinal section of the piston at right angles to the cross-section shown in Fig. 4.

In Fig. 1, 1 is the pivot of the closing lever (not shown), journalled in a casing, 2, rigid with a brake cylinder, 3, in which a brake piston, 4, may move. The position of the piston shown in the drawing will hereinafter be termed the bottom position of the piston. The piston may be drawn from its bottom position against the pressure of compression-spring, 5, by a chain, 6, one end of which is attached to the piston, while the other end is attached to the pivot, 1, for instance, by means of flanges, 7 and 8, on the pivot between which the end link of the chain is inserted and secured by a bolt, 9. As shown in Fig. 2, the pivot, 1, projects through a cover, 10, fitted on the casing, and the passage is made oil-tight by means of an ordinary stuffing box with glands. The pivot, 1, is provided with a fixed ratchet wheel, 11, which in the usual way, by engaging a pawl on the closing lever, will lock the closing lever in position in relation to the pivot, 1. The closing lever and its pawl are not shown in the drawing.

As shown in Fig. 1, the piston is provided with one-way ball-valves, the balls, 12 and 13, of which by means of a pin 14, through the piston are prevented from moving far from their seats. Both the casing, 2, and the cylinder, 3, are filled with oil. When the door closer is mounted and the door is being opened, the pivot, 1, will turn so that the chain, 6, will draw the piston, 4, away from its bottom position and compress the spring, 5. During this operation the oil may freely pass from the upper side of the piston to the lower side through the ball-valves in the piston. The door is closed by means of the spring, 5, by its pressure against the piston, 4,

and through the chain, 6, imparting to the pivot, 1, the turning moment required for the closing of the door. During the closing of the door the spring will press the piston towards its bottom position and the two ball-valves will shut off the flow of oil, so that the oil can pass from one end of the cylinder to the other only through the oil-passage 15, shown in Fig. 2, the opening of which may be adjusted by an adjustment screw, 16, so that by turning this screw it is possible to regulate the rate of speed with which the door closes.

As shown in Fig. 2, the cylinder is near to its bottom provided with a circumferential recess, 17. A groove, 18, is cut in the piston, which groove through passages, 19, is connected with the top of the piston. The effect of this is, that the piston during the latter part of its movement towards bottom position will itself provide a passage for the oil from one side of the piston to the other, so that the braking effect to all intents and purposes is discontinued and the final part of the closing of the door may take place very rapidly.

As viewed in Fig. 1, the pivot, 1, rests in the right side of the casing, 2. In the left side of the same casing is provided a bearing, 20, of the same shape and dimensions as that in which the pivot, 1, rests, as illustrated in the drawings. The cover, 10, is so constructed that when the screws holding it to the casing, 2, are unscrewed it may be removed, turned 180° on the pivot, 1, and returned to place on the casing, 2, whereby the inner end of the pivot, 1, will rest in the bearing in the left side of the casing, 2, see Fig. 1, and use that bearing, 20 instead of a similar bearing, indicated in broken lines in Fig. 2, provided at the right side of the casing 2. In this position of the pivot, 1, the spring and chain will impart to it a turning moment opposite to that imparted to it in the position shown in Fig. 1. It is thus possible by a simple and quick operation to change the door closer so that, it may be used with either a left-hand door or a right-hand door. The cover is kept in place on the casing by means of corner screws, 21.

As in the long run a waste of oil cannot be entirely avoided, the cover, 10, is, as shown in Fig. 3, provided with an oil plug, 22, which may be unscrewed when the door closer is to be refilled. The free end of the cylinder, 3, may, as shown, be closed by means of a screw plug, 23.

In the embodiment shown in Fig. 4, which is provided with a delaying device, no groove is cut in the piston and there is only one passage, 19, for the return of oil during the final shutting of the door; this passage is angular and opens, as before, through the top of the piston and also through the side, near the bottom, of the piston so that shortly before the piston reaches its bottom position the latter opening will be opposite the recess, 17, in the cylinder, whereby the brake resistance will be entirely suspended as hereinbefore described.

The delaying device consists in a control valve, 16, in an oil by-pass, 15, which communicates at its ends with the cylinder as in the embodiment first described, the valve 16 being adjustable so as to vary the size of the oil passage. In addition to this connection between the passage, 15, and the cylinder, another opening with control valve, 24, is provided at such a point of the movement of the piston, 4, from the top end to the bottom end of the cylinder, that the distance corresponds to that angle of the door at which normal closing rate is to intervene. During the first part of the closing movement until the valve, 24, is uncovered by the piston, the rate of closing will, because of the slow passage of the oil through the valve, 16, be very slow and will not increase to normal rate until valve 24 also begins to function. This delaying device may function at any angle of opening between 80° and 270°, the only condition for its action being that the door is opened sufficiently wide. Two additional control valves 25 and 26 are provided in the by-pass 15 to successively function after the valves 16 and 24 to vary the time of the suspension of the delaying action and the commencement of the quicker rate of closing. The foregoing valve passages extend transversely of and between the bypass 15 and the cylinder. These passages each comprise a valve seat for respective cooperation with their valves 16, 24, 25, 26. Where a plurality of axially spaced valves and passages are employed, however, it may be preferred to seal the valves to prevent oil leakage. A preferred sealing arrangement is shown in Fig. 4, wherein the valves have heads, having driver slots, which are threaded into the smaller inner parts of a plurality of recessed or countersunk threaded bores which are aligned with the valve passages, and sealing plugs 33 are threaded into the outer larger parts of said bores. By this latter arrangement, the valves may be adjusted by removal of the desired plugs 33 to expose the desired valves and their driver slots and then resealed by reseating the plugs 33.

A modification of the piston 4 is shown in Fig. 5, wherein the one-way ball valve, containing the ball 12, has a transversely extending portion which is connected adjacent each end to inlet and outlet passages, respectively, and is enlarged to provide a valve chamber 29 inwardly terminating adjacent the inlet passage in a valve seat for the ball valve 12. The outlet passage extends axially from the valve chamber 29 through the bottom of the piston 4 and a plug 30 closes the open rear end of the valve chamber 29 and carries a stop element 31 on its inner end and overlying the outlet passage to prevent the ball 12 from closing the outlet passage.

Fig. 4 shows the chain 6, connected to a sprocket wheel, 27, instead of the flanges, 7, 8, and on which the chain, 6, is wound, being attached to the wheel by a bolt, 28.

In order to eliminate a stuffing-box with glands that have to be re-tightened, the sealing of the journal or shaft opening for the pivot, 1, through the cover is effected by means of a cylindrical rubber gland, 32, fitting tightly around the pivot and kept pressed up against the inner side of the cover.

The outward appearance of the door closer in this embodiment is the same as that of the embodiment first described, and as will appear from the drawing, it is of attractive appearance, built on modern lines, it may easily be mounted as the spring requires no adjustment, and its design permits it to be placed on the inside of the door, also on outer doors opening outwards.

I claim:

1. A door check comprising, in combination, a fluid tight casing forming a cylinder and a chamber at one end of said cylinder, a bearing in said chamber, a pivot in said bearing for connection with a door and to be pivoted by door movement, a piston in said cylinder, a flexible connection

between said piston and said pivot to be coiled about said pivot when the latter is pivoted and thereby pull said piston along said cylinder toward said chamber, a spring in said cylinder and biasing said piston away from said chamber to uncoil said flexible connection, a fluid passage through said piston, a one-way valve in said passage to permit passage of fluid through said piston only when the latter is retracted by said flexible connection, a fluid bypass extending longitudinally of said cylinder and in connection therewith at both ends thereof, an adjustable valve in said bypass for regulating the passage of fluid therethrough, a second oil passage through said piston and opening laterally thereof, and a recess around the end of said cylinder that is remote from said chamber to provide a fluid passage to said laterally opening passage prior to complete retraction of said piston.

2. A door check comprising, in combination, a fluid tight casing forming a cylinder and a chamber at one end of said cylinder, a bearing in said chamber, a pivot in said bearing for connection with a door and to be pivoted by door movement, a piston in said cylinder, a flexible connection between said piston and said pivot to be coiled about said pivot when the latter is pivoted and thereby pull said piston along said cylinder toward said chamber, a spring in said cylinder and biasing said piston away from said chamber to uncoil said flexible connection, a fluid passage through said piston, a one-way valve in said passage to permit passage of fluid through said piston only when the latter is retracted by said flexible connection, a fluid bypass in said casing and extending longitudinally of said cylinder, a series of openings communicating, at both ends thereof, with said bypass and said cylinder and at a plurality of spaced intermediate points along said bypass, a valve seat in each of said openings except the opening at the end of said cylinder remote from said chamber, and an adjustable valve in each of said openings and respectively cooperative with the valve seats therein for selectively regulating the passage of fluid through the several individual openings to control the rate of movement of said piston during its spring biased return away from said chamber.

3. A door check comprising, in combination, a fluid tight casing forming a cylinder and a chamber at one end of said cylinder, a bearing in said chamber, a pivot in said bearing for connection with a door and to be pivoted by door movement, a piston in said cylinder, a flexible connection between said piston and said pivot to be coiled about said pivot when the latter is pivoted and thereby pull said piston along said cylinder toward said chamber, a spring in said cylinder and biasing said piston away from said chamber to uncoil said flexible connection, a fluid passage through said piston and including a valve chamber for said passage and extending transversely of said piston and inlet and outlet passages at opposite ends thereof, a valve seat in said valve chamber adjacent the inlet end thereof, a plug closing said valve chamber at the outlet end, a ball valve in said valve chamber to permit passage of fluid through said piston only when the latter is retracted by said flexible connection, a stop element carried by said plug and extending to coincidence with said outlet passage to preclude the closing of the latter by the ball valve, a fluid bypass extending longitudinally of said cylinder and in communication therewith at both ends thereof, and an adjustable valve in said bypass for regulating the passage of fluid therethrough.

4. A door check comprising, in combination a fluid tight casing forming a cylinder and a chamber at one end of said cylinder, a bearing in said chamber, a pivot in said bearing for connection with a door and to be pivoted by door movement, a piston in said cylinder, a flexible connection between said piston and said pivot to be coiled about said pivot when the latter is pivoted and thereby pull said piston along said cylinder toward said chamber, a spring in said cylinder and biasing said piston away from said chamber to uncoil said flexible connection, a fluid passage through said piston, a one-way valve in said passage to permit passage of fluid through said piston only when the latter is retracted by said flexible connection, a fluid bypass extending longitudinally of said cylinder, a series of openings in communication between said bypass and cylinder at both ends and at spaced intermediate points along said bypass, an adjustable valve cooperative with each opening for selectively regulating the passage of fluid therethrough and piston speed along said cylinder, said valves being recessed in said casing, and removable plugs closing said recesses.

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