

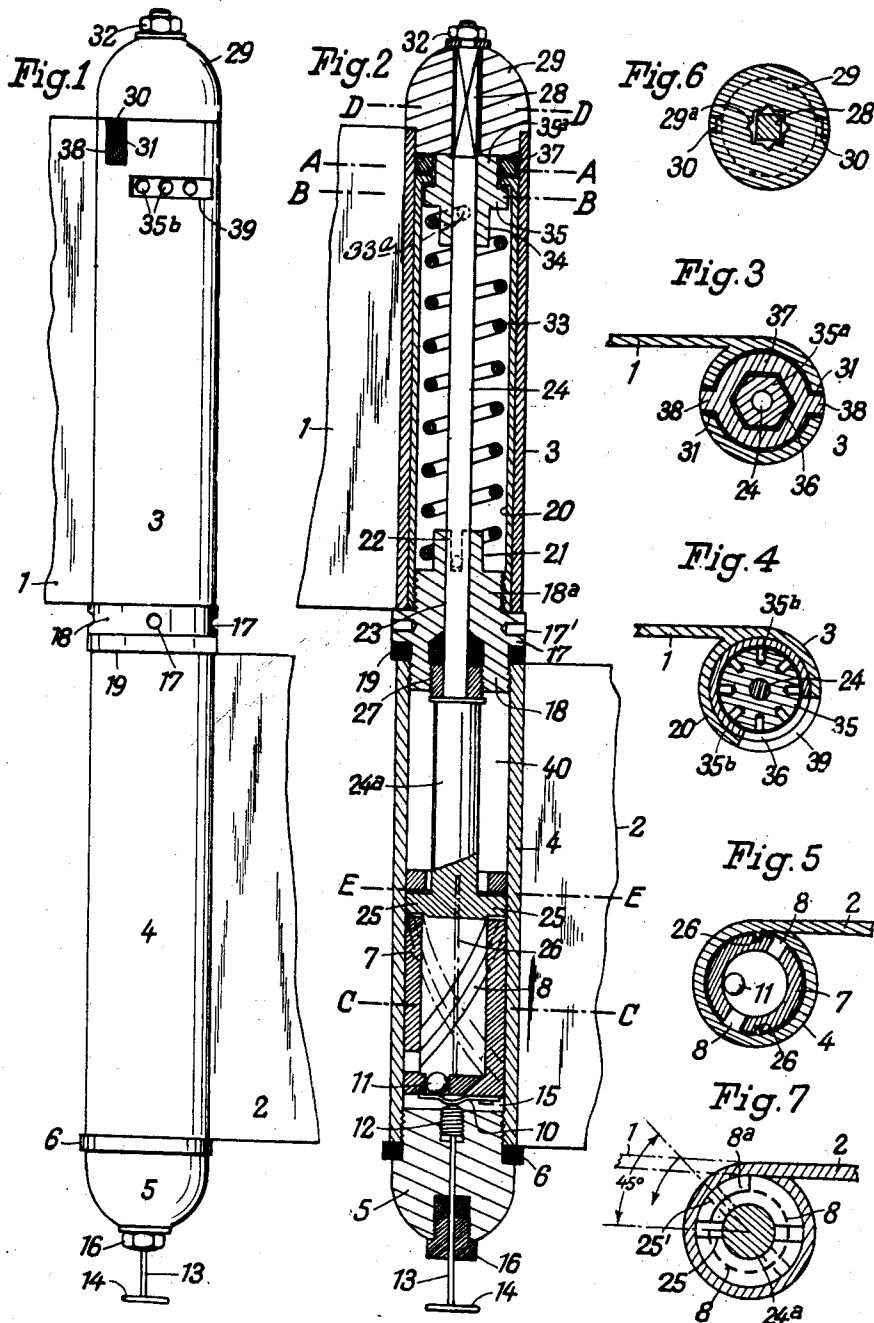
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DOOR HINGE

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UNITED STATES PATENT OFFICE

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DOOR HINGE

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This invention relates to combined door hinges and checks of the type having a closing spring and braking means comprising a fluid container associated with one of the leaves of the hinge and a piston operatively connected by a piston rod to one end of the closing spring.

One object of the present invention is to provide a door hinge and check having means for enabling the braking action to be rendered ineffective during the last part of the closing motion, so that during this part of the closing motion, the door will only be subject to the action of the spring. By this means even large doors will be closed with certainty, even when under the pressure of wind.

Another object of the invention is to provide a door hinge and check in which the braking means can also be adjusted so as to be effective almost up to the end of the closing motion, so that the door may be made to close gently, as is desirable in the case of single house doors, so that the same door hinge and check can be used for doors which are difficult to close as well as easy to close, independently of the amount by which the closing spring is stressed.

In the accompanying drawings a constructional example of the invention is shown,

Figure 1 being an elevation of the self-closing door hinge.

Fig. 2 a longitudinal section, and

Figs. 3 to 7 cross-section through the door hinge on lines A—A, B—B, C—C, D—D, E—E, of Figure 2.

Referring to the drawings, the hinge is provided with two leaves 1, 2, each of which has an integral knuckle 3, 4, respectively, formed in known manner by rolling or curling. The lower end of the knuckle 4 is closed by a solid plug 5, the closure being rendered pressure-tight by means of a sealing ring 6. A piston 7 is slidably arranged inside the knuckle 4, said piston having two opposite-handed helical slots 8, the upper ends of which merge into horizontally extending slots 8a (Fig. 7). In the lower end of the piston is a ball valve 11 which is arranged so as to open outwardly and is held

in position by a retaining spring 10. When the piston is in its bottom position, the end of a screw 12 which is screwed into the plug 5 comes into contact with the spring 10. The screw 12 has an adjusting spindle 13 extending through the plug 5 to the outside and provided with a knurled head 14, so as to enable the screw 12 to be turned to protrude into the space 15 of the cylinder below the piston by an adjustable amount. By this means the moment when the screw 12 will come into contact with the spring 10 of the ball valve can be varied. In order to prevent any possibility of braking fluid escaping between the spindle 13 and the hole in the plug 5 through which the spindle is passed, a gland 16 is provided in the end of the plug 5. The upper end of the hinge knuckle 4 is closed by an intermediate piece comprising two screw-threaded portions 18, 18a on either side of a central portion 17 of larger diameter having radial holes 17' for engagement by a spanner wrench. The portion 18 is screwed into the knuckle 4, the joint being sealed by means of a packing ring 19. The other screw threaded portion 18a of the intermediate piece is screwed into a hollow cylindrical member 20 which extends into the knuckle 3, so as to be a loose fit therein. The portion 18a of the intermediate piece has an extension 21 with a slot 22 therein and the intermediate piece has a hole 23 through which extends a piston rod 24. The lower end 24a of the piston rod 24 is of larger diameter and has a cross-bar 25 integral therewith, the ends of said cross-bar engaging in the slots 8, 8a of the piston 7. The piston 7 is prevented from being turned by the piston rod 24 by means of two longitudinal ribs 26 on the inside wall of the knuckle 4 (Fig. 5), said ribs being in sliding engagement with guide grooves in the wall of the piston. Escape of the braking fluid through the hole 23 in the intermediate piece 17, 18, 18a is prevented by a packing gland 27.

The upper part 28 of the piston rod 24 is of square section and projects beyond the upper end of the knuckle 3, which latter is closed by a plug 29 having an eight-cornered

hole 29a (Fig. 6) through which the part 28 of the piston rod is passed. Two diametrically opposed projections 30 on the plug 29 (Figs. 1 and 6) engage in slots 31 in the upper end of the knuckle 3, the plug 29 being secured in position by a nut 32 screwed on to the upper end of the piston rod, which is screw-threaded for this purpose. A helical spring 33 surrounds the rod 24, the lower end of said spring engaging in the slot 22 in the extension 21 of the intermediate piece 17, while the upper end engages in a hole 33a in a part 34 of a stepped member 35.

The upper part 35a of the member 35 is hexagonal and extends into a corresponding recess 36 in a securing ring 37 (Figs. 2 and 3) which is inserted in the knuckle 3 and prevented from turning by two projections 38 which engage in the slots 31 in the knuckle 3. The member 35 is also provided with holes 35b for a spanner wrench, the knuckle 3 and the pivot 20 being slotted at 39 (Figs. 1 and 4) to enable access to be obtained to the holes 35b.

The door hinge and check operates as follows:

The leaf 2 is mortised into the door post and the leaf 1 into the door. On the door being opened and the leaf 1 being turned on the member 20 relatively to the fixed intermediate piece 17, 18, 18a and the leaf 2, the knuckle 3, by means of the projections 30 (Figures 1 and 6) will turn the plug 29 round with it. By means of the projection 38, the knuckle will turn the ring 37, the recess 36 of which embraces the hexagonal part 35a of the member 35, thereby turning the latter and applying a torque to the spring 33, the lower end of which is prevented from turning by engagement with the part 21 of the fixed intermediate piece 18 whereby the spring is stressed. The rod 24, the square part 28 of which is engaged by the plug 29 turns, together with the latter. If the angular position of the cross-bar 25 is such that the cross-bar is opposite the entrance to the helical slots 8 (Fig. 7), the cross-bar will travel in the slots 8 and move the piston 7 upwards along the ribs 26. The oil within the piston 7 and that in the space 40 above the piston 7 in the knuckle 4 will, thereby, be forced through the ball valve 11 into the space 15 below the piston 7, the ball supported on the spring 10 being forced downwardly. On the door being released, the spring 33 will relax, that is to say it will turn the member 35 back again to its initial position and the hexagonal head 35a will turn the ring 37 round with it, the projections 38 will transmit the rotary motion to the knuckle 3 and thus to the door. At the same time, the plug 29 will turn back with the rod 24 and the bar 25 will force the piston 7 downwards again. The valve 11

is so constructed that it offers more resistance to the return flow of the oil into the space 40 above the piston 7 than to the inflow of the oil into the space 15 under the piston, so that a braking action is produced and shortly before the piston 7 reaches its lowest position the spring 10 will strike the screw 12 and thereby almost completely close the ball valve 11, so that the descending piston 7 will be more strongly braked shortly before its dead centre, that is shortly before the door lock snaps to.

When the braking action is to be made entirely ineffective through a considerable angle, the plug 29 on the square part 28 is removed and the piston rod is turned (in the present example through 45°), so that the cross-bar will occupy the position indicated by 25' in Figure 7, which is made possible by the horizontally extending grooves 8a. The plug 29 is thereupon replaced and screwed down tightly. On the door being opened through about 90°, the spring 33 will be stressed during the whole of the opening angle, but the piston will be raised only during the second half of the opening angle. In a corresponding manner the door is braked during the closing motion until it has reached a closing angle of 45°.

When this position is reached, the cross-bar 25 leaves the helical grooves 8 and enters the horizontal grooves 8a, that is to say the braking action already ceases at this position and the door, which is now only subject to the force of the closing spring 33, is closed by the spring without being braked. The angle of displacement of the cross-bar 25 with respect to the piston 7 depends on the square part in the plug 29. In the present case a star shaped eight cornered hole is provided, but of course a twelve cornered hole might be used, which will allow of a displacement through 30°. The displacement and the locking of the square part 28 in the plug 29 can also be effected by other means, for instance by inserted pins and with a finer angular sub-division.

What I claim is—

A combined door hinge and check, comprising in combination a pair of leaves, a closing spring having its ends secured respectively to said leaves, a fluid container associated with one of said leaves, a non-rotatable brake piston slidable in said container and having guideways therein extending in part helically and in part parallel to a plane normal to the longitudinal axis of the piston, a piston rod having a cross-bar thereon in engagement with said guideways, a closing cap secured on the other leaf, said closing cap and the end of the piston rod remote from the piston having mutually engaging securing means for adjustably securing the said end of the piston rod to the second mentioned leaf with the cross-bar of

the piston rod in various angular positions with respect to the piston, so as to enable the engagement of the cross-bar with the helically extending part of the guideways to take place at different periods of the opening movement of the door, as and for the purposes set forth.

In testimony whereof I have signed my name to this specification.

FRIEDRICH KREINER.

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