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HYDRAULIC DOOR CHECK

Filed Aug. 7, 1944

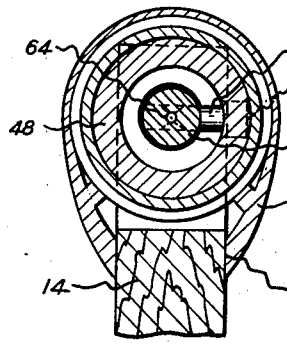


Fig. 2.

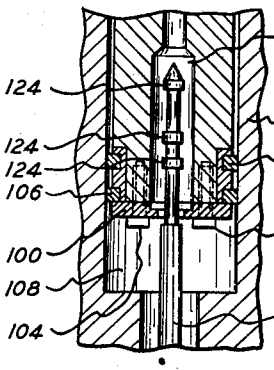


Fig. 3.

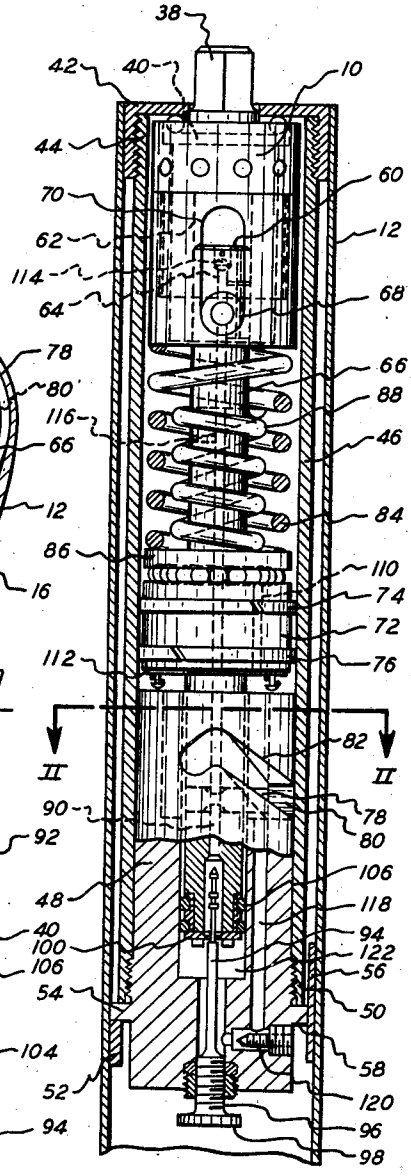


Fig. 1.

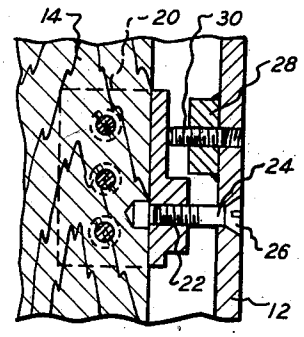


Fig. 4.

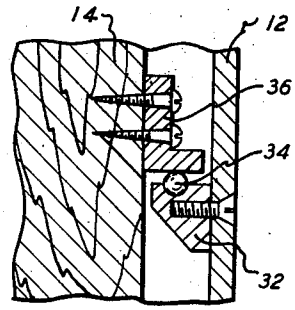


Fig. 5.

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HYDRAULIC DOOR CHECK

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4 Claims. (Cl. 16—55)

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The present invention relates to improvements in hydraulic door checks.

One object of the present invention is to provide an improved door check that may be mounted directly in the door structure.

Another object of the invention is to provide an improved door check which functions to swing the door toward a closed postion, having one or more "hesitations" for the convenience of persons passing through the door.

Other objects and advantages of the present invention reside in the construction, arrangement and combination of parts, which will more fully appear from a consideration of the following specification and annexed claims.

In the illustrated form of the invention shown in the accompanying drawings,

Fig. 1 is a vertical cross-sectional view of a portion of a door construction embodying the present invention,

Fig. 2 is a cross-sectional view of the hinge column of the door structure taken on lines II—II of Fig. 1,

Fig. 3 is a fragmentary enlargement of the "hesitation" valve contruction shown in Fig. 1,

Fig. 4 is a fragmentary enlargement of a portion of the door detail showing lateral adjustment of the door structure, and

Fig. 5 is a fragmentary enlarged detail of the antifriction support for the adjusted door section.

For a more detailed discussion of the door construction in which the present invention is illustrated, reference may be had to United States Patents No. 2,323,625 and No. 2,325,711.

The improved hydraulic door check, generally designated by reference character 10, is shown housed in an extruded metal hinge column 12 in the upper portion thereof. The main door section 14 is received through the longitudinal slot portion 16 on the column 12, the section 14 being notched out to provide a clearance for the check unit 10.

In Figs. 4 and 5 the manner in which section 14 is supported and adusted within the column 12 is illustrated. As shown, section 14 is provided with an inserted metal section 20 having a threaded bolt 22 to take the adjustment screw 24 which may be provided with a screw driver head 26. Threaded in a thickened portion 28 of the column 12 is a locking screw 30. Through the proper adjustment of the screws 24 and 30, it should be apparent that the door section 14 may be adjusted relative to the column 12.

In Fig. 5 the manner in which the door section is supported in the column 12 is illustrated.

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This construction consists of a bearing block 32 supported from the column 12 and carrying an antifriction roller 34. The door section 14 carries a flange plate 36 which rests on the element 34 to support the weight of the door section 14 and at the same time permits lateral relative adjustment between the column 12 and the section 14, as shown in Fig 4.

The hydraulic door check and associated structure comprises a square driver portion 38 adapted to be received in a similarly shaped female member supported in the door frame in a well-known manner. A thrust bearing is indicated at 40 and supports the door for suitable movement through the upper cap 42, which is slidably received within the column 12 and has threaded connection at 44 in the main outer cylinder 46 of the door check. The lower body portion 48 of the check is threaded on the cylinder at 50. A stop 52 engaging with a lug 54 locates the cylinder 46 and body 48 and their associated structure within the column 12. The key spline 56 and key 58 prevent relative rotation between the cylinder 46 and body 48, and the door structure elements 12 and 14.

Fixed with the driver 38 is an upper body portion 60 in which is a vertical bore 62 to receive the upper end 64 of the shaft 66. A cross pin 68, carried by the shaft 66, operates in the cross slot 70 of the body 60. Fixed to the central portion of the shaft 66 is the piston 72 having piston rings 74 and 76. At the lower portion of the shaft 66 is a pin 78 carrying a roller 80 which is adapted to operate in the slot 82 defined in the body 48.

With the parts in position as shown in Fig. 1, the door is in its closed position with the spring 84 reacting against the body 60 and the shaft 66 through the spring seat 86 to position the roller 80 in the extreme lower position of the groove 82. When the door is swung open relative rotation between the shaft 66 and the body 48 will advance the roller 80 upwardly along the groove 82, raising the shaft 66 and compressing the spring 84 in its initial movement and both the spring 84 and the spring 88 on subsequent movement, nested springs being employed to build up greater tension with initial light tension with the door in a closed position.

Extending throughout the entire length of the shaft 66 is a centrally located hole 90, which is enlarged at 92 to receive the "hesitation" valve 94, the latter being adjustably supported through a threaded connection 96 in the body 48 and actuated through a thumb screw 98. Attached

to the lower end of the shaft 66 is an orifice plate 100 having an orifice 102 of predetermined area through which the valve 94 extends. Screws 104 hold the orifice plate 100 in position. Piston rings 106 seal the shaft 66 for fluid tight reciprocation in the cylinder 108, defined in the body 48..

When the door is opened, the hydraulic fluid above the piston 72 passes down through the by-pass 110 past the plate valve 112. To lubricate the upper portion of the check, a certain amount of oil passes up through the hole 90 around the pin 68 and up through the top of the shaft 66 past the ball check 114. The majority of fluid, however, passing upwardly through the hole 90 enters the chamber above the piston 72 through the by-pass 116.

After the door has been opened and has been released to its closing movement, the tension built up in the springs 84 and 88 tends to lower the shaft 66 and its associated parts. At this time the fluid that is trapped between the lower side of the piston 72 and the top of the body 48 is forced down through the passage 118, past the adjustable metering valve 120 and into the chamber 122. The rate at which the fluid in the chamber 122 is permitted to enter the enlarged opening 92 and passed upwardly through the hole 90 depends upon the area between the orifice 102 and the "hesitation" valve 94. It will be noted from Fig. 3 that the valve 94 has spaced cylindrical portions 124 which are capable of passing through the orifice 102, but restrict the same to a greater extent than the portion of the valve 94 between the portions 124. This arrangement causes the door on closing to hesitate one or more times. In practice it has been found desirable to have a hesitation at the point that the door is normally opened when first passing through the same and a hesitation just prior to the time the door is completely shut to avoid slamming. If desired one or more hesitations may be provided in between these points. It will be understood that the location of the spaced portions 124 will determine the points of hesitation in the closing arc of the door.

Having thus described our invention what we desire to secure by Letters Patent and claim is:

1. A hydraulic door check comprising spring means in which energy is stored up on opening movement of a door, a cylinder, a piston operating in said cylinder, said spring means acting against said piston to displace hydraulic fluid from said cylinder, valve means for controlling movement of said piston and the rate of dissipation of said spring, and means associated with said valve means including axial spaced portions of similar cross section separated by portions of lesser cross section for providing first an increasing then a decreasing and finally an increasing rate of restriction during movement of said piston prior to an increasing restriction at the time of complete closing.

2. A hydraulic door check comprising a cylinder, a piston operating in said cylinder, means

adapted to be associated with movement of the door to move said piston in one direction upon opening of the door, a spring actuated by said piston to store up energy to close the door, means for admitting hydraulic fluid to one side of said piston upon opening movement of the door, valve means for regulating the discharge of hydraulic fluid from said cylinder to regulate the rate of closing of the door, said valve means including an orifice, a valve member working in said orifice, one of said valve elements being movable with said piston, one of said valve elements having suddenly variable restricting structure longitudinally thereof to impart one or more sudden pauses or hesitations prior to the full closing action of the door.

3. A hydraulic door check comprising spring means, means for storing up energy in said spring, adapted to be actuated upon swinging movement of the door, a hydraulic fluid circuit, a motion damping element operating in said circuit and operatively connected to said spring means to control the rate of dissipation of the spring energy, valve mechanism located in said circuit for suddenly decreasing and increasing the rate of dissipation during the closing movement of the valve to provide sudden pauses or hesitations in the door closing movement, said valve mechanism comprising a part longitudinally moved upon dissipation of spring energy, an orifice or fixed area defined in said part, longitudinally adjustable valve part projecting through said orifice, longitudinally displaced portions on said valve part of suddenly different areas for positioning in said orifice upon movement of said valve part and a fixed structure in which said valve part is mounted and longitudinally adjusted relatively to said orifice.

4. A hydraulic door check comprising spring means in which energy is stored up on opening movement of the door, a cylinder, a piston operating in said cylinder, said spring means acting against said piston to displace hydraulic fluid from said cylinder, valve means for controlling movement of said piston and the rate of displacement of said spring, and means associated with said valve means including axial spaced portions of larger cross section separated suddenly by portions of lesser cross section, for providing sudden pauses or hesitations in the closing movement of the door.

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The following references are of record in the file of this patent:

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