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SELF-CLOSING CONCEALED HINGE
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This invention relates to new and useful improvements in hinging, closing and checking means for doors, and the principal object of the invention is to provide, in conjunction with a fixed wall having a door opening and a door, a concealed hinge for the door and an improved concealed door closing and checking device operatively connected to the hinge.

As such, the concealed hinge is of the type disclosed in my United States Patent No. 2,709,276, issued May 31, 1935, while the closing and checking device in accordance with this invention is an improvement on the device disclosed in U.S. Patent No. 2,024,472, issued December 17, 1935, to Lewis C. Norton.

An important feature of the invention resides in the combination of the concealed hinge with the concealed closing and checking device so that no swinging, exposed arms are required for operative coaction between the fixed wall and the door, while another important feature resides in mounting the closing and checking device in a recess in the fixed wall rather than in the door, so that the size and operating capacity of the device is not limited by the thickness size of the door. Still another important feature of the invention resides in certain structural and functional improvements in the operating mechanism of the closing and checking device itself.

Some of the advantages of the invention lie in its simplicity of construction, dependable operation, and in its adaptability to economical manufacture.

With the foregoing more important objects and features in view and such other objects and features as may become apparent as this specification proceeds, the invention will be understood from the following description taken in conjunction with the accompanying drawings, wherein like characters of reference are used to designate like parts, and wherein:

FIGURE 1 is a fragmentary vertical sectional view of an embodiment of my invention installed on a fixed wall and a door;

FIGURE 2 is a plan view of the invention installed on the wall and door shown in horizontal section; and

FIGURE 3 is an enlarged plan view of the self-closing, concealed hinge means.

Referring now to the accompanying drawings in detail, the numeral 10 designates a fixed wall having a door opening 11, while 12 indicates a door swingable through approximately 180° from its closed position in the opening 11 to its open position indicated by the dotted lines 12a. The door 12 is supported by concealed hinge means designated generally by the numeral 13, which are of the type disclosed in my aforementioned Patent No. 2,709,276 and require no detailed description herein except to say that such hinge means include a pair of butt members 14, 15 and a two-part link unit 16 hingedly coupling the butt members together. The butt member 14 is secured by suitable screws 17 in a relatively shallow recess 18 formed in the door 12, as will be readily apparent.

The improved concealed door closing and checking device is designated in general by the numeral 20 and is mounted in an elongated recess 21 formed in the fixed wall 10 adjacent the door opening 11. The device 20 is supported in a frame or channel constituted by elongated upper and lower plates 22, 23, the latter being provided with an inverted L-shaped extension 24 which underlies the adjacent end portion of the plate 22 and,

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together with the latter, is secured by suitable screws 25 to a supporting angle bracket 26. The bracket 26 is fastened by suitable screws 27 to the wall 10, being disposed in a cavity 28 formed in the wall at the top of and in communication with the inner end portion of the recess 21. The aforementioned butt member 15 of the hinge means 13 is secured within the outer end portion of the recess 21 by being fastened to the underside of the plate 22 by suitable screws 29, and is also secured to the wall 11 by the screws 30.

The device 20 embodies in its construction an elongated housing 31 which forms a cylinder 32 therein, a chamber 33 for checking fluid being provided intermediate the ends of the cylinder as shown. The ends of the cylinder are equipped with closure plugs 34, 35 and the portion of the housing 31 adjacent the plug 34 is provided with a longitudinal fluid passage 36 communicating with the chamber 33 and equipped with longitudinally spaced ports 37, 38 in communication with the adjacent end portion of the cylinder 32. A door closing speed regulating needle valve 39 and a door latching speed regulating needle valve 40 cooperate with the respective ports by engaging seats 41, 42 formed in the passage 36, the valve 39 being located between the chamber 33 and the port 37 while the valve 40 is between the two ports 37, 38, whereby the valve 39 controls the flow of fluid through both ports and the valve 40 through the port 38 only, all as in the aforementioned Patent No. 2,024,472. It is to be noted that the valves 39, 40 project upwardly through openings in the plate 22 and are readily accessible from the cavity 28 upon removal of a cover plate (not shown). A suitable filler plug 43 is provided for the fluid chamber 33 and is also accessible through an opening in the plate 22. The entire housing 31 is secured to the underside of the plate 22 by a set of screws, some of which are shown at 44.

A plunger 45 is reciprocable in the cylinder 32 toward and away from the end plug 34 and consists of a pair of coaxial, axially spaced pistons 46, 47 which are connected together by a toothed rack 48. The latter meshes with a pinion 49 on a shaft 50 which is rotatably journaled in a bottom bearing 51 and an upper bearing plug 52 in the housing 31. In the device disclosed in Patent No. 2,024,472 the shaft 50 is operatively connected to pivoted arms to effect sliding of the plunger when the door is opened and closed, but in the embodiment of my invention such arms are not provided since means, hereinafter described are used to operatively connect the plunger to the hinge means 13.

A compression spring 53 is provided in the cylinder 32 between the end plug 35 and the piston 47 of the plunger 45 so as to urge the plunger toward the end plug 34. The piston 46 has a check valve 54 provided therein, which permits free fluid flow through the piston during opening of the door when the plunger 45 travels in the direction of the arrow 55, but prevents flow of fluid through the piston when the plunger travels in the opposite direction during closing of the door, whereby fluid is forced by the piston 46 through the ports 37, 38 and passage 36 back into the chamber 33.

A stem 56 extends through the spring 53 and is screw-threadedly secured at one end thereof to the piston 47, while the other end portion of the stem is slidable in and projects outwardly through a bore 57 formed in the end plug 35 and is operatively connected to a pin 15' of the two-part link unit 16 in the butt member 15 of the hinge means 13. Packing rings 58 are provided in the plug 35 to prevent leakage of fluid around the stem 56, and it will be understood from the foregoing that when the door 12 is opened, the link unit 16 of the hinge means 13 will cause the stem 56 to slide in the direction of the arrow

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55, thus compressing the spring 53 and passing fluid through the check valve 54 into the end portion of the cylinder 32 between the piston 46 and the plug 34. Thereupon, when the opening force on the door is discontinued, the spring 53 will slide the plunger 45 and stem 56 in the relatively opposite direction, thus causing the link unit 16 to close the door in a controlled manner governed by the checking action of fluid passing through the ports 37, 38 and passage 36.

A check valve 59 is provided in the piston 47 to facilitate flow of fluid into the portion of the cylinder occupied by the spring 53 during the closing movement of the door.

While in the foregoing there has been described and shown the preferred embodiment of the invention, various modifications may become apparent to those skilled in the art to which the invention relates. Accordingly, it is not desired to limit the invention to this disclosure and various modifications and equivalents may be resorted to, such as may lie within the spirit and scope of the invention as claimed.

What is claimed as new is:

1. For use with a concealed door hinge, a concealed door closing and checking device comprising an elongated housing formed with a cylinder therein and with a fluid chamber intermediate the ends of said cylinder, a plunger reciprocable in one end portion of said cylinder and including first and second coaxial pistons secured together in axially spaced relation, the first piston and said housing at said one end portion of the cylinder being provided with fluid passage means communicating with said fluid chamber, a compression spring provided in the other end portion of said cylinder in abutment with the second piston of said plunger, a stem extending through said spring and connected at one end thereof to said second piston, the other end portion of said stem projecting outwardly from said housing and being operatively connected to said door

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hinge, said second piston having a fluid passage, and a check valve provided in said fluid passage.

2. For use with a concealed door hinge, a concealed door closing and checking device comprising an elongated housing formed with a cylinder therein and with a fluid chamber intermediate the ends of said cylinder, a plunger reciprocable in one end portion of said cylinder and including first and second coaxial pistons secured together in axially spaced relation, the first piston and said housing at said one end portion of the cylinder being provided with fluid passage means communicating with said fluid chamber, a closure plug provided on said housing at the other end of the cylinder and formed with an axial bore, a stem disposed axially in the cylinder and secured at one end thereof to the second piston of said plunger, the other end portion of said stem extending slidably through the bore of said closure plug to the outside of said housing for operative connection to a concealed door hinge, a compression spring surrounding said stem in said cylinder in abutment with said closure plug and said second piston, said second piston being provided with a fluid passage, and a check valve positioned in said fluid passage of the second piston.

3. The device as defined in claim 2 wherein said check valve permits flow of fluid only from said chamber into said other end portion of said cylinder.

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