

May 31, 1938.

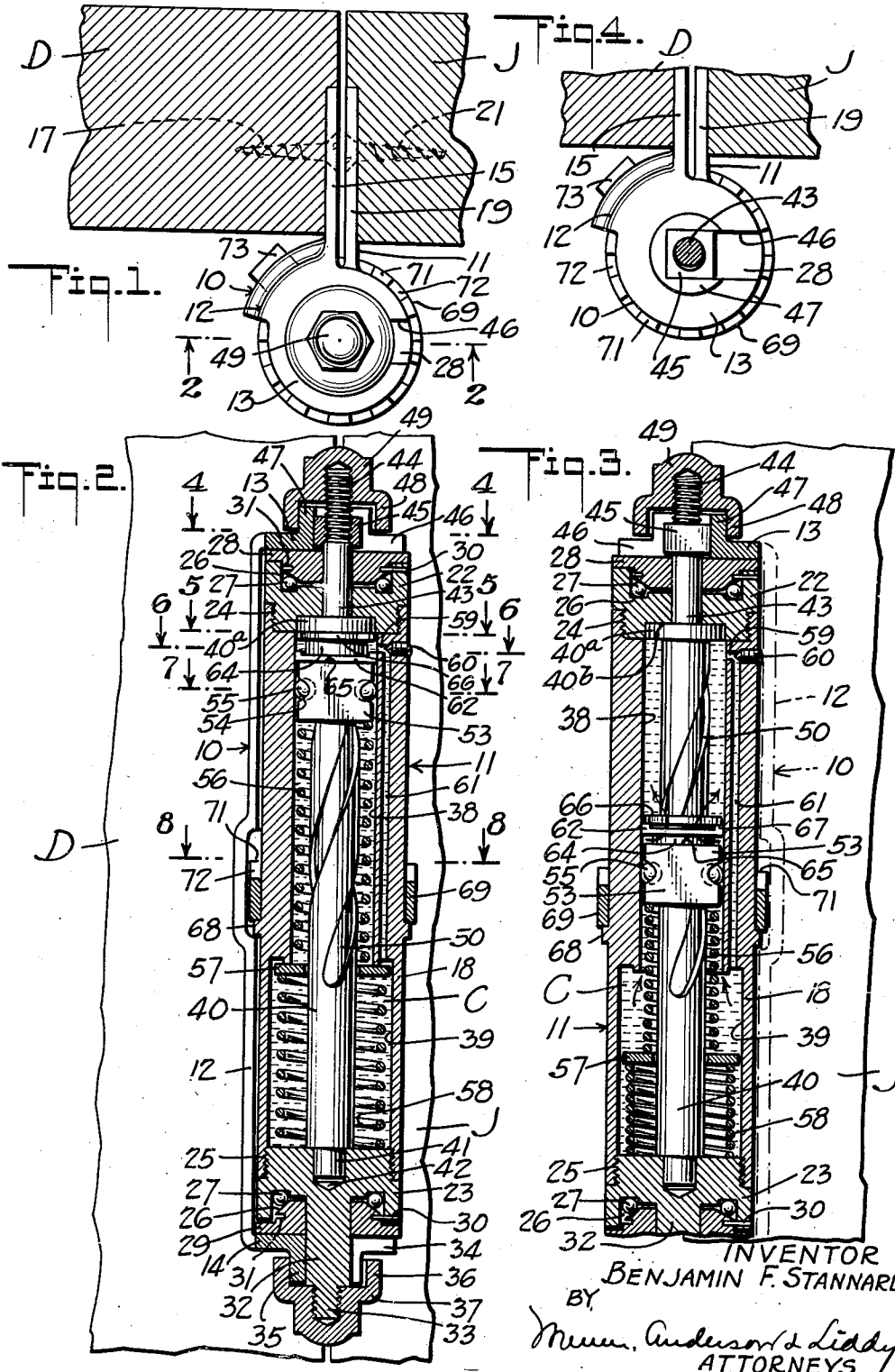
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CLOSURE CONTROLLING DEVICE

Filed May 20, 1936

2 Sheets-Sheet 1



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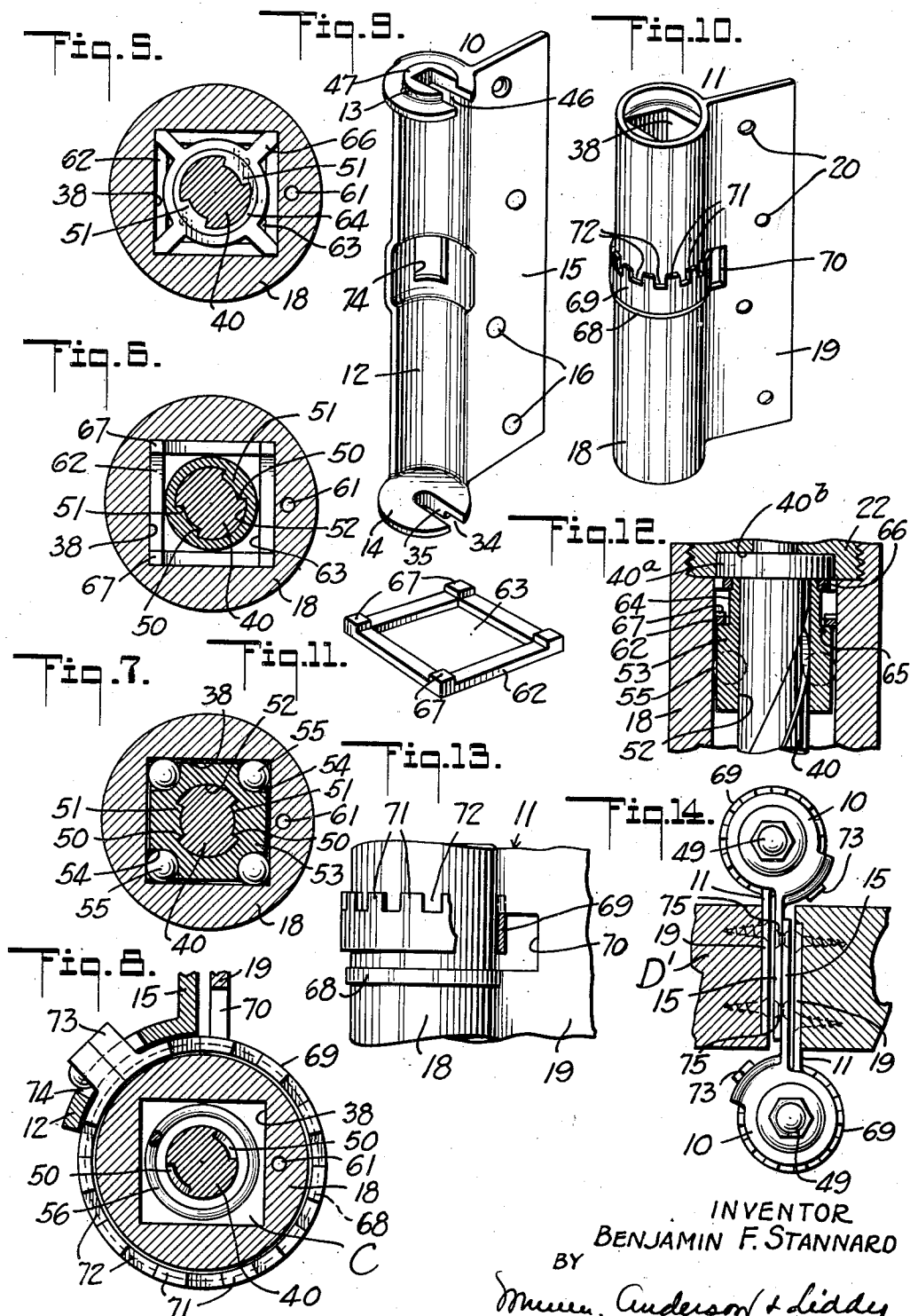
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## UNITED STATES PATENT OFFICE

2,118,950

## CLOSURE CONTROLLING DEVICE

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6 Claims. (Cl. 16—54)

This invention relates generally to closures, such as hingedly mounted doors, and more particularly to devices for automatically closing and checking the closing movement of doors.

5 An object of the invention is to provide a simple, compact and positively acting device which embodies means for effectively closing and checking the closing movement of a door in a manner to prevent slamming of the door and insure that  
10 the door when released from an open position will be moved to its closed position smoothly and silently, and irrespective of the extent to which the door is opened.

Another object of the invention is to provide  
15 a closure controlling device of the above described character which is further structurally characterized to provide a hinge for the door so as to form a single unit having the general exterior appearance and approximate dimensions of a  
20 conventional hinge, thus entirely obviating the present practice of employing a separate door check.

A further object of the invention is to provide a door checking hinge embodying means by which  
25 the door can be retained in various open positions, and instantly released therefrom when desired, so as to permit unrestricted movement of the door.

With these and other objects in view, the invention consists in the combinations and arrangements of elements as set forth in the following specification and particularly pointed out in the appended claims.

In the accompanying drawings,  
35 Figure 1 is a view showing in top plan the closure controlling device applied to a door;

Figure 2 is a vertical sectional view taken on the line 2—2 of Figure 1 and illustrating the positions occupied by the working parts of the  
40 device when the door is closed;

Figure 3 is a view similar to Figure 1 and illustrating the position occupied by the working parts in a substantially 180° open position of the  
45 door;

Figure 4 is a horizontal sectional view taken on the line 4—4 of Figure 2;

Figures 5, 6, 7, and 8 are enlarged horizontal detail sectional views taken, respectively, on the lines 5—5, 6—6, 7—7 and 8—8 of Figure 2;

50 Figure 9 is a perspective view of one hinge member of the device;

Figure 10 is a perspective view of the other hinge member of the device;

Figure 11 is a perspective view of a check valve  
55 member embodied in the device;

Figure 12 is a fragmentary vertical sectional view of the check valve mechanism;

Figure 13 is a fragmentary view in side elevation illustrating a door holder embodied in the device;

Figure 14 is a top plan view of a double acting  
5 hinge embodying two of the closure controlling devices.

Referring specifically to the drawings, this invention comprises metallic hinge members 10 and 11, the former constructed to provide an elongated and substantially quarter-cylindrical portion 12 from the ends of which project transverse circular heads 13 and 14, and from one longitudinal edge of which projects a rectangular attaching plate 15 having openings 16 through which screws 17 are adapted to be extended to secure the member to the hinge edge of a door D.

The member 11 is constructed to provide an elongated and externally cylindrical portion or casing 18 which is of the same diameter as that of the heads 13 and 14, from which radially projects an attaching plate 19 having openings 20 receiving screws 21 to secure such member to the jamb J of the door D.

The ends of the casing 18 are closed by plugs 22 and 23 threaded at 24 and 25, respectively, in the casing, and having raceways 26 receiving balls 27 confined in the raceways by thrust washers 28 and 29 retained against axial displacement from the respective plugs by pins 30 projecting from the latter into annular grooves 31 in the washers..

Projecting axially from the lower plug 23 through the washer 29 is a trunnion 32 terminating in a threaded stud 33 and adapted to be freely received in a radial slot 34 formed in the head 14 and bounded by a collar 35 adapted to be received within the annular flange 36 of a cap nut 37 when screwed on the stud 33 as shown in Figure 2.

The upper portion of the casing 18 is provided with a non-circular bore 38 which in the present instance is of square cross-section, whereas the remaining portion of the casing is provided with an enlarged circular bore 39. Extending axially through the bores 38 and 39 is an actuating member in the form of a shaft 40, the lower end of which is provided with a trunnion 41 journaled in a socket 42 in the plug 23. The upper end of the shaft 40 is provided with a relatively long trunnion 43 journaled in the plug 22 and extending through the washer 28. Beyond the washer 28 the trunnion 43 is left-hand threaded at 44 to receive a nut 45 which is screwed tightly onto the trunnion and is received in a radial slot 46 in the head 13.

This slot is bounded by a collar 47 adapted to be received within the annular flange 48 of a cap nut 49 when screwed onto the trunnion 43. The slot 46 and nut 45 co-act in compelling the shaft 40 to rotate in the plugs 22 and 23 and with the hinge member 10 when hinging movement of the latter relative to the member 11 is effected, all for a purpose to be hereinafter described. It is to be particularly noted that with the hinge members 10 and 11 secured, respectively, to the door D and jamb J, as shown in the drawings, the door can be hung and unhung when the cap nuts 37 and 49 are removed, as the hinge member 10 can be separated laterally from the hinge member 11 by the provision of the radial slots 34 and 46 in the heads 14 and 13, respectively, which permit the trunnions 43 and 32 to be disengaged from the heads. However, it will be readily apparent that when the cap nuts are applied as shown in Figure 2, they co-act with the collars 35 and 47 to maintain the hinge members 10 and 11 connected co-axially in proper hinging relationship.

The actuating shaft 40 is provided with spiral grooves 50—50 along that portion of its length in the non-circular bore 38 of the casing 13; and into these grooves project spiral teeth 51—51 formed in the bore 52 of a follower member 53. This follower member is in the form of a square block loosely fitting the bore 38 and having seated in pockets 54 at its corners, balls 55 which have rolling contact with the walls of the bore 38, all as clearly shown in Figures 3 and 7. It will thus be apparent that as the shaft 40 is rotated relative to the casing 13 upon each hinging movement of the member 10 relative to the member 11 as will effect opening of the door D, the spiral grooves 50 co-act with the teeth 51 to feed the follower member 53 axially on the shaft 40 from its position shown in Figure 2 towards the position shown in Figure 3.

Surrounding the shaft 40 and having one end abutting the follower member 53 is a coil spring 56, the other end of which abuts a disk 57 freely receiving the shaft. A second and larger coil spring 58 surrounds the shaft within the bore 39 and abuts the disk and the lower plug 23. Thus as the follower member 53 is axially fed as aforesaid, the springs 56 and 58 will be loaded by being compressed so as to tend to close the door.

The bores 38 and 39 together form a fluid chamber C, and all unoccupied space therein is filled with a suitable liquid, such as castor or other oil which acts as a checking medium to the closing movement of the door, and is supplied to the chamber through a port 59 in the casing 13 communicating with the upper end of the chamber. This port is closed by a removable plug 60 which also functions as a valve to control a by-pass duct 61 extending in the wall of the casing from the port 59 so as to open into the chamber C at the upper end of the enlarged bore 39. In order to prevent leakage of liquid from the chamber C, the shaft 40 is provided with a collar 40a which has a ground joint in a circular pocket 40b formed in the plug 22.

The follower member 53 carries a check valve 62 in the form of a square washer having a running fit in the bore 38 and provided with a square opening 63 freely receiving a reduced cylindrical extension 64 on the follower member. This valve is axially movable relative to the follower member between a shoulder forming a seat 65 thereon and a stop collar 66 on the extension 64 which collar is in the form of a four-armed spider as

clearly shown in Figure 5. When the valve 62 occupies the one extreme position against the shoulder 65, as shown in Figure 2, the valve is closed so as to function in preventing the flow of liquid downwardly in the chamber C from above the valve. However, when the valve 62 occupies its other extreme position shown in Figure 3 wherein it is spaced from the stop collar 66 by lugs 67 at the four corners of the valve which directly abut the stop collar as shown in Figure 3, the valve is open to permit the flow of liquid upwardly in the chamber past the valve from beneath the latter.

The operation of the invention is as follows:

With the door closed, the parts of the device occupy the position shown in Figure 2. Upon initiating opening movement of the door a corresponding angular movement of the shaft 40 will be effected to cause its grooves 50 to coact with the teeth 51 of the follower member 53 in feeding the latter downwardly in the chamber C so as to compress and thus load the springs 56 and 58. As this movement of the follower member is initiated, the pressure thereby imposed on the liquid in the chamber beneath the follower member will act against the check valve 62 to open the latter so that the liquid can thus flow past the valve as indicated by the arrows in Figure 3, as well as flow upwardly through the by-pass duct 61 and port 59 into the upper end of the chamber. It will thus be apparent that the opening movement of the door will be practically unrestricted by the liquid, and will serve to load the springs 56 and 58.

Upon releasing the door, the springs 56 and 58 will, of course, urge the door closed, but the closing movement of the door will be effectively resisted and checked by the liquid in the chamber C, as upon initiation of the reverse movement of the follower member 53, the pressure imposed on the liquid in the chamber above the follower member will act against the check valve 62 to close the latter so that the liquid in advance of the valve will be forced to flow through the restricted port 59 and duct 61, in order to permit circulation of the liquid. The rate of closing movement of the door can be varied by an adjustment of the plug 60 to vary the flow of liquid through the port 59, as will be understood.

Mounted on the casing 13 to normally rest by gravity upon an annular shoulder 68 disposed medially between the ends of the casing, is a sleeve 69 which constitutes a holding means and passes freely through a slot 70 in the portion 19 of the member 11. This sleeve is provided on its upper edge with a circular series of teeth 71 produced by forming substantially square notches 72 in the sleeve. The sleeve is also provided with a radial lug 73 which projects into a slot 74 in the portion 12 of the member 10 so that the sleeve is compelled to move with this member, yet is capable of vertical adjustment on the casing 13 from the annular shoulder 68.

When it is desired to retain the door in an open position, the sleeve 69 is raised to the position shown in Figure 13, wherein one of its notches 72 receives the material of the attaching plate 19 at the upper edge of slot 70, so that by temporarily holding the sleeve raised until the door is released, the action of the springs 56 and 58 tending to close the door will force one of the teeth 71 tightly against the attaching plate 19, so as to thus maintain the sleeve 69 raised and the door open. However, when it is desired to close the door, it is only necessary to initiate fur-

ther opening movement of the door which will free the sleeve so that the latter will gravitate to its inactive position shown in Figure 1, and thereby permit the door to close when released.

5 In Figure 14, two of the devices embodying this invention are utilized to form a double acting hinge which will function to permit unrestricted opening movement of a door D' to either side of a doorway, and yet properly check the closing  
10 movements of such a door. In this use of the invention, the attaching plates 15 of the devices are permanently secured together by suitable fastening members 75, and the other attaching plates 19 of the devices respectively secured to the door  
15 and jamb, as shown in this figure.

However, one of the devices must be slightly modified in such an installation by providing the shaft 40 and follower member 53 with spiral grooves 50—50 and teeth 51—51, respectively,  
20 which are reversed from the corresponding parts of the other device which will be clearly understood in view of the swinging of the door to either side of the doorway effecting opposite movements of the follower members of the respective devices.

25 What is claimed is:

1. A checking hinge for closures comprising a pair of hingedly connected hinge members one of which is provided with a casing having a bore at least a portion of which is non-circular, and defining a fluid containing chamber; an actuating shaft in the chamber, fixed to hingedly move with the other of said members and disposed in co-axial relationship to the axis of the hinged connection between the hinge members; a member  
30 mounted on the shaft and confined by said non-circular portion of the bore against rotation with the shaft; spring means in said chamber operatively associated with said member; means on the shaft and said member co-acting to feed the latter in one direction axially of the chamber and load said spring means in response to relative  
35 hinging movement of the hinge members in one direction; and a valve plate snugly fitting said non-circular portion of the bore and mounted on said member for a limited movement relative thereto to occupy an open or closed position according as said member is fed axially in one direction or the other; and means defining a by-pass  
40 duct in the casing through which fluid can circulate in the chamber from one side of the valve plate to the other.

2. A hinge for closures comprising a pair of hinge members one of which is provided with trunnions having screw-threaded portions at its  
55 ends, and the other with spaced heads provided with radial slots receiving said trunnions to co-axially relate said members; collars on the heads, bounding said slots, and nuts threaded onto said portions of the trunnions and having flanges receiving said collars to connect and retain the  
60 hinge members in co-axial hinging relationship.

3. A hinge for closures comprising a pair of hinge members one of which is provided with a

fluid containing casing having a trunnion projecting from one end; an actuating shaft journaled in the casing and projecting from its other end to form a second trunnion; means for mounting the other hinge member on said trunnions to  
5 hingedly connect the members and to fix said shaft relative to said other hinge member for hinging movement therewith; urging means in the casing; a member mounted on said shaft and confined by the casing against rotation relative thereto; co-acting means on said shaft and said  
10 member by which rotation of the shaft in response to relative hinging movement of the hinge members in said one direction will cause said member to load the urging means; and means  
15 including a check valve carried by said member, coacting with the fluid in the casing to check relative hinging movement of the hinge members in the reverse direction under the action of said urging means.

4. In a hinge door check of the type which includes a pair of hingedly connected members urged to hingedly move relatively in one direction; means operatively connected to one member for rotation therewith yet be free for axial  
20 adjustment relatively thereto; and means on the other member with which the first means, when adjusted axially to one position, can co-act to retain the members in any one of a plurality of relatively adjusted angular positions under the  
25 urging action of the members and automatically free said members for relative hinging movement upon initiation of further relative adjustment of the members against the urging action of the members.

5. In a hinge door check of the type which includes a pair of hingedly connected members urged to hingedly move relatively in one direction; a sleeve rotatably mounted and axially adjustable on one member to normally gravitate to an inactive position in the applied position of the hinge on a closure; means for operatively  
30 connecting the sleeve to the other member to rotate therewith yet be free for axial adjustment upwardly; and means on the sleeve co-acting with said one of the members when the sleeve is manually adjusted upwardly from its inactive position, to cause the sleeve to releasably retain the  
35 members in any one of a plurality of relatively adjusted positions under the urging action of the members.

6. In a hinge door check of the type which includes a pair of hingedly connected members; means operatively connected to one member for rotation therewith and adjustment axially thereof under the action of gravity from a retaining position to a non-retaining position; and means on the other member with which the first means, when adjusted to said retaining position, can co-act to retain the members in any one of a plurality of hingedly related positions.

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