Aug. 16, 1938. F. O. DE MILLAR 2,127,327

AUTOMATIC DOOR CHECK CONSTRUCTION

Filed July 23, 1936

Fig. 1.

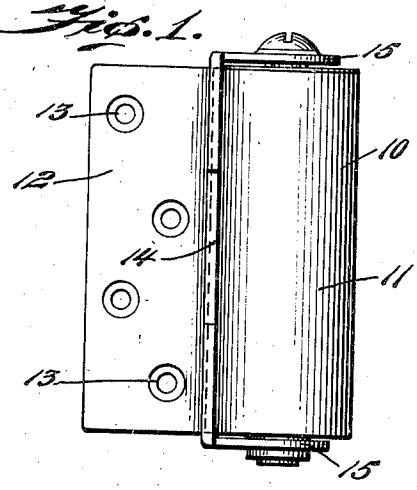


Fig. 2.

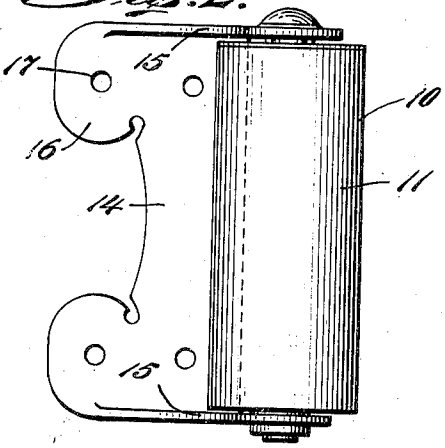


Fig. 4.

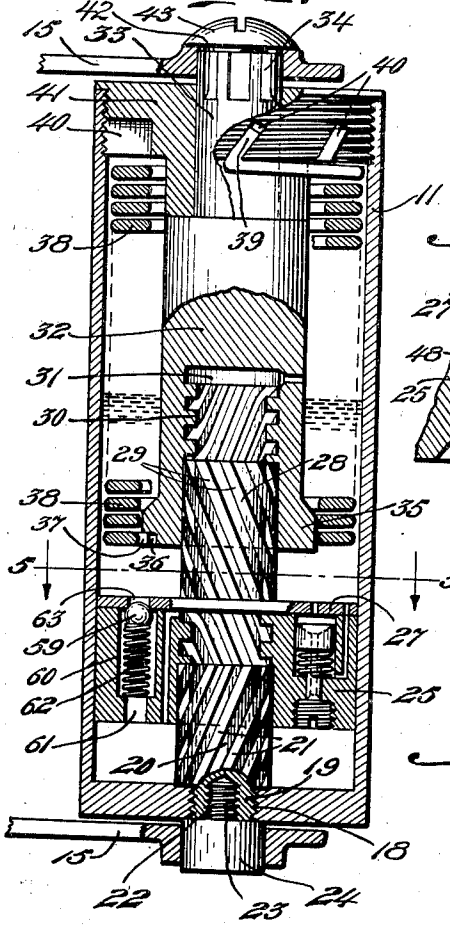


Fig. 3.

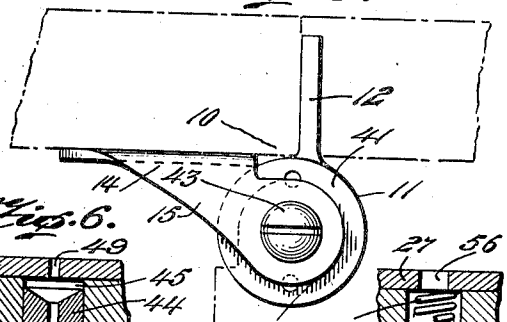
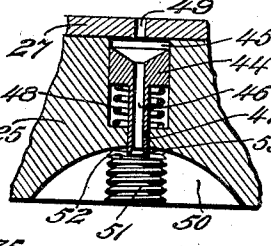


Fig. 6.



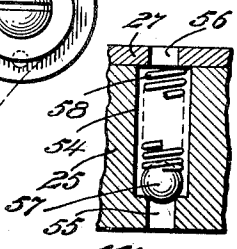
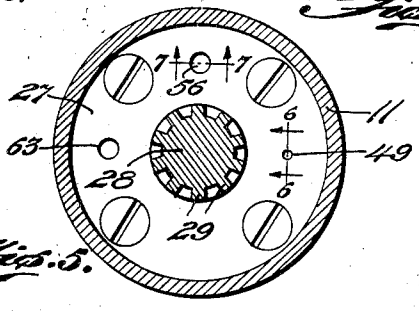


Fig. 7.

Fig. 5.



Inventor
Floyd O. De Millar
By Nathaniel Frucht
Attorney

Patented Aug. 16, 1938 2,127,327

UNITED STATES PATENT OFFICE

2,127,327

AUTOMATIC DOOR CHECK CONSTRUCTION

Floyd O. De Millar, Providence, R. I., assignor to Dutee W. Flint, Providence, R. I.

Application July 23, 1936, Serial No. 92,159

17 Claims. (Cl. 16—54)

My present invention relates to delayed action control devices, and has particular reference to automatic door closure constructions.

Automatic door closures of standard type include air controlled devices for closing door, the devices being regulatable so as to obtain a desired closing period. These devices are attached to the door and to the door jamb, and are unsightly and relatively expensive.

It is the principal object of my invention to devise a novel construction which may be incorporated as an integral part of a door hinge, whereby a separate door check is not required.

It is a further object of my invention to devise a simple construction which can regulatably control the closing of the door, whereby the device may be adopted for doors of different weights. It is an additional object of my invention to devise a construction utilizing a small number of relatively inexpensive parts, whereby the cost of manufacture is low and the selling price reasonable.

With the above and other objects and advantageous features in view, my invention consists of a novel arrangement of parts more fully disclosed in the detailed description following, in conjunction with the accompanying drawing, and more specifically defined in the claims appended thereto.

In the drawing,

Fig. 1 is an elevation of the novel hinge;

Fig. 2 is a side elevation thereof;

Fig. 3 is a top plan view, the parts being shown in closed position, open position being indicated by dotted lines;

Fig. 4 is an enlarged central vertical section through Fig. 1, parts being broken away;

Fig. 5 is a section on the line 5—5 of Fig. 4; and

Figs. 6 and 7 are enlarged detailed sections on the lines 6—6 and 7—7 of Fig. 5.

It has been found desirable to provide an automatic closure device which is particularly suitable for doors and the like, and which will automatically close a door after it has been opened, the closing being positive and at a predetermined rate of movement. It has also been found advantageous to provide a safety arrangement for taking care of excessive closing pressures or sudden jars against the door during the closing operation, thus preventing injury to the operating parts.

I accomplish the above desirable results by utilizing a strong spring means as a closing force, and retarding the action of this spring means by the use of a hydraulic fluid to regulate the closing action, a safety device being further provided to prevent injury to the operating parts in the event of excess pressure or sudden force tending to close the door.

To this end, the novel closure device 10 includes a housing 11, preferably of metal, having a laterally extending flange 12 suitable for insertion in the jamb of a door, the flange 12 having openings 13 for receiving the necessary securing screws. A swinging member 14 has sides 15 which are rotatably mounted with respect to the housing 11, as hereinafter described, and an end flange 16 for securing to a door, the end flange having openings 17 for receiving attaching screws or the like. When the door opens, the member 14 rotates with the door as indicated in dotted lines in Fig. 3, the opening movement being free; the door is then automatically closed by inward movement of the member 14 in response to actuating mechanism housed in the housing 11, as hereinafter described.

Referring now to Fig. 4, the housing 11 is provided with a central opening 18 in the lower end thereof, the opening being screw threaded to receive the threads of the reduced end 19 of a stud 20, which has helical threads 21 as indicated, these threads being disclosed as ten in number although any number may be used. The screw threaded portion 19 has a central bore 22 in which the reduced end 23 of a bearing hub 24 is threadedly received, the bearing hub 24 serving as a pivotal lower mounting for the lower flange 15 of the swinging member 14. A cylindrical element 25 is internally threaded as at 26 to cooperate with the helical threads 21, and has an upper plate portion 27 on which a second stud 28 is mounted, having spiral threads 29, these spiral threads 29 cooperating with internal spiral threads 30 formed in a central bore 31 of a cylindrical spindle 32, the upper end of the spindle being reduced in size to form an upstanding hub 33 which has vertical key ways 34 cut therein. The lower end of the spindle extends laterally to form a spring support 35, and has a recess 36 in which one end 37 of a strong helical spring 38 is received, the other end 39 of the spring being bent upwardly for selective seating in one of a plurality of slots 40 formed in a cap 41 which is threaded into the upper end of the housing 11 and serves as a closure therefore, and as an end bearing for the spindle 32. The upper flange 15 of the member 14 has a portion 42 which is keyed to engage with the key ways 34, and a closure screw 43 extends over the portion 33 and is threaded into a central bore of the member 33, whereby the parts are locked together in operative arrangement.

Referring now to the cylindrical element 25, this member houses a check valve, a balancing device as illustrated in Fig. 6, and a safety device as illustrated in Fig. 7. The balancing device includes a piston 44 which is movable in a bore 45, and has a central opening 46, the piston having a stem 47 of reduced area, whereby a coil

spring 48 may be positioned in the bore 45 to constantly urge the piston upwardly. The plate 27 has an opening of predetermined size 48 positioned therein directly over the bore 46, and a fluid passageway 50 is provided in the base of the member 25 having a central stud 51 with a flat upper face 52 on which the end of the stem 47 normally seats, this stem end being cut away as indicated at 53 to provide knife end contact with the flat face 52. The safety device comprises a second bore 54, the element 25 having a reduced passageway 55 at the lower end and an aligned opening 56 in the plate 27 at the upper end, the bore housing a ball valve 57 which normally closes the end of the passageway 55 under the influence of a strong compression spring 58 seated in the bore 54. The check valve includes a ball valve 59 in a bore 60 in the element 25, the bore having a reduced passageway 61 at the lower end and housing a spring 62 which normally urges the ball valve 59 upwardly to close an opening 63 in the plate 27.

The operation of the automatic closure device may now be explained. The housing 11 is assembled as illustrated, and a fluid such as oil of suitable viscosity is placed in the housing, the size of the opening 49, see Fig. 6, being selected to obtain the desired closing time. When the door is opened the member 14 turns, and rotates the spindle 32 thus causing a combined rotation and upward movement of the cylindrical element 25 and a tensioning of the spring 38. The upward movement of the element 25 creates a pressure above the plate 27 and a downward flow of the oil past the check valve 59 and into the chamber below the element 25 as the spring 62 is quite weak.

The door now being released, the spring 38 turns the spindle 32 and thus produces a downward movement of the element 25, which is resisted by the oil in the chamber below, this oil passing upwardly through the passageway 50, bore 46 and opening 49 to the chamber above the element. The size of the opening 49 thus regulates the speed of flow of oil and the rate of closing movement of the door; if the spring closes the door too rapidly, a pressure builds up above the piston 44 and the piston is forced down to bring the stem into contact with the stud 51, thus preventing further movement until the flow through opening 49 relieves the pressure, whereby the piston 44 functions as a balance control. If an excessive pressure is applied to the door, as by pushing or by a sudden jar, the safety valve 56 opens to permit quick upward flow of oil, thus preventing damage to the operating parts and to the door. The use of two hubs 20 and 28 insures a positive movement of the element 25 in response to rotation of the spindle.

While I have described and illustrated a specific door closing mechanism, the invention may be applied to any delayed closure device, by suitable modification within the skill of a mechanic. Although a spring has been disclosed as the preferred operating force, the spring may be replaced by any mechanism adapted to exert a turning action on the spindle; thus certain constructions of doors may be so hung that the weight of the door when in open position acts as the motivating force for turning the spindle thus permitting use of a weak spring or eliminating the spring entirely. Changes in the size, the material of the parts, and their relative proportions and arrangements, may thus be made to suit designs for different closure devices without departing from the spirit and the scope of the invention as defined in the appended claims.

I claim:

1. In a device of the character described, a housing containing a fluid, a movable element dividing said housing into two chambers, means for transferring fluid from one chamber to the other on movement of the element in one direction, means for transferring fluid from the second chamber to the first chamber at a predetermined rate upon movement of the element in the opposite direction, and means for checking acceleration of flow above the predetermined rate.

2. In a device of the character described, a housing containing a fluid, a movable element dividing said housing into two chambers, means comprising a check valve controlled passageway for transferring fluid from one chamber to the other on movement of the element in one direction, means for transferring fluid from the second chamber to the first chamber at a predetermined rate upon movement of the element in the opposite direction, and means for checking acceleration of flow above the predetermined rate.

3. In a device of the character described, a housing containing a fluid, a movable element dividing said housing into two chambers, means for transferring fluid from one chamber to the other on movement of the element in one direction, and means comprising a pressure balance mechanism for transferring fluid from the second chamber to the first chamber at a predetermined rate upon movement of the element in the opposite direction.

4. In a device of the character described, a housing containing a fluid, a movable element dividing said housing into two chambers, means comprising a check valve controlled passageway for transferring fluid from one chamber to the other on movement of the element in one direction, and means comprising a pressure balance mechanism for transferring fluid from the second chamber to the first chamber at a predetermined rate upon movement of the element in the opposite direction.

5. In a device of the character described, a housing containing a fluid, a movable element dividing said housing into two chambers, means for transferring fluid from one chamber to the other on movement of the element in one direction, means for transferring fluid from the second chamber to the first chamber at a predetermined rate upon movement of the element in the opposite direction, means for checking acceleration of flow above the predetermined rate and safety means for quickly transferring fluid from the second chamber to the first chamber upon excessive rise in pressure of the fluid in said second chamber.

6. In a device of the character described, a housing containing a fluid, a movable element dividing said housing into two chambers, means comprising a check valve controlled passageway for transferring fluid from one chamber to the other on movement of the element in one direction, means comprising a pressure balance mechanism for transferring fluid from the second chamber to the first chamber at a predetermined rate upon movement of the element in the opposite direction, and safety means for quickly transferring fluid from the second chamber to the first chamber upon excessive rise in pressure of the fluid in said second chamber.

7. In a device of the character described, a housing containing a fluid, a movable element di-

viding the housing into two chambers, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, and a pressure responsive valve controlling flow through said second flow passageway.

8. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, a pressure responsive valve controlling flow through said second flow passageway, and a valve controlled relief passageway in said element leading from said second chamber to said first chamber.

9. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, means for positively moving said element in said housing to change the relative size of said chambers, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, and a pressure responsive valve controlling flow through said second flow passageway.

10. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, means for positively moving said element in said housing to change the relative size of said chambers, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, a pressure responsive valve controlling flow through said second flow passageway, and a valve controlled relief passageway in said element leading from said second chamber to said first chamber.

11. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, a rotatable spindle, means responsive to rotation of said spindle for moving said element in said housing to change the relative size of said chambers, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, and a pressure responsive valve controlling flow through said second flow passageway.

12. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, a rotatable spindle, means comprising hubs having helical threads and responsive to rotation of said spindle for moving said element in said housing to change the relative size of said chambers, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, and a pressure responsive valve controlling flow through said second flow passageway.

13. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, a rotatable spindle, means responsive to rotation of said spindle for moving said element in said housing to change the relative size of said chambers, means for rotating said spindle in one direction, means for rotating said spindle in the reverse direction, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, and a pressure responsive valve controlling flow through said second flow passageway.

14. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, a rotatable spindle, means responsive to rotation of said spindle for moving said element in said housing to change the relative size of said chambers, manually actuatable means for rotating said spindle in one direction, means for rotating said spindle in the reverse direction, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, and a pressure responsive valve controlling flow through said second flow passageway.

15. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, a rotatable spindle, means responsive to rotation of said spindle for moving said element in said housing to change the relative size of said chambers, manually actuatable means for rotating said spindle in one direction, spring means for rotating said spindle in the reverse direction, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, and a pressure responsive valve controlling flow through said second flow passageway.

16. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, a rotatable spindle, means responsive to rotation of said spindle for moving said element in said housing to change the relative size of said chambers, manually actuatable means for rotating said spindle in one direction, spring means in said housing for rotating said spindle in the reverse direction, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, and a pressure responsive valve controlling flow through said second flow passageway.

17. In a device of the character described, a housing containing a fluid, a movable element dividing the housing into two chambers, a rotatable spindle, means responsive to rotation of said spindle for moving said element in said housing to change the relative size of said chambers, manually actuatable means for rotating said spindle in one direction, spring means in said housing for rotating said spindle in the reverse direction, means for adjusting the tension of said spring means, a valve controlled flow passageway in said element leading from one chamber to the second chamber, a second flow passageway in said element leading from the second chamber to the first chamber, and a pressure responsive valve controlling flow through said second flow passageway.

FLOYD O. DE MILLAR.