May 3, 1927. 1,627,329

C. V. HILL

HINGE FOR DOORS

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Fig. 1.

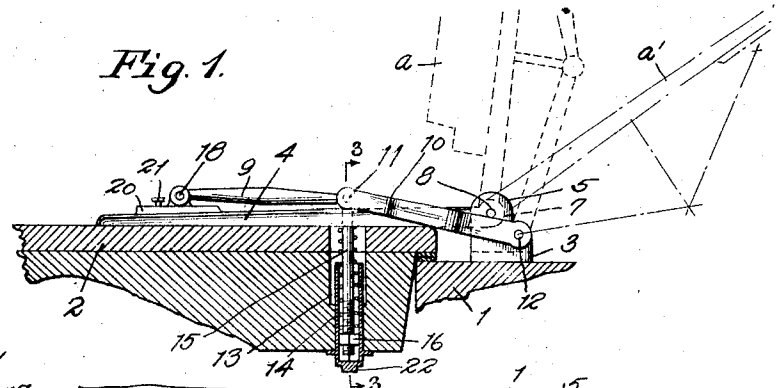
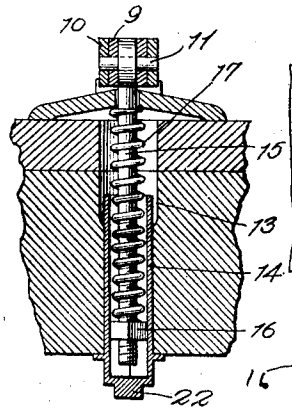


Fig. 3.



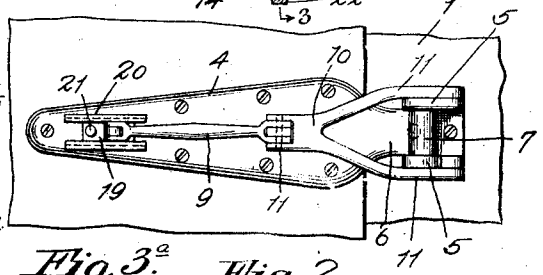
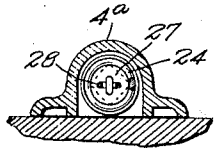


Fig. 3a. Fig. 2





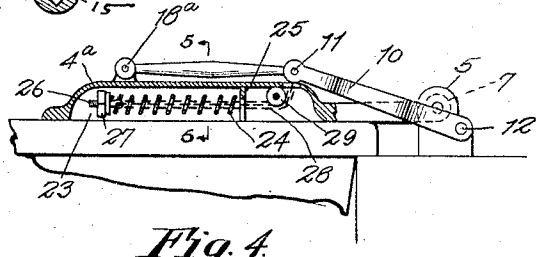
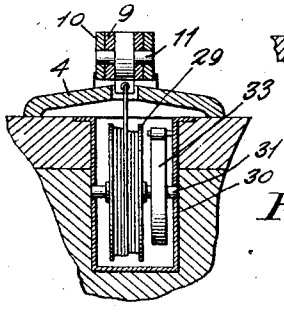


Fig. 5. Fig. 4.



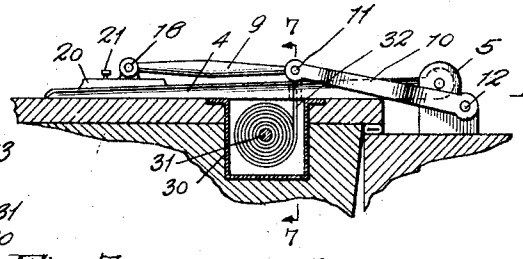


Fig. 7. Fig. 6.

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Fig. 8.

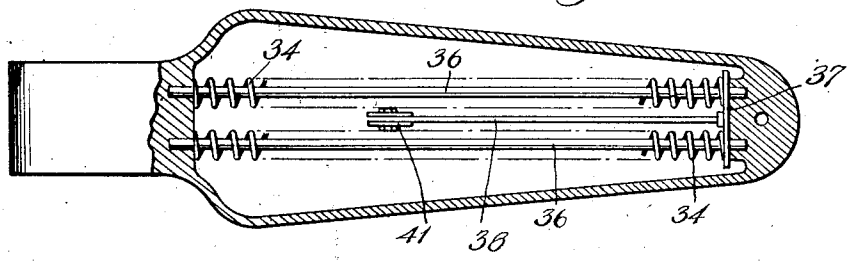


Fig. 9.

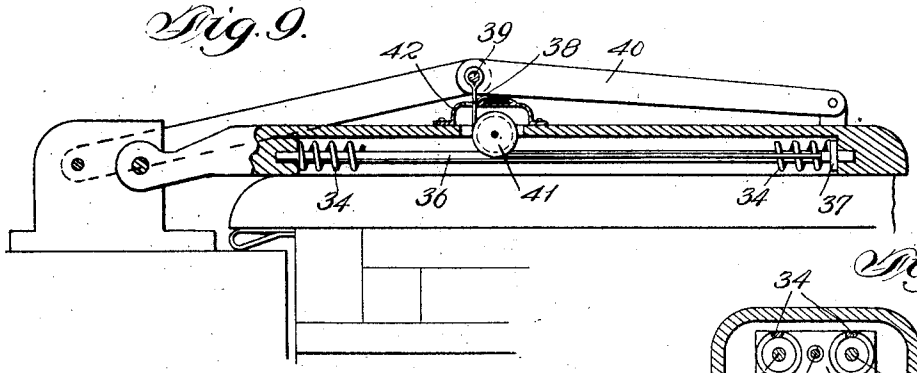


Fig. 10.

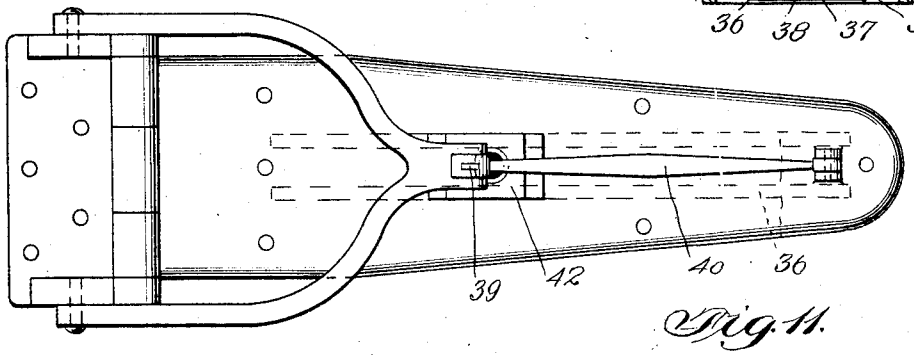


Fig. 11.

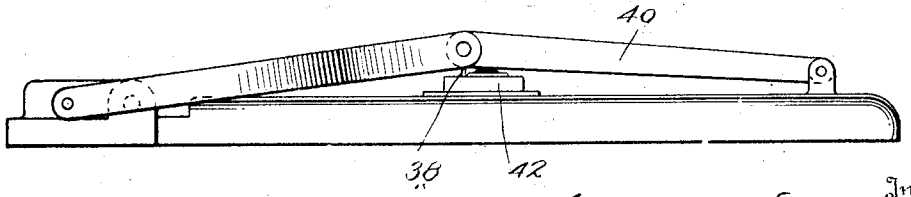


Fig. 12.

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Patented May 3, 1927. 1,627,329

UNITED STATES PATENT OFFICE.

CLEMENT V. HILL, OF TRENTON, NEW JERSEY.

HINGE FOR DOORS.

Application filed August 1, 1925. Serial No. 47,577.

This invention relates to hinges for doors, and particularly to hinges of that type, designed for use in connection with refrigerator doors and other like closures, wherein spring-controlled toggle lever mechanism is employed in conjunction with the hinge for swinging the door closed and maintaining it in open position when swung open to a certain degree.

In prior hinge structures of this type with which I am familiar, the structures are of a more or less bulky, awkward and inconvenient character and offer such interference to a door opening movement as to prevent a full opening movement of the door.

One object of my invention is to provide a combined hinge and door closer which is simple of construction, reliable and efficient in action, of a compact type, and adapted to permit a full range of door opening movement to be obtained without interference.

A further object of the invention is to provide a novel construction and arrangement of hinge members and toggle levers whereby a hinge having an easy working motion and which lies close to and does not protrude objectionably beyond the door frame and door is produced.

A still further object of the invention is to provide a novel construction and arrangement of the closing spring whereby the spring is enclosed and protected from injury and its exposure and projection beyond the door structure is avoided.

A still further object of the invention is to provide novel means whereby, through adjustment of the toggle mechanism, the tension of the spring may be regulated or the spring thrown out of action at will and as may be found desirable in practice.

With these and other objects in view, the invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawing, in which:—

Figure 1 is a horizontal transverse section through one side of a door and its hinging jamb, showing the application of the invention, and also showing in dotted lines two open positions of the door, one an extreme open position such as permitted by my improved hinge construction.

Figure 2 is a view in front elevation of the parts shown in Figure 1.

Figure 3 is a transverse section on line 3—3 of Figure 1 on an enlarged scale.

Figure 3ª is a detail transverse section through the guide tube or casing of the plunger stem.

Figure 4 is a view generally similar to Figure 1, showing the door in plan and the swinging hinge member in longitudinal section, and illustrating a modified form of my invention.

Figure 5 is a transverse section on line 5—5 of Figure 4.

Figure 6 is a view generally similar to Figure 5 showing another modified form of my invention.

Figure 7 is an enlarged transverse section on line 7—7 of Figure 6.

Figure 8 is a top plan view of one of the hinge leaves, broken away, showing another embodiment of my invention.

Figure 9 is a horizontal transverse section through one side of a door and its side jamb and a hinge embodying the construction of Figure 8.

Figure 10 is a section on the line 10—10, Figure 9.

Figures 11 and 12 are respectively top plan and side elevations of a flush hinge embodying my invention.

Referring now more particularly to the drawing, and especially Figures 1 to 3, inclusive, thereof, 1 designates the hinging jamb of the doorway of a refrigerator or other enclosing structure, and 2 the door for closing said doorway.

The hinge embodying my invention comprises a relatively stationary hinge member 3 and a swinging hinge member 4. These members are adapted to be suitably secured to the jamb 1 and to the door 2, respectively. As shown, the member 3 comprises a rectangular or oblong rectangular plate having a pair of spaced ears or knuckles 5, while the member 4 is in the form of an elongated plate provided at its outer end with a neck or projection 6 terminating in an eye or knuckle 7, through which eye or knuckle and the eyes or knuckles 5 of the hinge member 3 passes a pintle 8, whereby the two hinge members are pivotally coupled.

Associated with the hinge members are toggle links or levers 9 and 10, which extend longitudinally of the hinge structure and are pivotally coupled by a pivot pin or pintle at their inner ends, as shown at 11,

The opposite or outer end of the link or lever 9 is pivotally and adjustably connected with the hinge member 4, as hereinafter described, while beyond its pivoted end the major portion as well as the outer end of the link or lever 10 is bifurcated or forked, and the arms 11 of this bifurcated or forked portion straddle the hinge member 3 and lie upon the outer sides of the knuckles 5 and are pivotally connected therewith, as indicated at 12. This pivotal connection 12 is arranged inwardly as well as in rear of the pivotal connection 8, for a purpose hereinafter described.

The door 2 is provided with a bore or passage 13 extending through the same between its outer and inner sides, and fixedly mounted within the inner portion of this bore or passage is a guide tube or casing 14 within which is slidably mounted the inner end of a plunger rod or stem 15, the outer end of which is pivotally coupled to the pin or pintle 11 coupling the jointed ends of the toggle links or levers 9 and 10. The enclosed portion of the casing 14 is threaded to receive a nut 16 and surrounding the rod or stem between this nut and the inner or bottom side of the hinge member 4 is a coiled expansion spring 17, operating through its expansive energy to normally draw the jointed ends of the toggle levers inwardly or toward the face of the door 2. The nut 16 may serve as a plunger head slidably engaging the tube or casing 14 and centering the plunger rod or stem 15 therein, and it also serves as an adjusting means whereby the tension of the spring may be regulated, as will be readily understood.

It will be understood, of course, that in practice any suitable number of hinges embodying my invention may be employed for the proper mounting of the door 2 upon the jamb 1, and that the conjoint strength of the springs 14 of the hinges employed may be such, in proportion to the size and weight of the door 2, as to swing the door to a fully closed position in the operation of the hinges for a door closing action. By reference to Figure 1, showing one of the hinges, it will be seen that when the door 2 is fully closed, the hinge members lie substantially in longitudinal alinement, the hinge member 10 extending at a slight angle between its pivot points 11 and 12, in which position of the links the spring-actuated plunger rod will be fully retracted and the links caused thereby to exert through their toggle closing action a closing pressure on the door 2. When the door is swung open these relative positions of the links and plunger stem will be maintained until, through the arc of movement of the door, the distance between the pivotal points of the outer ends of the levers is shortened, whereupon the toggle action will be "broken" and the links bowed and their jointed ends moved outward relative to the face of the door, whereby the plunger stem 15 will be drawn outwardly and the spring 14 compressed and placed under tension. When the door reaches an open position substantially at right angles to the face of the door frame, as indicated in the dotted line position *a*, the spring will be properly tensioned for a door closing action, but the movement of the link member 10 to a position in rear of the pivot 8, that is, to a position beyond center, will cause the action of the spring to be nullified and a locking connection between the hinge members and the toggle levers to be effected, whereby the door will be held while in such position from a closing action. A slight inward movement of the door beyond this position will, however, bring the link member 10 to a position in which it is no longer beyond center, whereupon the door will be free to close under the action of the closing springs. It will be observed that by reason of the forked construction of the link 10, and its mode of connection with the hinge member 3, said link member is free to swing from side to side, forwardly and rearwardly of the hinge member 3, without interference therefrom or from the door or door jamb, as a result of which the door may be opened to a still further degree, as indicated by the dotted line position *a'*, which will be found to be desirable and advantageous under many conditions. The hinge structure described thus permits of a very wide range of opening movement of the door, thus overcoming the objections to prior structures in which the construction and arrangement of parts is such as to cause interference and to prevent the door from having an opening movement beyond an angle of 90°.

The outer end of the link 9 is shown as indirectly pivoted to the hinge member 4 through a pin 18 coupling said link member to a slide plate 19 movable in a guideway formed by undercut guide rods or rails 20 on the member 4, said slide plate being provided with a set screw 21 for engagement with the member 4 and a binding action for clamping it in fixed position at any point along the length of the guideway. By the provision of this adjustable pivotal connection between the hinge member 4 and the link member 9, the distance between the pivoted outer ends of the link members 9 and 10 may be varied, to regulate the bowing action and closing movement of the links, as well as to enable the plunger stem 15 to be adjusted to regulate the working pressure of the spring 17, this adjustment allowing the working pressure of the spring to be varied from the exterior of the door without the necessity of adjusting the nut 16. By loosening the screw 21 so as to allow the slide 19 to have free sliding movements

in its guideway the toggle levers may be permitted to have movement to compensate for the variation in distance between their pivoted outer ends when the door is opened and closed without materially moving the plunger or compressing the spring, so that the spring pressure may be relieved from the door when its use is not desired. In practice the guide tube or casing 14 may be externally of cylindrical form and fitted to rotate in the bore 13, and it may be internally of angular form conforming to the nut 16, so that the nut may slide therein, while a gripping connection will be instituted between the tube and nut whereby through rotary movements of the tube the nut may be adjusted to vary the tension of the spring. For this purpose the inner end of the tube may be formed or provided with a suitable finger piece 22. This will allow ready and convenient regulation of the spring pressure from the inside of the door.

In Figures 4 and 5 I have shown a modified form of my invention in which the general structure is the same as that disclosed in Figures 1 to 3, inclusive, except for the use of a different type of spring closer. In this modified construction the swinging hinge member 4^a is hollow or channeled on its inside to form a housing 23 to receive the closing spring 24. This spring is arranged to bear at one end against an apertured guide member or partition 25 in the housing and at its opposite end against a washer or head upon a stem 26 on which is fitted an adjusting nut 27, which stem is connected with one end of a chain, cord or like flexible element 28, extending through the spring and through the aperture in the guide 25 and around a guide pulley 29 and thence outward through a guide opening in the housing and connected at its opposite end to the pivot member 11 coupling the jointed ends of the toggle levers. This construction, the operation of which is obvious, provides an organization of the self-contained unit type and an arrangement of the spring which adapts the entire device to be mounted upon the outside of the door jamb and door and provides for the enclosure of the spring so as to protect it in a very secure manner against injury. A further departure in this construction is that the sliding connection between the pivoted outer end of the link member and the fixed hinge member is dispensed with, said link member having a fixed or non-adjustable pivotal connection with the member 4^a, as indicated at 18^a.

In the form of my invention shown in Figures 6 and 7 I have also disclosed the use of a different type of spring closing means, and which is of spring drum type, the same comprising a grooved wheel or drum 29 mounted within a casing 30 on a shaft 31 journaled in the sides of said casing, to which drum is secured one end of a cord or other flexible element 32, which is adapted to wind thereon and unwind therefrom, and the other end of which cord or flexible element is fastened to the pivot member 11, a coiled motor spring 33 fastened at its opposite ends to the casing 30 and shaft 31 being provided for a spring take-up and let-out action of the element 32. As shown, the casing 30 is fitted within a mortise or recess in the door and is open at its outer side and adapted to underlie and to be covered by the hinge member 4, on the removal of which from the door 2 access to the casing and its contained parts may be readily obtained.

From the foregoing description, taken in connection with the drawing, the construction and mode of operation of my improved hinge closer will be readily understood and it will be seen that the invention provides a device of this character which is simple, strong and durable in construction, and which is composed of a minimum number of parts compactly arranged so as to lie close to the door and door jamb. Also it will be seen that the construction is such as to avoid the use of any interfering parts which will prevent a full opening movement of the door, the construction and arrangement of the hinge member 10 and forked lever 11 ensuring a range of movement which will permit the door to be swung open to an extreme degree. Also it will be seen that the construction described provides for the ready and convenient adjustment of the spring tension and the release of the door from spring tension whenever desired.

In Figures 8, 9 and 10, I have shown slightly the hinge as being provided with two springs 34, which are mounted on rods 36 joined at one end by a suitable yoke 37. A chain or other flexible cable 38 is secured at one end to the yoke 37 while its other end is connected to the joint 39 of the toggle lever 40. The rods 36 being anchored to the hinge leaf, the opening of the door causes the toggle lever to bow outward from the hinge thereby pulling on the chain 38 which in turn pulls the yoke 37 on the rods 36 and compresses the springs 34.

In the views heretofore referred to I have illustrated my invention in an offset hinge, but it will be understood from Figures 11 and 12 that my invention is equally efficient in a flush hinge. As the structure is practically the same I will not describe these figures in detail.

In the event that a larger chain roller 41 is desired I may cast a housing 42 integral with the spring leaf to accommodate such roller and if desired I may provide a buffer on top of this housing to prevent the toggle lever from striking the metal of the hous-

ing thus eliminating the noise of metal striking metal.

By my invention it is possible to open the refrigerator door, pull wide without imposing strains upon the hinge and its parts and without liability of breaking the same.

Having thus fully described my invention, I claim:—

1. In a door hinge and closer, a stationary hinge member adapted to be secured to the door jamb, a swinging hinge member pivoted to the first-named hinge member and adapted to be secured to the door, a pair of toggle levers pivotally connected at their inner ends to each other and at their outer ends to the hinge members respectively, and a closing spring acting upon said toggle levers, the toggle lever pivoted to the stationary hinge member being movable from side to side of said member beyond opposite sides of the pivotal connection between the hinge members.

2. In a door hinge and closer, a stationary hinge member adapted to be secured to a door jamb, a swinging hinge member adapted to be secured to a door and pivotally connected at one end to said stationary hinge member, a pair of links pivoted at their inner ends to each other, one of said links being pivoted at its outer end to the swinging hinge member and the other of said links having a forked outer end straddling the stationary hinge member and pivoted thereto so as to permit said link to swing from side to side of said stationary hinge member and beyond opposite sides of the pivotal connection between the hinge members, and spring closing means for cooperation with said links.

3. In a door hinge and closer, a stationary hinge member, a relatively movable hinge member pivoted at one end thereto, a pair of links pivotally coupled at their inner ends to each other, one of said links being pivotally connected at its outer end with the stationary hinge member, an adjustable pivotal connection between the outer end of the other link member and the swinging hinge member, said connection including means for fixing the same in adjusted position, and a closing spring coupled to the jointed ends of the link members.

4. In a door hinge and closer, a pair of pivotally connected hinge members, a pair of links pivotally coupled at their inner ends to each other, one of said links being pivotally connected at its outer end to one of the hinge members, and the other of said links having a forked end straddling the other hinge member and pivoted thereto inwardly of and rearwardly beyond the pivotal connection between the hinge members, and spring closing means associated with said links.

5. In a door hinge and closer, a pair of pivotally coupled hinge members adapted to be attached to a door and door jamb respectively, a pair of links pivoted at their inner ends to each other, one of said links having a slidably adjustable connection at its outer end with one of the hinge members and provided with means for securing it in adjusted position, and the other of said links having a forked outer end straddling the other hinge member and pivotally connected therewith inwardly of and outwardly beyond the pivotal connection between the hinge members, a closing spring, and a connection between the closing spring and the pivoted inner ends of the levers.

6. In a door hinge, a stationary hinge member adapted to be secured to a door jamb, a movable hinge member adapted to be secured to a door and pivoted at one end to the stationary hinge member, and a pair of spring-controlled toggle lever members pivoted at their inner ends to each other, one of said toggle lever members being pivoted at its outer end to the movable hinge member and the other of said toggle lever members having a bifurcated or forked outer end straddling the stationary hinge member and pivoted thereto inwardly and in rear of the pivotal connection between the hinge members.

7. In a door hinge, a stationary hinge member adapted to be secured to a door jamb, a movable hinge member adapted to be secured to a door and pivoted at one end to the stationary hinge member, a pair of toggle lever members pivoted at their inner ends to each other, one of said toggle lever members being pivoted at its outer end to the movable hinge member and the other of said toggle lever members having a bifurcated or forked outer end straddling the stationary hinge member and pivoted thereto inwardly and in rear of the pivotal connection between the hinge members, and a controlling spring coupled to the jointed ends of the toggle lever members and opposing resistance to the outward movement of said members.

In testimony whereof I affix my signature.

CLEMENT V. HILL.