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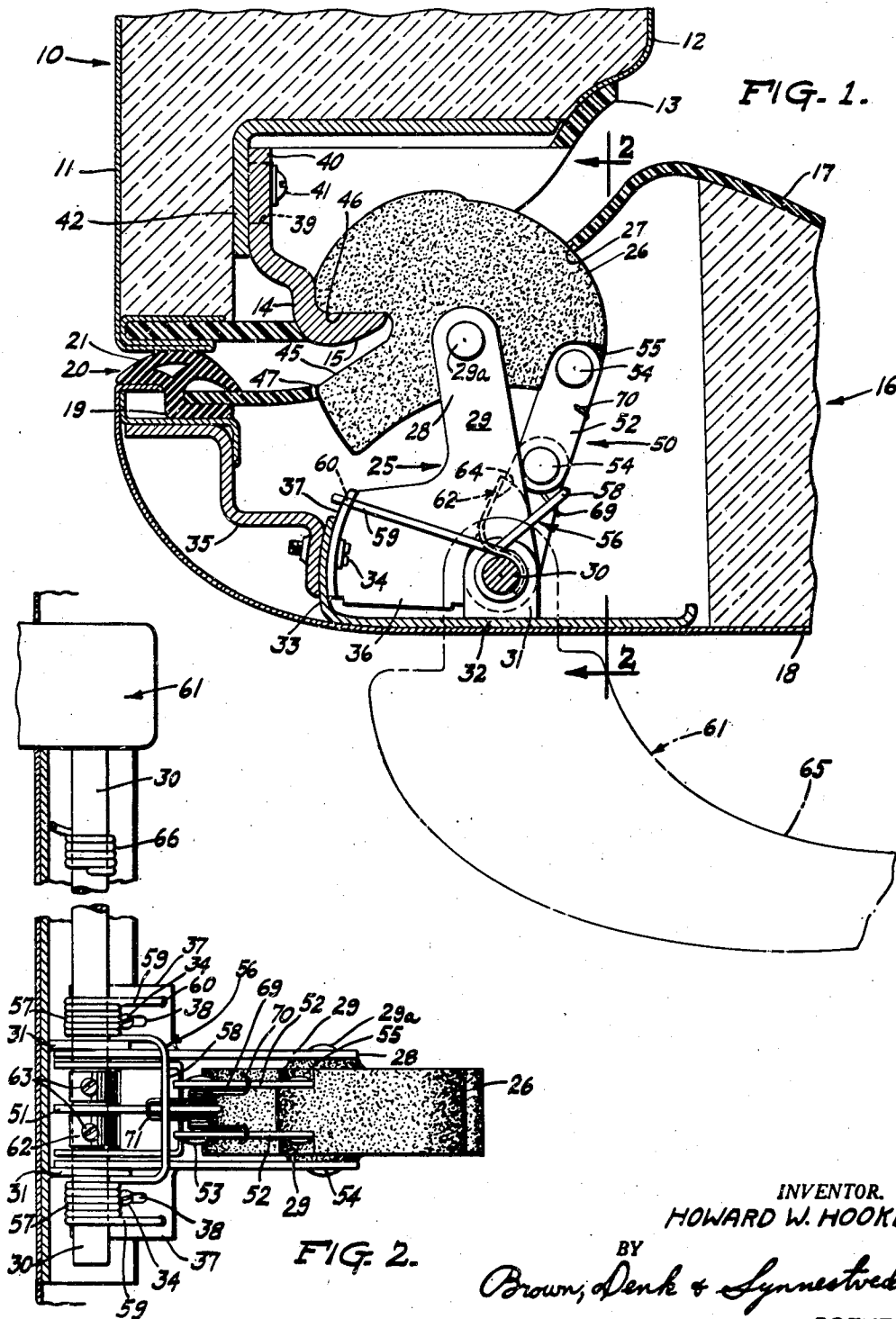
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LATCH MECHANISM

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2 Sheets-Sheet 1



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LATCH MECHANISM

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6 Claims. (Cl. 292—332)

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This invention relates to latches of the type generally used on refrigerator doors.

More particularly, it has to do with latches of the type disclosed in the co-pending applications of George E. Curtiss, Jr., Serial No. 507,839, filed October 27, 1943, now Patent No. 2,451,380, dated October 12, 1948, and Serial No. 515,570, filed December 24, 1943, now Patent No. 2,451,381, dated October 12, 1948, both being assigned to the assignee of the instant invention. The aforesaid applications are directed to latch mechanisms wherein a toggle is employed in such manner as to amplify the main source of latching power to apply a positive "draw-in" of the door to its closed position, and deliver its maximum available force at the time when the door reaches its fully closed position.

A further feature of the aforesaid applications is the provision of means for retaining the latch bolt in a retracted or cocked position, when the door is open, ready for automatic actuation to its latched position—engaged with the keeper—when the door is swung shut.

The primary object of the present invention is to provide a latch mechanism of the above-described type which, while reliable and highly effective, is characterized by extreme simplicity.

Another object of the invention is to provide a self-cocking latch mechanism which is further characterized by ease of operation when the door is being either opened or closed.

A further object is to provide a toggle-actuated latch which is of sturdy, and particularly compact construction.

The preferred embodiment of the invention has been illustrated in the accompanying drawings, wherein:

Figure 1 is a plan view of the latch mechanism of the present invention shown mounted on a refrigerator door, the latch bolt member being engaged with an associated keeper carried by the door jamb, said door and jamb being shown in fragmentary transverse section;

Figure 2 is a side elevational view of the latch mechanism, taken as indicated by line 2—2 of Figure 1;

Figure 3 is a view similar to Figure 1, showing the latch mechanism in its retracted, cocked position; and

Figure 4 is a perspective view of an element of the invention.

Referring now to the details of the drawings and, more particularly, to Figure 1 thereof, the numeral 10 designates the door jamb of a refrigerator cabinet of which only a fragment is

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shown, further illustration being considered unnecessary to a clear understanding of the invention, as its construction follows well known refrigerator cabinet design. Such construction normally includes an outer shell 11, an inner food compartment liner 12 in thermally spaced relation with said shell, and a breaker-strip 13 closing the gap between their adjacent front edges. The door jamb is provided with an adj-
10 justably mounted keeper 14 having an external strike face 15 for cooperation with the latch bolt, in a manner to be described later.

A door 16 is shown in Figure 1, in its closed position against jamb 10. This door comprises
15 an inner panel 17 and an outer panel 18 joined about their peripheries at 19 in any suitable manner, but preferably in a manner providing means for securing to the door a resilient sealing gasket 20. The gasket is provided with a hollow half-round portion 21 which extends around the periphery of the door and is arranged so as to be slightly compressed against the jamb, as shown in Figure 1, to seal the interior of the cabinet in a substantially airtight condition when the
25 door is closed.

The airtight seal of the door against the jamb is important to prevent loss of refrigeration when the door is closed, and it is a particular feature of the present latch mechanism, and of the afore-
30 said toggle-actuated latches, to draw the door positively into such airtight condition with increasingly amplified force and releasably to lock it there in a manner preventing rebounding when the door is swung shut. There is mounted upon the door structure, and preferably between the
35 inner and outer panels thereof, a latch mechanism 25 having a latch bolt 26 extending through an opening 27 in the inner panel into position for latching engagement with keeper 14, when the door is closed. The latch bolt is journaled, for movement into and out of such latching en-
40 gagement, upon the ends 28 of a pair of spaced support members 29, as by a pivot pin 29a clearly illustrated in Figure 2.

In particular accordance with the present invention support members 29 are, in turn, pivotally mounted upon a vertically positioned actu-
45 ating shaft 30 which is journaled in a pair of spaced lugs 31 carried by a base or mounting plate 32. Plate 32 is suitably secured, for example by welding, to the inner side of outer door panel 18. This plate is provided with an inwardly turned substantially arcuate flange por-
50 tion 33 secured, as by screw 34, to a support member 35 which is welded or otherwise suitably se-
55 cured to outer panel 18. It should be understood,

of course, that while two support members (29) have been illustrated, the supporting structure may, if desired, include only a single support member.

Supports 29 are each provided with lateral extensions 36, the ends of which are turned outwardly in opposite directions (Figure 2) to provide arcuate flanges 37 each having a slot 38 through which screws 34 pass into threaded engagement with member 35, thus fixing the position of said support members relative to shaft 30 and base plate 32. It will be noted that both of the flanges 33 and the flange 37 are co-centered with respect to the center of shaft 30, to provide for rotational adjustments of support members 29 about the shaft, when screw 34 is loosened. A face-to-face relation of the flanges is maintained in all positions of adjustment, thereby assuring good frictional contact therebetween when the screw is again tightened to fix the support members in the position to which they have been adjusted. Therefore, if during assembly of the latch structure upon the door, it is found that the bolt does not engage the keeper in a manner best suited for latching engagement therewith, it may readily be adjusted, as just described.

Keeper 14 is also adjustable to further this end, such adjustment being provided by slot 39 in the back wall portion 40 thereof (see Figures 1 and 3), through which slot a fastening screw 41 is passed and threadedly engaged in a keeper mounting structure 42 fixed to door jamb 10. By loosening screw 41 the keeper may be adjusted toward or away from the bolt to the position best suited for proper latching engagement therewith, and then fixed therein by again tightening screw 41.

Latch bolt 26, which may conveniently comprise a single piece of some suitable plastic material, is formed with a slot 45 in its peripheral edge to provide a keeper-engaging portion 46, and a strike face-engaging portion 47, the purpose of which will be explained hereinafter. The bolt is rotatable between a keeper-engaging position, as illustrated in Figure 1, and a position removed therefrom, as shown in Figure 3. The apparatus for so operating the latch bolt comprises a toggle 50 movable between an extended position, wherein said bolt is in engagement with the keeper, and a retracted position in which the bolt is withdrawn from the keeper.

The toggle comprises a link 51 having one end thereof pivotally mounted upon shaft 30—in a position located generally centrally between support members 29 (Figure 2)—and a pair of parallel links 52 each of which has one end pivotally secured, by means of a knuckle pin 53, to the other end of link 51. Links 52 are arranged on opposite sides of link 51 in slightly spaced relation therewith. The bolt-engaging ends of links 52 are pivotally secured by pivot pin 54 in recesses 55 provided on opposite side faces of bolt 26 at a position radially removed, or laterally offset, to the right, as seen in Figures 1 and 3, from pivotal mounting 29a of bolt 26.

Movement of the toggle between its extended, or straight line position shown in Figure 1, and its retracted, or "broken" position illustrated in Figure 3, will, respectively, rotate the bolt about its pivotal mounting into and out of latching position. To stop the pivotal movement of the bolt in the desired extended or retracted terminal positions, the pivotal mounting of links 52 upon the bolt is arranged so that when either of the desired positions is reached the side edges

of the links will contact the side walls of recess 55.

Actuation of the toggle to its extended position (Figure 1) is accomplished by a heavy spring 56 which, as illustrated in Figure 2 has spaced portions 57 thereof wrapped around shaft 30 on the outside of each lug 31, and a central portion 58 extending upwardly to the right, as seen in Figure 1, and around links 51 at a position adjacent the knuckle of the toggle and thus normally urging the toggle to its extended position. The ends 59 of the spring are anchored in apertures 60 in arcuate flanges 37 of support members 29, so that adjustment of the support may be made without affecting the pressure of the spring. It will be noted that when toggle 50 is in its extended position as described, and as seen in Figure 1, links 51 and 52 are in a straight-line condition whereby any rebound forces which may be exerted to rotate the bolt in a clockwise direction after the door is closed will be directed against and opposed by shaft 30, thus releasably locking the bolt in its keeper-engaging position until such time as the toggle is broken to permit opening of the door.

To open the door, a handle 61 is provided which is fixed to shaft 30 in a position vertically spaced from the latch mechanism, it being understood, of course, that the position in which the handle is shown is merely illustrative, and that it may be positioned anywhere along the length of shaft 30 without changing its mode of operation, as described hereinafter.

To effect actuation of the latch under control of handle 61, there is provided a toggle-actuating member 62 fixed to shaft 30 as by screws 63, in a position between supports 29. As best seen in Figure 4, member 62 is provided with a flat portion 64 which, as shown in Figure 1, is adapted to engage the left edge of link 51 when the handle is in its normal rest position (indicated by numeral 65 in Figures 1 and 2), and the toggle is extended. The handle 61 is normally urged toward this position by a coil spring 66 (Figure 2) positioned on shaft 30 just below the handle. Flanges 67 are preferably provided on toggle-actuating member 62, to stiffen the flat portion 64 thereof.

From the foregoing description it is seen that when the latch bolt is in its keeper-engaging position and the toggle is extended, rotation of handle 61 in a clockwise direction causes member 62 to rotate link 51 in the same direction, thus breaking the toggle and moving the latch bolt out of its latching engagement with keeper 14.

With particular reference to Figure 3, it will be understood that retraction of the toggle by handle 61 cannot move links 52 past a position in alignment with pivot pins 29a and 53, as indicated in the figure by the line 68. In this position the force of spring 56 reacts through links 52 through that portion of bolt 26 lying between pivot pins 29a and 54, directly against the pin 29a, thus releasably locking the bolt in withdrawn position until the toggle is again extended. While movement of the mechanism to this position is adequate, it has been found that a position slightly over this dead-center condition better serves the purposes of the invention, as in an over-center position the mechanism is less subject to accidental tripping while the door is open. To move the links 52 to this over-center position with respect to the line of centers of pivots 53 and 29a, a comparatively light spring 69 has been positioned on pivot pin 53. This spring has

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its ends 70 hooked over the edges of links 52 (Figure 2) and its central portion 71 looped over the link 50 in a manner to urge said links 52 to the position shown in Figure 3, that is, over-center with respect to line 68.

When links 52 are in the aforesaid dead-center position, illustrated by line 68 in Figure 3, the force of the heavy spring is exerted against pin 29a, and therefore nullified insofar as further rotational movement of the mechanism is concerned. Thus the force of the comparatively light spring 69 is sufficient to move the pivotal connection 54, of links 52 and bolt 26, past the dead-center position to the over-center position illustrated, which position is determined by the edge of links 52 contacting the walls of recess 54, as previously described.

It is important to note that because of the toggle-like arrangement which links 52 form with that portion of the bolt lying between pins 29a and 54, light spring 69 becomes increasingly effective while the effectiveness of the heavy spring to rotate bolt 26, decreases as toggle 50 approaches this retracted condition. Because of this, the latch is held in its retracted position by the comparatively light force of spring 69 against which force the mechanism may be easily actuated back past the aforesaid dead-center position 68, after which heavy spring 56 exerts its force to straighten the toggle and thereby rotate the bolt into its keeper-engaging position, shown in Figure 1. It will be understood, of course, that as the toggle approaches its fully extended or straight-line position, the force necessary to move it diminishes, while the force exerted by the toggle in a direction substantially transverse to the spring force thereon, becomes increasingly amplified, reaching its maximum just as the toggle reaches its straight-line position and the bolt is fully latched.

When the door is swung toward closed position, abutment 47 on bolt 26 hits strike face 15 of keeper 14 with sufficient force to rotate the bolt counter-clockwise against the resistance of light spring 69. This rotation is effective to move the pin 54 over the dead-center position and to permit spring 56 to actuate the bolt as described.

It will be noted that after handle 61 has retracted the toggle, said handle may be released to be returned by spring 66 to its normal position free of the toggle linkage, as illustrated by the broken-line position indicated by numeral 65 (Figure 1).

Having thus described the invention in detail, it will be apparent that there is provided a toggle-actuated latch mechanism of the advantageous type described in the aforesaid copending applications, which, additionally, is characterized by extreme simplicity and compactness. Moreover, the simplicity of the apparatus both promotes ease in operation and insures a trouble-free mechanism.

I claim:

1. A door latch, comprising, an actuating shaft, fixed support means at least partially carried by said shaft, a latch bolt pivotally mounted upon said support means and adapted for pivotal movements into and out of latching engagement with a keeper, a toggle movable between extended and retracted positions and adapted to effect such movements of said bolt, said toggle comprising two pivotally connected links the free end of one of which is rotatably mounted upon said actuating shaft and the free end of the other of

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which is pivotally connected to said bolt at a position radially removed from the pivotal mounting of said bolt upon said support, means for rotating said shaft and for moving said toggle to its retracted position to move said bolt out of latching engagement with the keeper, and spring means for moving said toggle to its extended position to move said bolt into latching engagement with the keeper with increasingly amplified force as the bolt advances toward latched position.

2. A door latch, comprising, an actuating shaft, fixed support means at least partially carried by said shaft, a latch bolt pivotally mounted upon said support means and adapted for pivotal movements into and out of latching engagement with a keeper, a toggle movable between extended and retracted positions and adapted to effect such movements of said bolt, said toggle comprising two pivotally connected links the free end of one of which is rotatably mounted upon said actuating shaft and the free end of the other of which is pivotally connected to said bolt at a position radially removed from the pivotal mounting of said bolt upon said support, means for rotating said shaft, means responsive to the rotation of said shaft to effect movement of said toggle to its retracted position and consequent movement of said bolt out of latching engagement with the keeper, and spring means for moving said toggle into its extended position to move said bolt into latching engagement with the keeper with increasingly amplified force as the bolt advances toward latched position.

3. A door latch, comprising a rotatable actuating shaft, support means mounted upon said shaft, a latch bolt, a pivot pin carried by said support and upon which said bolt is mounted, said bolt having a peripheral portion thereof adapted for rotative movements into and out of latching engagement with a keeper, a toggle movable between extended and retracted positions and adapted to effect such movements of said bolt, said toggle comprising two pivotally connected links the free end of one of which is pivotally mounted upon said shaft and the free end of the other of which is pivotally connected to said bolt at a position radially removed from the pivotal mounting of said bolt upon said support, spring means for moving said toggle into its extended position to move said bolt into latching engagement with said keeper with increasingly amplified force as the bolt advances to such position, means for manually rotating said shaft, means fixed to said shaft for moving said toggle to its retracted position against the force of said spring when said shaft is rotated, whereby to move the bolt out of latching engagement with the keeper, and means for terminating the movement of the toggle in a predetermined retracted position wherein the force of said spring is directed against and opposed by the pivot pin upon which said bolt is mounted to thus releasably hold the toggle in said retracted position.

4. A construction in accordance with claim 3, in which there is included means terminating the movement of said toggle in a predetermined extended position wherein rebound forces tending to cause inadvertent retractive movement are directed through said links against said shaft to thus releasably hold said toggle in its extended position.

5. A construction in accordance with claim 3, and including a relatively light spring effective to further ensure that said toggle is maintained in said retracted position.

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6. A door latch, comprising, a shaft, support means at least partially carried by said shaft and mounted with freedom for rotation thereabout, means for adjustably establishing the angular position of said support means with respect to said shaft, a latch bolt pivotally mounted upon said support means and adapted for pivotal movements into and out of latching engagement with a keeper, a toggle movable between extended and retracted positions and adapted to effect such movements of said bolt, said toggle comprising two pivotally connected links the free end of which is adapted to react against said shaft and the free end of the other of which is pivotally connected to said bolt at a position radially removed from the pivotal mounting of said bolt upon said support, means on said shaft for moving said toggle to its retracted position to move said bolt out of latching engagement

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with the keeper, and spring means for moving said toggle into its extended position to move said bolt into latching engagement with the keeper with increasingly amplified force as the bolt advances toward latched position.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,161,772	Inonye -----	Nov. 23, 1915
1,164,743	Musselman -----	Dec. 21, 1915
1,242,749	Wells -----	Oct. 9, 1917
2,210,495	North -----	Aug. 6, 1940

Certificate of Correction

Patent No. 2,469,113.

May 3, 1949.

HOWARD W. HOOKER

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 7, line 13, before the word "which" insert *one of*;
and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of October, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.