Aug. 6, 1940. E. W. NORTH 2,210,495

LATCH

Filed April 2, 1938

Fig. 3.

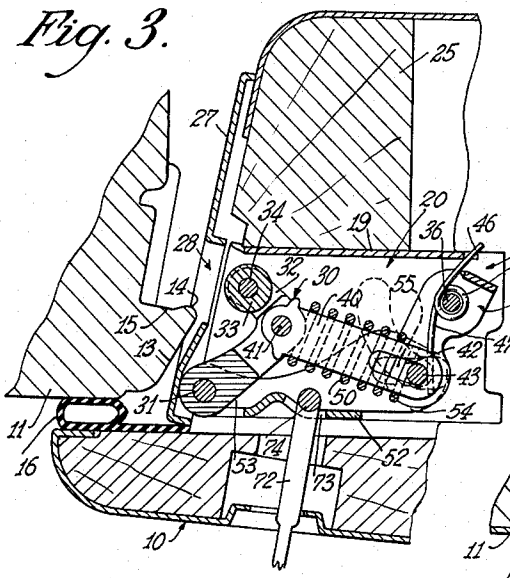


Fig. 1.

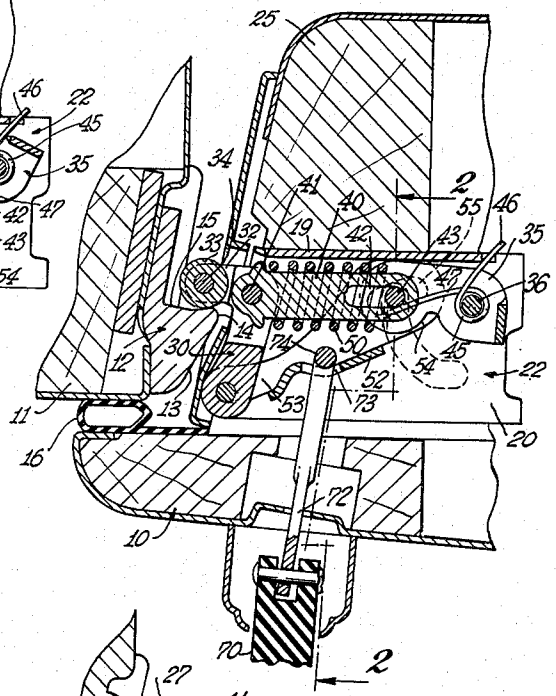


Fig. 2.

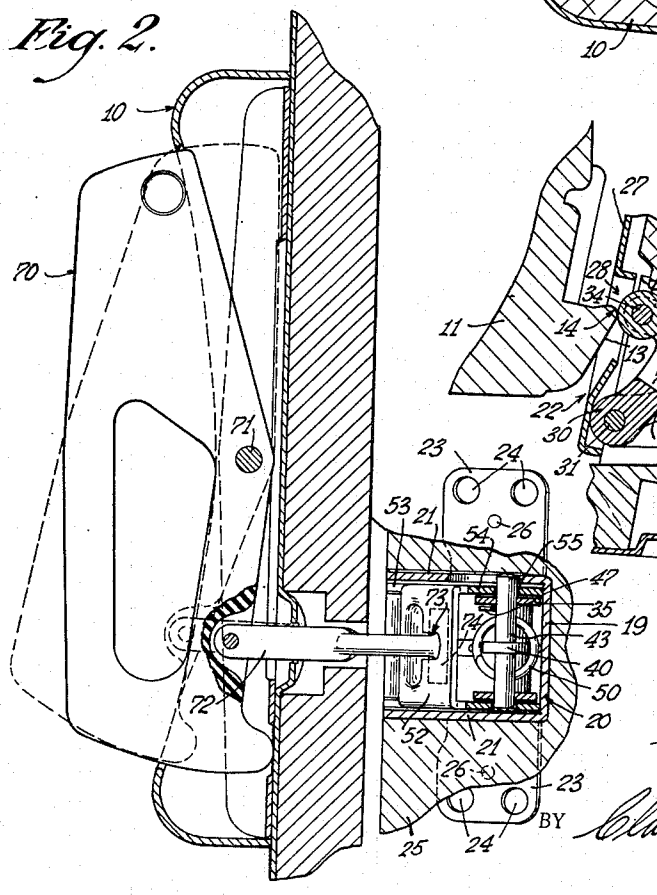
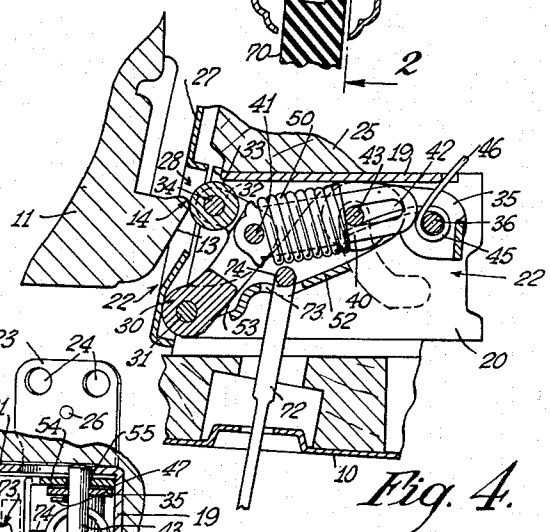


Fig. 4.



Edwin W. North
INVENTOR.

BY Clarence E. Threedy
HIS ATTORNEY.

Patented Aug. 6, 1940

2,210,495

UNITED STATES PATENT OFFICE

2,210,495

LATCH

Edwin W. North, Rockford, Ill., assignor to National Lock Co., Rockford, Ill., a corporation of Delaware

Application April 2, 1938, Serial No. 199,617

9 Claims. (Cl. 292—123)

This invention relates to latch structures, and has as its principal object the provision of an improved structure of this class adapted for general application to closures and particularly suited for use with utility cabinets, such as refrigerators and the like.

More particularly stated, it is an object of the invention to provide a simple, inexpensive and highly efficient latch structure having a latch bolt and spring means therefor arranged to exert a maximum closing effort in conjunction with a keeper so as to hold a closure firmly in place, this arrangement being of particular advantage in maintaining refrigerator doors tightly closed.

Another object is the provision of a latch including a bolt and operating mechanism cooperable therewith to keep the bolt in normally latched position and effective to permit automatic latching responsive to a closing movement of the door on which the latch is mounted.

Another object is the provision of a latch bolt and cooperating mechanism therefor of the type heretofore characterized and further provided with an easy-opening mechanism whereby relatively powerful latching mechanism may be quickly and easily released by handle means on the door.

Viewed from another aspect, it is an object of the invention to provide a latch including a pivoted bolt and a pivoted operating lever and link means including a pivotal connection between the bolt and operating lever, all arranged so that the pivotal axes of the bolt, the operating lever and the pivotal connection, extend in parallelism, there being spring means normally urging the operating lever into a position to dispose the axis of the pivotal connection out of alignment in a radial sense with the pivotal axes of the bolt and lever, whereby to render the pivotal connection immovable in a direction away from the bolt, there being spring means between the pivotal connection and bolt normally urging the latter into closed position and yieldable in a direction away from the bolt when the latter strikes its keeper responsive to a closing movement of the door.

Other objects and novel aspects of the invention reside in certain details of construction, form, location and operation of the parts hereinafter to be described in view of the drawing, in which:

Fig. 1 is a horizontal section through the novel latch structure operatively mounted in a closure;

Fig. 2 is a vertical section along the jagged line 2—2 of Fig. 1, showing the relation of the latch to the operating handle;

Fig. 3 is a horizontal section similar to Fig. 1 showing the latch mechanism in plan with the bolt in open position responsive to handle operation; while

Fig. 4 is a horizontal section similar to Figs. 1 and 3 and showing the bolt in unlatched position responsive to closing movement of the door.

For purposes of illustration, the improved latch is described in conjunction with a refrigerator cabinet including a door or closure 10 (Fig. 1) movable relative to a jamb or stationary rail 11 in which is mounted a hook-shaped keeper 12 provided with a forward cam edge 13, a latching nose 14, and a rearward latching seat or recess 15. Between the door and jamb there is the usual flexible sealing gasket or strip 16.

The latch structure itself includes a mounting or housing 20 (Fig. 2) of substantially elongated and channel-shaped form with opposite side wall portions 21 and open ends 22 at its longitudinal extremities, there being a pair of divergent, laterally extending mounting flanges 23 struck up from the housing near its front (left-hand) open end and provided with apertures 24 through which mounting screws extend into a rail 25 (Fig. 1) projecting from the inner side of the door opposite the jamb 11. The mounting flanges 23 are also provided with tapped bores 26 into which mounting screws for a face plate 27 are threaded, the face plate providing a trim around the latch bolt and being recessed slightly as at 28 to permit the latching nose 14 of the keeper to project as close as possible into the path of the bolt (Figs. 3 and 4).

A bolt 30 (Fig. 3) is pivotally mounted in the housing upon pin means 31 extending between the opposite side walls 21 near the front (left-hand) open end of the channel-shaped mounting, the bolt having a pair of offset yoke arms 32 between which is mounted an impact roller 33 on pin means 34 seated in opposite ends of the yoke arms.

Pivotally mounted in the housing near an end thereof opposite the bolt 30 is a toggle lever 35 preferably in the form of a U-shaped stamping mounted on pin means 36 extended close to the bight portion of the stamping between the opposite side walls 21 of the housing parallel to the mounting pin 31 for the latch bolt (Fig. 2 also).

Link means between the bolt 30 and the toggle lever 35 includes a link arm 40 having pivotal connection near its opposite extremities with the

bolt and toggle lever at points eccentric of their respective pivotal axes, the link arm 40 being extended into a slot cut in the bolt and pivotally connected to the bolt by pin means 41 extending through the end of the link 40 parallel with the mounting pin 31 of the bolt, so that the link arm may pivot in a plane parallel to or in the pivotal plane of the bolt. Near the opposite end of the link arm 40 is an axially elongated slot 42 through which extends a pivot pin 43 extending parallel with the other pivot means 31, 36 and 41 and seated at its opposite ends in the opposite arms of the U-shaped stamping or toggle lever 35 (see also Fig. 2).

The intermediate pivot pin 43 connecting the link arm and toggle lever at a point eccentric of the pivotal axis 36 of said lever constitutes a form of toggle joint or abutment means, and when the toggle lever 35 is pivoted in opposite directions, the intermediate lever pin 43 may be brought into alignment with the pins 31 and 36.

The arrangement of the toggle lever 35 in the housing is such that the bottom wall 19 thereof constitutes a limiting means or stop against which the lever 35 abuts when the same is turned in a particular direction (for example, Fig. 1). Spring means 45 is arranged on the pivot pin 36 with one end 46 bearing against the mounting portion 19 and the opposite end 47 bearing against the intermediate pivot pin 43 so as normally to urge the toggle lever 35 and the link means 40 in said particular direction to the limit of movement against the housing bottom 19. In this latter normal position of the mechanism, the bolt 30 is in latching position as seen in Fig. 1, and attention is called to the fact that in this position the pivotal axes constituted by the several pin means 31, 36, 41 and 43 are all out of alignment in a radial sense, the intermediate pin 43, in particular, being out of alignment with the pins 31 and 36.

The matter of alignment of the pivotal axes mentioned above is of importance in connection with the use of spring means cooperable with the link means to urge the bolt into normally latching position. This spring means is preferably in the form of a compression coil spring 50 mounted loosely on the link arm 40 and having one end bearing against the intermediate link pin 43 between the opposite U-shaped arms of the toggle lever 35, with the opposite end of the spring bearing against the bolt 30.

Referring to Fig. 1, it will be apparent that if an effort be applied to the latch bolt 30 in the region of its roller 33 and acting generally lengthwise of the link arm 40, the spring 50 will be compressed against the intermediate pin 43 so as to move the bolt into unlatched position, as shown in Fig. 4. Such a movement of the bolt would be effected by engagement of the roller 33 against the cam edge 13 of the keeper when the door is slammed shut, and attention is called to the fact that the slotted portion 42 in the link arm permits the latter to shift toward the right relative to the pin 43 when the spring 50 is compressed as aforesaid, pivotal movement of the toggle arm 35 being prevented because of the off-center or non-aligned position of the pin 43 relative to the pivotal axis 36 of the toggle lever, the abutment of the latter lever against the limiting means or bottom 19 of the housing preventing any movement of the toggle lever as a result of the compression of the spring 50.

The spring 50 is intended to keep the latch bolt into firmly latched engagement with its keeper to provide a door seal of maximum effectiveness, and the spring 50 is therefore relatively strong. However, the mechanical advantage provided by the arrangement shown is such that an ordinary closing movement of the door 10 will be entirely adequate to compress the spring 50 until the bolt roller 33 passes the nose 14 of the keeper, whereupon the bolt will be quickly and forcefully driven home, seating the roller 33 in the latching recess 15 (Fig. 1).

The invention further contemplates an easy-opening feature which requires considerably less effort to move the latch bolt into unlatched position than would be required if it were necessary to compress the spring 50, the easy-opening operating mechanism working independently of the spring means 50 in so far as the arrangement makes it unnecessary to compress this latter spring to move the bolt into unlatched position.

This easy-opening feature includes the toggle lever 35 and the link means 40 interconnecting the same with the bolt. When the lever 35 is pivoted (anticlockwise) from its normal position, shown in Fig. 1, to its releasing position shown in Fig. 3, the link 40, through the pin connection 43, is shifted inwardly of the housing and draws the bolt 30 after it, thereby withdrawing the roller 33 from the seat 15.

As an additional element of the manual opening mechanism, there is provided in the latch a main operating lever in the form of a channel-shaped stamping or bracket 52 (best seen in Fig. 2), similar in shape to, but smaller in size than, the housing 20, this lever being pivotally mounted on the pin means 31 for the bolt 30, the pin 31 extending through opposite end portions 53 of the stamping.

The opposite end portions 54 of the main lever stamping (opposite the ends 53) are provided with elongated aligned slots 55 (best seen in dotted lines in Fig. 3, beneath the similarly elongated slot 42 in the link 40), the slots 55 fitting around the extending end portions of the intermediate pin 43 so as to have pivotal connection with the link means in common with the toggle lever 35.

Thus, when the main operating means 52 is pivoted in a clockwise sense from the position seen in Fig. 1 to that seen in Fig. 3, the link means 40 serves to withdraw the bolt by effort applied to the pivotal connection 43 of the link means with the toggle lever.

Various mechanisms may be provided for operating the main lever means 52, and in the present arrangement seen particularly in Fig. 2 there is provided an operating handle 70 having a pivotal mounting 71 on the outside of the door 10 and having an eccentrically connected operating rod 72 extending through the door for connection at its inner end with the main operating lever 52. This latter connection is effected through the provision of a horizontally elongated slot 73 in the vertical or bottom wall of the U-shaped stamping which constitutes the main operating lever, and the provision of laterally projecting offsets 74 in the nature of a T-head at the inner end of the handle operating rod 72, which projections 74 are inserted through the slot 73 and turned ninety degrees so as to bear against the adjoining marginal portions of the stamping around the opening 73. When the handle 70 is raised (clockwise, Fig. 2), the rod 72 moves outwardly (to the left) and pivots the main operating member or lever 52 in a clockwise direction from the position seen in Fig. 1 into the position

seen in Fig. 3. The bolt **30** will return automatically to normally latched position under urgence of the spring means **45** when the handle is released.

It will be apparent that as a result of the lever system set forth that the spring means **45** may be relatively weaker than the main spring means **50**, and hence operation of the bolt by the handle **70** is a relatively effortless task. If the handle means be released before the door is closed, the spring means **45** will quickly restore the lever system to the condition seen in Fig. 1 so that if the door thereafter be slammed shut, the toggle lever **35** will already be in off-center position relative to the linkage system, so that when the roller **33** strikes the cam edge **13** of the keeper, the main spring **50** and associated mechanism will operate to seat the bolt securely. On the other hand, if the handle be maintained in raised position while the door is closed, the spring means **45** and the linkage mechanism will effect pivotal movement of the bolt into latching position as seen in Fig. 1, there being practically no resistance to the latching roller portion **33** of the bolt as the same is pivoted home. The novel latch construction permits of the employment of tolerances and clearances providing easy action of the mechanical parts and at the same time assuring very accurate positioning of the bolt relative to its kepeer, particularly when the bolt is turned home upon release of the handle and toggle lever **35**.

The latter statement is best demonstrated by a comparative reference between Figs. 3 and 1, in the order named, wherein it will be observed that when the toggle lever **35** is turned back to normal position by the spring means **45**, the bolt **30** pivots in such manner that the roller **33** thereof is, in a manner of speaking, firmly hooked around the nose **14** of the keeper such that by the time the toggle lever is in its normal off-center position as seen in Fig. 1, the link arm **40** and its spring means **50** are disposed so that the slightest opening movement of the door is instantly resisted by the spring **50**.

The foregoing illustrative embodiment of the invention is subject to modification in the form, location and operation of various elements particularly described in detail herein as a preferred form of construction, but it is to be understood that the invention is not to be limited to such details except as may be expressly provided in the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a latch, a base member and a bolt pivoted thereon, a plurality of serially connected operating levers a first one of which has one terminus pivotally connected to said bolt eccentrically of the pivotal axis thereof, and a last one of which has an opposite terminus pivotally fixed on said base member, spring means urging said series of levers into a normal position limited by said base member and in which normal position pivotal movement of the bolt in one direction will exert a thrust on the levers of said series tending to pivot the same in the direction of limited movement, one of the levers of said series connected to the bolt being arranged to shift as well as pivot with respect to another lever of the series, spring means arranged to resistantly communicate thrust movement of the bolt to said series when the series is in said normal position, and a main operating lever pivoted coaxially with said bolt and having pivoted connection with said series of levers at a point between the terminal extremities thereof.

2. In a latch, a pivoted bolt, a system of operating levers having pivotal connection with an eccentric part of said bolt, spring means arranged to pivot said lever system into a predetermined normal position wherein pivotal movement of the bolt in one direction will exert a thrust action on said system of levers, one of said levers being arranged to shift radially of its pivotal connection with another lever responsive to thrust action of the bolt as well as pivot in its connection in said system, additional spring means normally resisting thrust movement of said bolt, and operating means in the form of a lever pivoted coaxially with said bolt and having pivotable connection with said lever system at a point therein which is offset relative to the pivotal connection thereof with the bolt.

3. In a latch, a pivoted bolt, a first operating lever pivotable about an axis parallel to that of the bolt, a link pivotally interconnecting the bolt and the operating lever, spring means urging said bolt away from said operating lever into latched position, said link being arranged to shift as well as pivot relative to its connection with said first operating lever upon pivotal movement of the bolt toward unlatched position, said bolt being pivotable into unlatched position toward said operating lever against the tension of said spring means, and a second operating lever pivotable about the same axis as the bolt and having pivotable connection with the first operating lever along the pivotal axis of the connection between said first operating lever and said link, together with means yieldingly urging said first and second operating levers into normal position to dispose said bolt in latched position.

4. In a latch, a pivoted bolt, toggle mechanism including a toggle lever pivoted for movement about an axis parallel with the pivotal axis of said bolt, and link means having pivotal connection with said toggle lever and said bolt eccentrically of the pivots of said lever and bolt, spring means interposed between the pivotal connections of said link and normally urging said bolt into latching position when said toggle lever is pivoted into a normal position in a particular direction, spring means urging said toggle member into said normal position in said particular direction, means limiting the movement of said toggle lever in said particular direction, and an operating member, pivotally mounted on the bolt pivot and having pivotal connection with said toggle mechanism at the pivotal juncture of the link and toggle lever.

5. In a latch, a pivoted bolt, toggle mechanism operatively connected with said bolt and including a pair of pivotally joined toggle members and spring means normally urging the same into a normal position, main spring means cooperable with said toggle mechanism to yieldably hold said bolt in latching position when said toggle member is in said normal position, and lever means pivoted coaxially with said bolt and pivotally connected at the pivotal juncture of said toggle members for operation to move the toggle mechanism out of said normal position to effect movement of said bolt into unlatched position without tensioning of said main spring means.

6. In a latch: a pivoted bolt, spring means having one end arranged to urge said bolt into latching position, toggle mechanism operatively linked to said bolt constituting a relatively fixed

abutment means for the opposite end of said spring means when said toggle mechanism is disposed in off-center condition relative to its connection with the bolt, yieldable means normally urging said toggle mechanism into said off-center position, and lever means coaxially mounted with said bolt and having operative connection with said toggle mechanism and operable to move the latter from said off-center position to move said bolt into unlatched position independently of and without tensioning said first-mentioned spring means.

7. A latch including a bolt, a compression spring arranged with one end bearing against the bolt and an opposite end bearing against a movable abutment member, link means operatively connecting said bolt with said abutment member, a second spring means normally urging said movable abutment member into a normal position wherein the same will not be moved by compression of said first-mentioned spring responsive to force applied to said bolt and tending to urge the same into unlatched position against said compression spring, and lever means mounted coaxially with the pivot of said bolt and connected at the juncture of said link means with said abutment member for operation to withdraw said abutment member from said normal position and move said bolt into unlatched position independently of and without tensioning said compression spring.

8. In a latch, a mounting, a latch bolt pivoted on said mounting, a pair of toggle members pivotally joined and means in the region of the pivotal juncture of said toggle members constituting an abutment for a spring, a first one of said toggle members being pivoted on said mounting and the other toggle member being pivotally attached to said bolt eccentrically of the pivotal axis of the latter, said other toggle member being shiftable radially relative to said pivotal juncture and said abutment means, a compression spring on said other toggle member and interposed between said bolt and abutment means so as to be compressible against the latter when the same is disposed in a normal position by said toggle members and the bolt is pivoted toward unlatched position against said spring, a second spring means urging said toggle members toward and against a stopping part on said mounting and into a normal position with the abutment means in the normal position aforesaid, and means pivoted coaxially with the pivot of said bolt and pivotally connected to the juncture point of said toggle members for moving said toggle members out of said normal position to move said bolt toward unlatched position without shifting said other toggle member.

9. In a latch, a mounting, a latch bolt pivoted on said mounting, a pair of toggle members pivotally joined and means arranged in the region of the pivotal juncture of said toggle members for movement therewith and constituting an abutment for a spring, a first one of said toggle members being pivoted on said mounting and the other toggle member being pivotally attached to said bolt eccentrically of the pivotal axis of the latter, said other toggle member being shiftable radially relative to said pivotal juncture and said abutment means by unlatching movement of the bolt when said first toggle member is disposed in a certain position, a compression spring on said other toggle member and interposed between said bolt and abutment means so as to be compressible against the latter when the same is disposed in said certain position by said toggle members and the bolt is pivoted toward unlatched position against said spring, a second spring means urging said toggle members into a normal position against stop means on said mounting with the abutment means in the certain position aforesaid, and operating means for said toggle members including a lever pivoted on said mounting coaxially with said bolt and having pivotal connection with said pivotal juncture of the toggle members, said lever being operable to move said toggle members out of said normal position to move the bolt into unlatched position.

EDWIN W. NORTH.