292-332

Oct. 12, 1948. G. E. CURTISS, JR 2,451,381

REFRIGERATOR DOOR LATCH

Filed Dec. 24, 1943 2 Sheets-Sheet 1

FIG. 1.

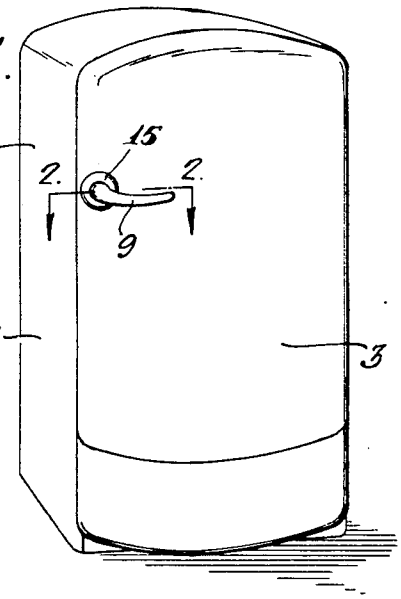


FIG. 2.

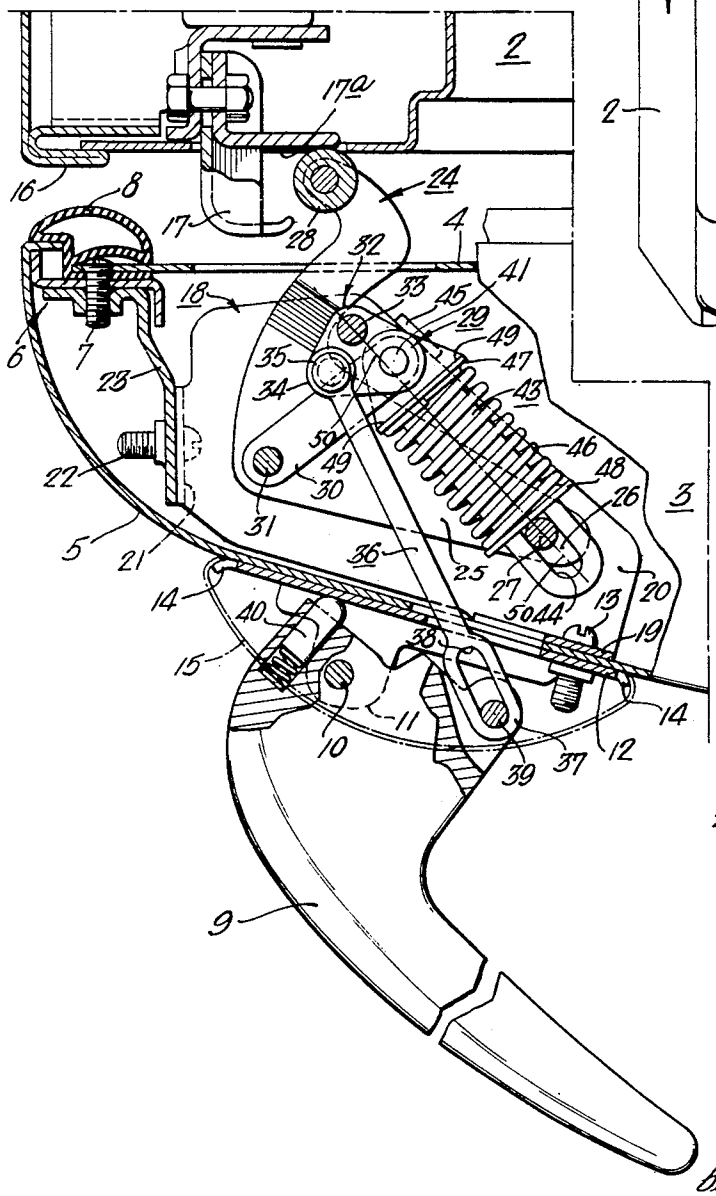
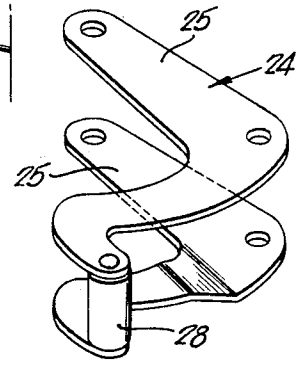


FIG. 5.



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FIG. 3.

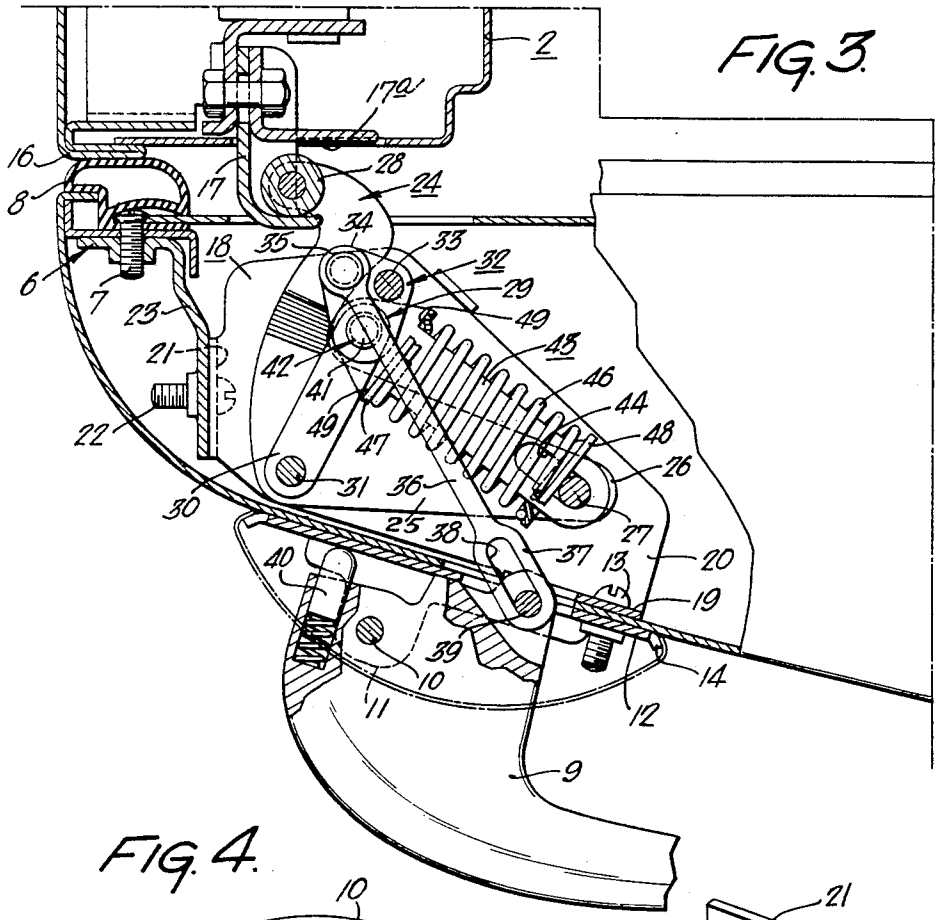
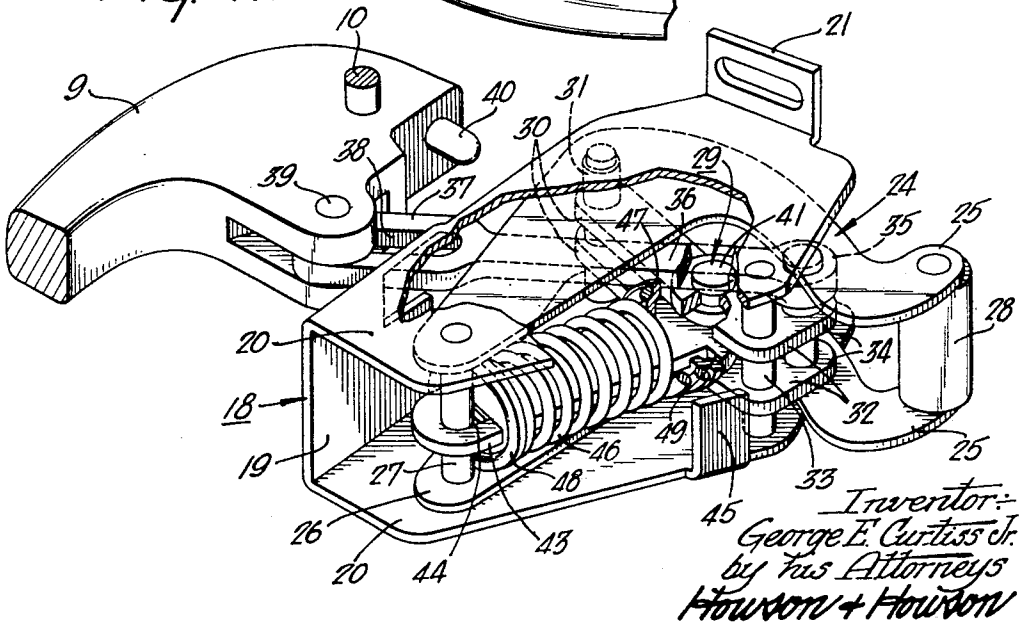


FIG. 4.



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UNITED STATES PATENT OFFICE

2,451,381

REFRIGERATOR DOOR LATCH

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Application December 24, 1943, Serial No. 515,570

11 Claims. (Cl. 292—332)

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

More particularly, the invention relates to latches of the type disclosed in the co-pending application of George E. Curtiss, Jr., Serial No. 507,839, filed October 27, 1943, wherein a toggle mechanism is employed in such manner as to amplify the main source of latching power to apply an unusually large draw-in of the door to its closed position and deliver its maximum available force at the time when the door is fully closed. This latch mechanism also is provided with a self-cocking device comprising a trigger mechanism which acts to cock the latch in a retracted position ready to snap to an advanced operative position when the refrigerator door is swung closed, and it is in respect to an improving simplification of this self-cocking feature that the present invention has particular reference.

A principal object of the present invention is to provide a self-cocking latch mechanism characterized by a minimum of mechanical complexity.

Another object is to provide a self-cocking latch mechanism of the spring-actuated type wherein the cocking action is effected primarily by a combined action of the spring and of the transmission elements which serve as the operative connection between the spring and the movable latch member.

More specifically, an object of the invention is to provide a self-cocking latch mechanism of the spring-and-toggle actuator type wherein the cocking action is a function primarily of the spring-and-toggle mechanism itself exclusive of complicating trigger devices such as employed in the latch mechanism disclosed in the aforesaid Curtiss application.

Another object of the invention is to provide a self-cocking latch mechanism which is characterized by relative ease of operation; and wherein extremely light forces are sufficient to cause uncocking and subsequent prompt actuation of the latch.

A further object is to provide a latch mechanism which is of sturdy, compact and inexpensive construction, and which possesses long wearing qualities.

Figure 1 is a perspective view of a refrigerator embodying the invention;

Figure 2 is a sectional view on an enlarged scale taken in the horizontal plane indicated by the line 2—2, Figure 1, showing the mechanism in unlatched position;

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Figure 3 is a view similar to Figure 2 showing the mechanism in latched position;

Figure 4 is a perspective view of the latching mechanism detached from the door and with parts broken away; and

Figure 5 is a perspective view of an element of the mechanism.

Referring now to the drawings, and more particularly to Figures 1 and 2 thereof, the numeral 1 designates a domestic type refrigerator comprising a cabinet 2 and a door 3, the latter having an inner panel 4 and an outer panel 5 joined about their peripheries at 6 as by screws 7 which serve also to fasten the customary resilient sealing gasket 8 to the door at that juncture. A suitable door handle 9, which may be of standard design, is pivotally mounted by way of a pin 10 in lugs 11 of a substantially flat member 12 secured to the exterior of the outer panel 5 of the door 3 by screws or the like 13, said member being provided with outwardly turned lugs 14 which serve to secure a circular face plate 15 about the base of the handle 9. The resilient sealing gasket 8 on the door 3 is adapted to close against a door jamb 16 of the cabinet 2 and provides an airtight seal between the door and the cabinet when the door is closed. The door jamb 16 is equipped with an adjustably mounted keeper 17 which is provided with a release surface or abutment 17a, the purpose of which is explained hereinafter.

As best illustrated in Figure 4 of the drawings, the latch comprises a substantially channel-shaped support or housing 18 comprising a bottom wall 19 and a pair of parallel side walls 20, 20 having at the forward ends thereof slotted ear portions 21 turned outwardly at right angles. As shown in Figure 2, screws 22 pass through these slotted ear portions 21 and are threaded into a member 23 which extends outwardly from the juncture 6 of the outer and inner door panels and is secured to the door at this juncture by the screw 7, thereby providing a fastening for the forward end of the housing 18 to the door 3. The right or rearward end of this housing 18 is fastened through its bottom wall 19 to the inside of the outer door panel 5 by the same screw 13 which secures the flat member 12 to the outside of said panel 5.

Between the parallel walls 20, 20 of the housing 18 is a latch bolt 24 (see Figures 4 and 5) preferably comprising a pair of spaced substantially Z-shaped bolt arms 25, 25 each of which has its bottom end 26 pivotally attached to the walls 20, 20 by a pivot pin 27 located toward the rear of said walls and at a point offset to the right

from the keeper 17, as viewed in Figures 2 and 3. This pivotal mounting provides for movement of the other end of the bolt 24 in a substantially straight line or flat arc between positions behind and clear of the said keeper 17 as shown in Figures 3 and 2 respectively. Rotatably carried by this other end of the Z-shaped bolt 24 is a self-lubricating cylinder or roller 28 which provides substantially frictionless engagement of said bolt 24 with the surfaces of the keeper 17.

As shown in Figures 2, 3 and 4 of the drawings, a toggle mechanism movable between extended and retracted positions as later described and comprising a toggle joint 29, is provided within the housing 18, being arranged to turn the bolt arms 25, 25 about the pivot pin 27 so that the roller 28 is moved into and out of operative engagement with the keeper 17. In accordance with the present invention, the toggle joint 29 preferably comprises a pair of spaced links 30, 30 attached to the aforesaid bolt arms 25, 25 by a pivot pin 31, and a pair of relatively short links 32, 32 journaled on the housing walls 20, 20 by a pivot pin 33. While pairs of links are preferred, it is to be understood that the links of the toggle joint could just as well be single, and it should be understood that links of other relative lengths may be used without departing from the spirit of the invention.

The short links 32, 32 are provided with ear portions 34, 34 to which is pivotally connected one end 35 of a rod 36 having its other end formed with an elongated loop 37 which provides a slot 38 for reception of a pin 39 on the handle 9. This pin 39 is offset from the pivot 10 of the handle, and with the slot 38 provides a lost motion connection between the handle and the rod 36. The handle 9 is normally urged in a counterclockwise direction, as viewed in Figures 2 and 3, to a position in proximity to the outer panel 5 of the door 3 by a spring pressed pin 40 located on the opposite side of the pivot pin 10 from the pin 39.

As more clearly illustrated in Figure 3, the pivot pin 33 is located on an imaginary straight line which intersects the pivotal mounting pin 27 of the bolt arms 25, 25 and the outer end of the bolt structure, and the Z-shape of the bolt arms provides the clearance necessary to avoid interference between the pin 33 and the arms during pivotal movements of the latter to and from latching position.

The links 30, 30 and 32, 32 are pivotally united by a pivot pin 41 thereby forming the knuckle 42 of the toggle joint 29 and this knuckle is constrained in its movements to an arcuate path defined by the rotation of links 32, 32 about the pin 33. Pivotally attached to the pin 41 at the knuckle 42 and between the links 30, 30 and 32, 32 is a rearwardly extending link 43 having its rearward end slotted as at 44 to receive therethrough the pivot pin 27 which serves to guidingly support the link 43 above the bottom wall 19 of the housing 18. The slot 44 also restricts the forward motion of the toggle to an extended substantially straight line position when the latch is in its fully locked position. Inwardly turned from the top edge of the side walls 20, 20 are a pair of stop members 45, 45 serving to limit the retractive movement of the knuckle 42. These stops 45, 45 may be eliminated if desired and the bolt arms 25, 25 allowed to contact the pin 33 to stop the retractive movement of the bolt at the desired position.

Surrounding the link 43 and carried thereby is a coil spring 46 having its ends seated upon slotted washers 47 and 48 through which the link 43 passes, the rearward end of the spring 46 being anchored against the pin 27, while the forward end of the spring bears against a pair of abutments 49, 49 on the link 43, disposed closely adjacent the knuckle 42 of the toggle joint 29, and in effect presses directly against the said knuckle.

The operation of the device is as follows: As viewed in Figure 3, the roller 28 of the bolt 24 is in a latched position behind the keeper 17. When it is desired to open the door, the handle 9 is grasped and rotated in a clockwise direction about its pivot 10. This movement carries the pin 39 also in a clockwise direction about the pivot 10 which draws the rod 36 downwardly and thereby rotates the short links 32, 32 in a counterclockwise direction about the pivot 33 thereby breaking and then retracting the toggle. Normally the movement continues until the knuckle 42 meets the stops 45 at which point the links 32 will have moved to or, preferably, slightly past a position of dead center with respect to the link 43 and to the thrust of the spring 46, wherein the pressure of the spring will tend to hold the toggle cocked in retracted position. As illustrated in Figure 2 of the drawings, the said dead center position occurs when a straight line between the axes of the pins 33 and 41 corresponds to or parallels an imaginary line 50 intersecting the axes of the pins 33 and 27. Retraction of the toggle as described acts through the long links 30, 30 to move the bolt arms 25, 25 in a clockwise direction to an extent withdrawing the roller 28 from behind the keeper 17, thereby permitting the door to be swung open. The slot 38 in the rod 36 allows the handle 9 to resume its normal position on the door under the urge of the spring pressed pin 40 while the latch bolt remains in its cocked position.

To close and latch the door, the latter is merely swung toward closed position until the roller 28 strikes the abutment 17a which causes the bolt arms 25, 25 to move in a counterclockwise direction about the pin 27 thereby drawing the long links 30 and the knuckle 42 away from the stops 45 and turning the links 32 back past the aforesaid dead center position so that the thrust of the spring 46 may again operate to urge the toggle toward the extended position. At the instant the knuckle 42 passes the line of dead center between the thrust of the spring and the pivoted axis 33 of the link 32, the bolt arms 25, 25 are urged by the pressure of the spring, acting through the toggle, in a counterclockwise direction about the pivot 27 thereby moving the roller 28 from behind into forcible contact with the inner side of the keeper 17, the pressure of said contact increasing as the toggle approaches the fully extended position and drawing the door forcibly into its closed position.

It will now be apparent that the arrangement of parts which affords the dead center relation between the spring and one of the primary links of the toggle, when the latter is retracted, provides a self-cocking means which is independent of special trigger devices and which requires substantially no structure other than that which is essential to the spring and toggle mechanism itself. Another valuable characteristic of the device resides in its relatively high sensitivity to release from the cocked condition, so that in closing the door a very light pressure of the roller 28 against the abutment 17a is sufficient to insure latching of the door. It is to be noted also that the individual parts of the latching mechanism are of sturdy, inexpensive and relatively

simple design well adapted to mass production methods.

It will be understood further that the apparatus described and shown herein, including the configuration of the several parts thereof, is illustrative only of the inventive principles involved, and that these principles may be applied in other physical embodiments within the scope of the claims without departing from the invention.

I claim:

1. A door latch comprising a movable latching member adapted to engage a keeper, a support, toggle means movable to extended and retracted positions to move said member into and out of latching engagement with said keeper respectively, said toggle means comprising a first link having one end pivoted on said support and a second link having one end pivoted on said latching member, said links being pivoted together at their other ends to form a knuckle, spring means interposed between said toggle means and a reaction point removed therefrom effective to move said toggle to its extended position with the said knuckle disposed at one side of the line of thrust of the spring with respect to the pivot of the first link on said support, and manual means for moving said toggle to its retracted position with the knuckle disposed at the opposite side of said line, said toggle being resiliently held in said retracted position by said spring means.

2. A door latch comprising a pivotally mounted latching member adapted to engage a keeper, a support, toggle means movable to extended and retracted positions to move said member into and out of latching engagement with said keeper respectively, said toggle means comprising a first link having one end pivoted on said support and a second link having one end pivoted on said latching member, said links being pivoted together at their other ends to form a knuckle, spring means interposed between said toggle means and a reaction point removed therefrom effective to move said toggle to its extended position with the said knuckle disposed at one side of the line of thrust of the spring with respect to the pivot of the first link on said support, and manual means for moving said toggle to its retracted position with the knuckle disposed at the opposite side of said line, said toggle being resiliently held in said retracted position by said spring means, engagement of said latching member with the keeper serving to release said spring means to effect movement of said toggle to its extended position by said spring means.

3. A door latch comprising pivotally mounted latching means arranged for rotation into and out of latching engagement with a keeper, a support toggle means movable to extended and retracted terminal positions to rotate said latching means into and out of latching engagement with said keeper respectively, said toggle means comprising a first link having one end pivoted to said support and a second link having one end pivoted on said latching means, said links being pivoted together at their other ends to form a knuckle, resilient means reacting between said toggle means and the support at a point removed from said toggle means to effect movement thereof to its extended position with the knuckle disposed at one side of the line of thrust of said resilient means with respect to the pivot of the first link on said support, and manual means for moving said toggle means to its retracted position against the pressure of said resilient means to a position where the knuckle is disposed at the opposite side of said line, said resilient means also reacting against said toggle means to hold the same in said retracted position.

4. A door latch comprising pivotally mounted latching means arranged for rotation into and out of engagement with a keeper, support means, toggle means comprising a first link mounted for pivotal movement about an axis and operable to react against said support means, and a longer link operatively associated with said latching means, said links being pivotally connected together to form a knuckle, said toggle means being movable to extended and retracted terminal positions to rotate said latching means into and out of latching engagement with said keeper respectively, spring means anchored to said support means at a point removed from said links and impinging against said knuckle for effecting movement of said toggle means into said extended position with the knuckle disposed at one side of the dead center line of thrust of the spring means with respect to the axis of the first link, manual means operable to move said knuckle over said dead center line, said spring means being thereby operable to hold said toggle means in said last-mentioned over center position, and means limiting said over center movement.

5. A latching mechanism comprising a movable latching member adapted to engage a keeper, a support, a toggle having a first link pivotally mounted on said support and a longer link operatively associated with said member, said toggle being movable to extended and retracted positions to move said member into and out of latching position with said keeper respectively, spring means interposed between the knuckle of said toggle and a reaction point removed from said links and having its direction of thrust shiftable over a dead center position with respect to the axis of the pivotal mounting of the first link so that on one side of said dead center position said spring is effective to move said toggle to its extended position to actuate said member into latching position and on the other side of said dead center position is effective to hold said toggle in retracted position and said member out of latching position, and manual means operable to shift the spring thrust to the side of the dead center position in which the toggle is retracted, engagement of said latching member with the keeper serving to shift said spring thrust to the opposite side of said dead center position to hold said toggle in retracted position and said latching member out of latching position.

6. A latching mechanism comprising a movable latching member adapted to engage a keeper, a support, a toggle having a first link pivotally mounted on said support and a second link operatively associated with said member, said toggle being movable to extended and retracted positions to move said member into and out of latching position with said keeper respectively, spring means operable to effect actuation of said toggle to its extended position, and manual means for effecting actuation of said toggle to its retracted position, said manual means including a pivotally mounted handle and a connecting rod having one end thereof pivotally connected to said first link and its other end pivotally attached to said handle so that rotation of said handle operates to rotate said first link about its axis and move said toggle to said retracted position.

7. A latching mechanism comprising a movable latching member adapted to engage a keeper, a support, a toggle having a first link pivotally

mounted on said support and a longer link operatively associated with said member, said toggle being movable to extended and retracted positions to move said member into and out of latching position with said keeper respectively, spring means having its direction of thrust shiftable over a dead center position with respect to the axis of the pivotal mounting of the first link so that on one side of said dead center position said spring is effective to move said toggle to its extended position to actuate said member into latching position and on the other side of said dead center position is effective to hold said toggle in retracted position and said member out of latching position, manual means operable to shift the spring thrust to the latter side of the dead center position, said manual means including a pivotally mounted handle and a connecting rod having one end thereof pivotally connected to said first link and its other end pivotally connected to said handle so that rotation of the handle operates to rotate said first link and move said toggle to retracted position and to shift said spring thrust over the said dead center position to hold the toggle in said retracted position.

8. A door latch comprising a movable latching member arranged for movement into and out of latching engagement with a keeper, a support, toggle means movable to extended and retracted terminal positions to respectively advance and retract said member with respect to said keeper, said toggle means comprising a first link mounted for movement about an axis in said support and a second link pivoted to said first link and operatively associated with said member, and resilient means reacting between said toggle means and a reaction point removed from said toggle means and having its direction of thrust shiftable over a dead center line of thrust of said spring with respect to the axis of said first link whereby to direct the force exerted by said resilient means for retaining the toggle means in each of said terminal positions.

9. A door latch comprising a latch member movable between advanced and retracted positions with respect to a keeper, a toggle joint actuator for the member, arranged with respect to the latter so that advancement and retraction of the member is effected respectively by extension and retraction of the joint, said joint comprising pivotally connected arms and a fixed pivot for one of said arms against which the joint reacts in advancing and retracting said member, a spring interposed between said toggle joint and a reaction point removed from said arms and exerting pressure on said arms tending normally to extend the joint, and means for retracting the joint to an extent bringing the one said arm into dead center relation with respect to its fixed pivot and to the line of thrust of said spring whereby the spring pressure becomes operative to resist return movement of the joint toward extended position.

10. A door latch comprising a supporting structure, a latch bolt pivotally mounted on said structure, a toggle comprising a first link pivoted on said structure and a second link pivoted on said first link and on said bolt eccentrically of the pivotal axis of said bolt, a spring mounted on said structure laterally of said toggle and arranged to exert pressure on the pivotal connection between said first and second links, said spring being arranged for movement overcenter with respect to the pivot of said first link on said structure to force said toggle into its locked and broken positions, said toggle in its broken position holding said bolt in its retracted position and said toggle in its locked position locking said bolt in its latching position, the force of said spring being multiplied during movement of said toggle toward its locked position, manually operable means for moving said spring overcenter to unlock said toggle, and tripping means for moving said spring overcenter to lock said toggle.

11. A door latch comprising a supporting structure, a latch bolt pivotally mounted on said structure, a toggle comprising a first link pivoted on said structure and a second link pivoted on said first link and on said bolt eccentrically of the pivotal axis of said bolt, a spring mounted on said structure laterally of said toggle and arranged to exert pressure on the pivotal connection between said first and second links, said spring being arranged for movement overcenter with respect to the pivot of said first link on said structure to force said toggle into its locked and broken positions, said toggle in its broken position holding said bolt in its retracted position and said toggle in its locked position locking said bolt in its latching position, the force of said spring being multiplied during movement of said toggle toward its locked position, manually operable means including a handle and a lost motion connection between said handle and said first link for moving said toggle out of its locked position and for moving said spring overcenter whereby said toggle is driven to its broken position, and tripping means for moving said toggle out of its unlocked position and overcenter to rotate said bolt and move it into latching position.

GEORGE E. CURTISS, JR.

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

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Disclaimer

2,451,381.—*George E. Curtiss, Jr.*, Penn Wynne, Pa. REFRIGERATOR DOOR LATCH. Patent dated Oct. 12, 1948. Disclaimer filed Aug. 28, 1951, by the assignee, *Philco Corporation.*

Hereby enters this disclaimer to claims 1, 2, 3, 6, 8, 9, 10, and 11 of said patent.

[*Official Gazette October 9, 1951.*]