April 11, 1939. H. E. VAN VOORHEES 2,153,819

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Filed Aug. 30, 1934 4 Sheets-Sheet 1

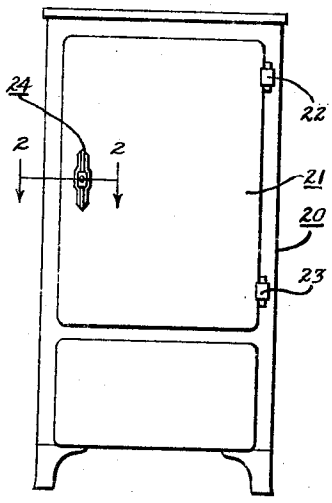


Fig. 1

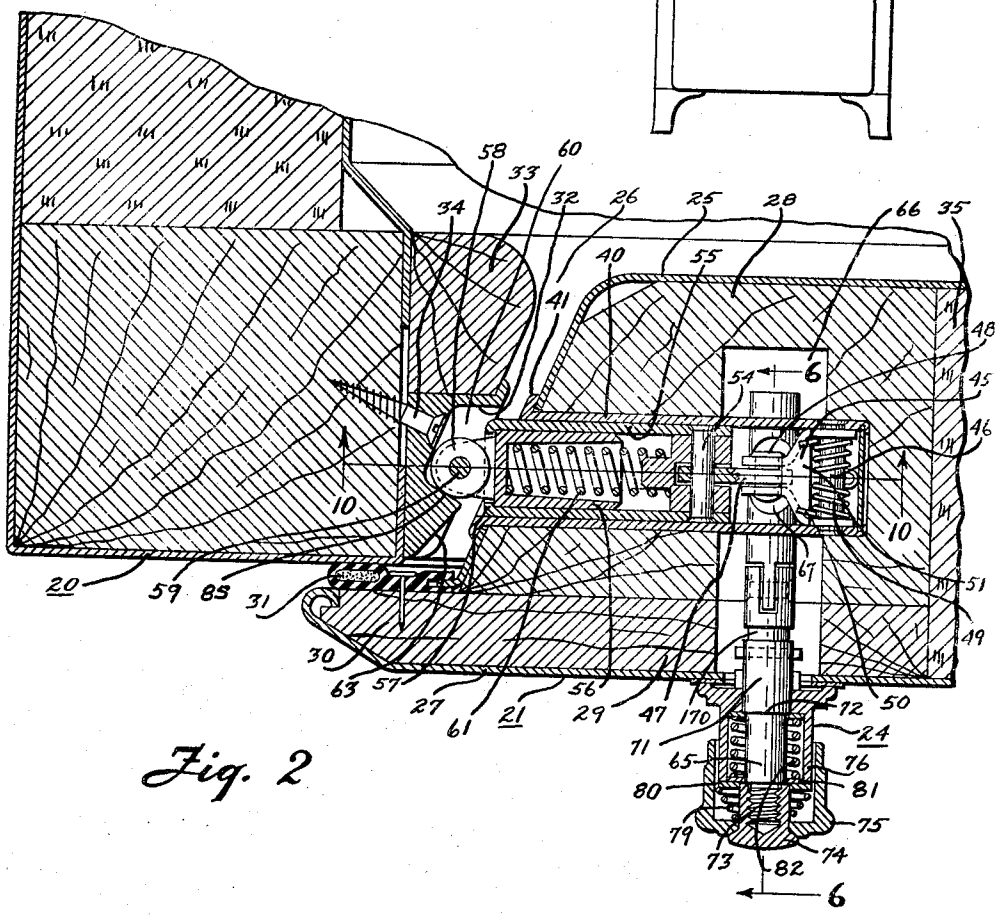


Fig. 2

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Filed Aug. 30, 1934 4 Sheets-Sheet 2

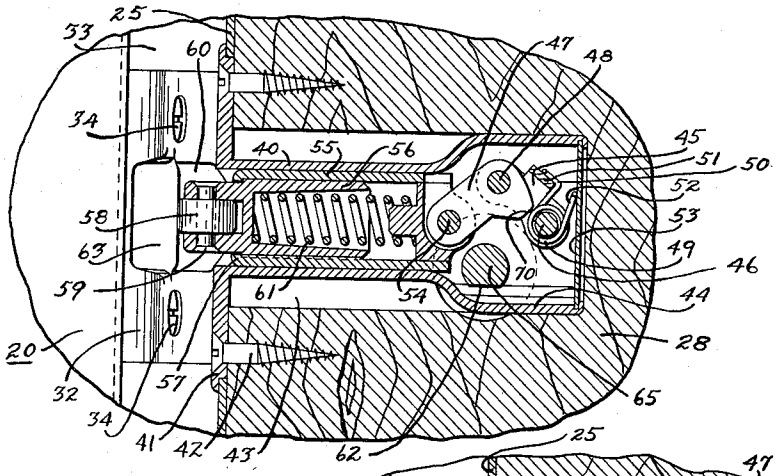


Fig. 3

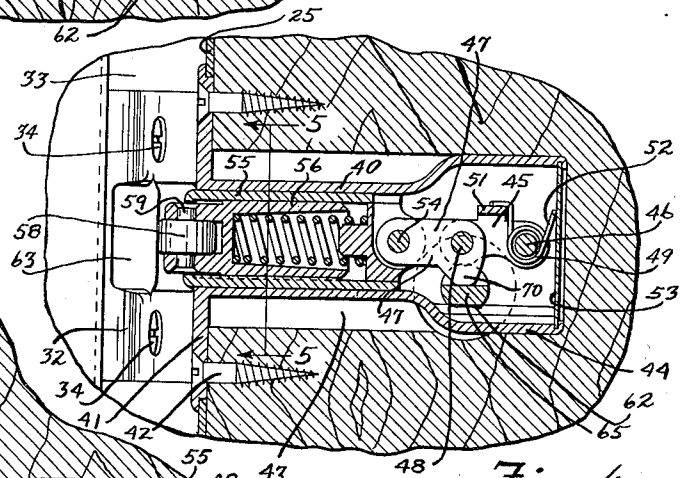


Fig. 4

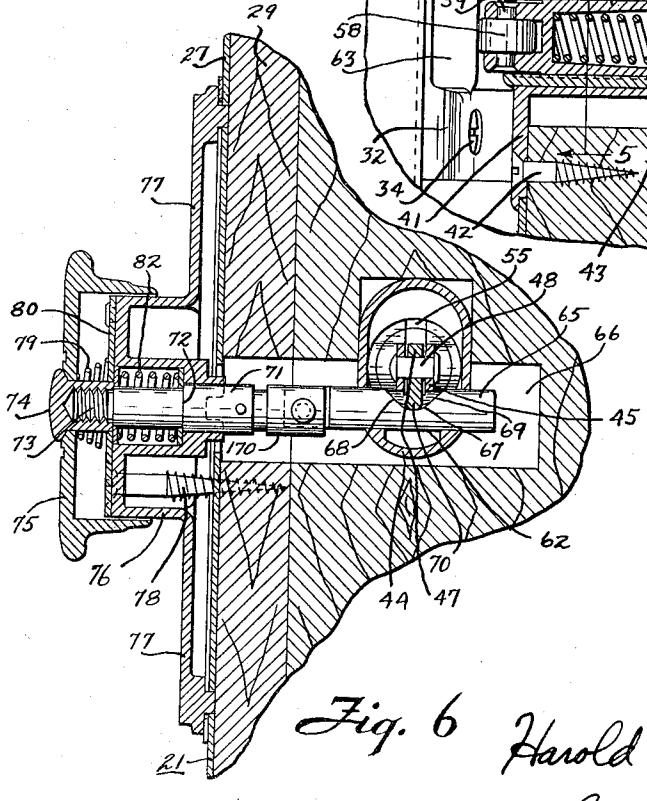


Fig. 6

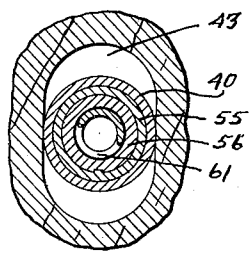


Fig. 5

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LATCH

Filed Aug. 30, 1934 4 Sheets-Sheet 3

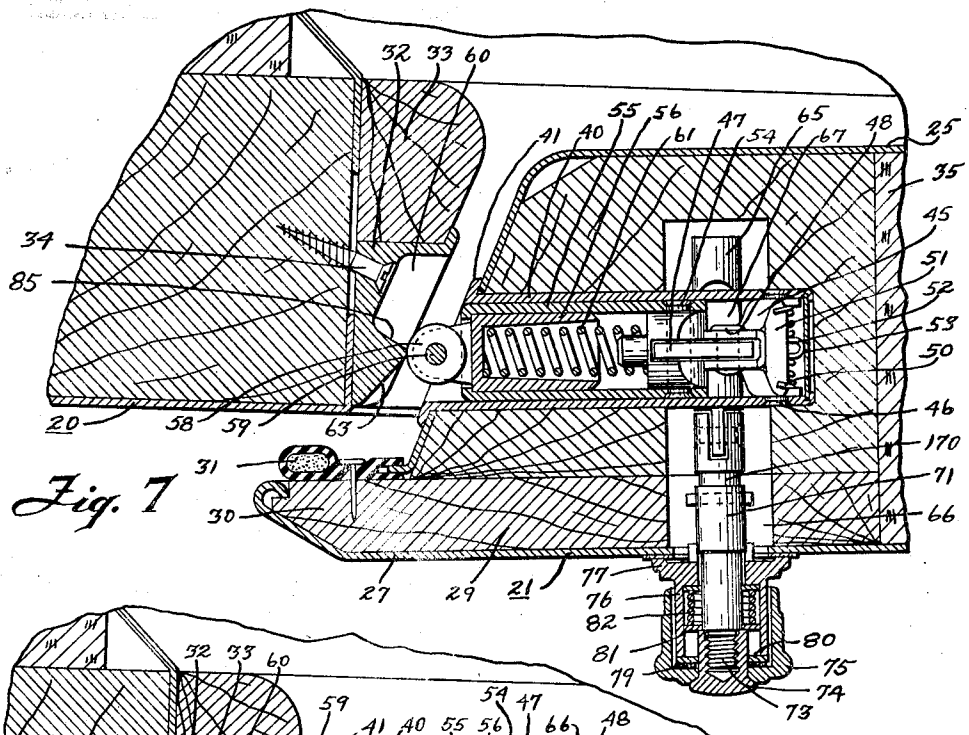


Fig. 7

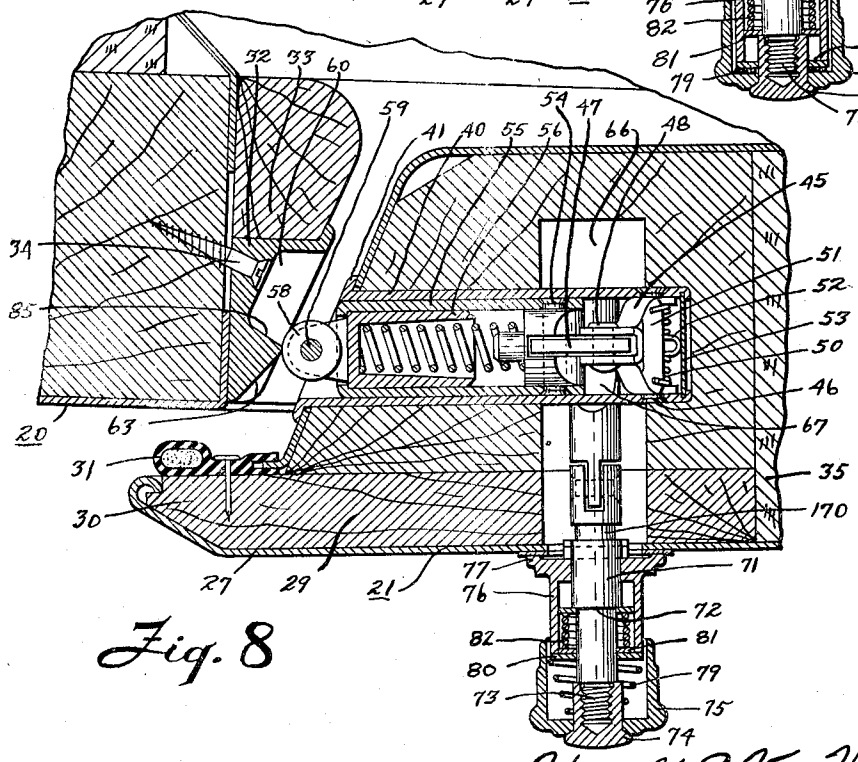


Fig. 8

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April 11, 1939. H. E. VAN VOORHEES 2,153,819

LATCH

Filed Aug. 30, 1934 4 Sheets-Sheet 4

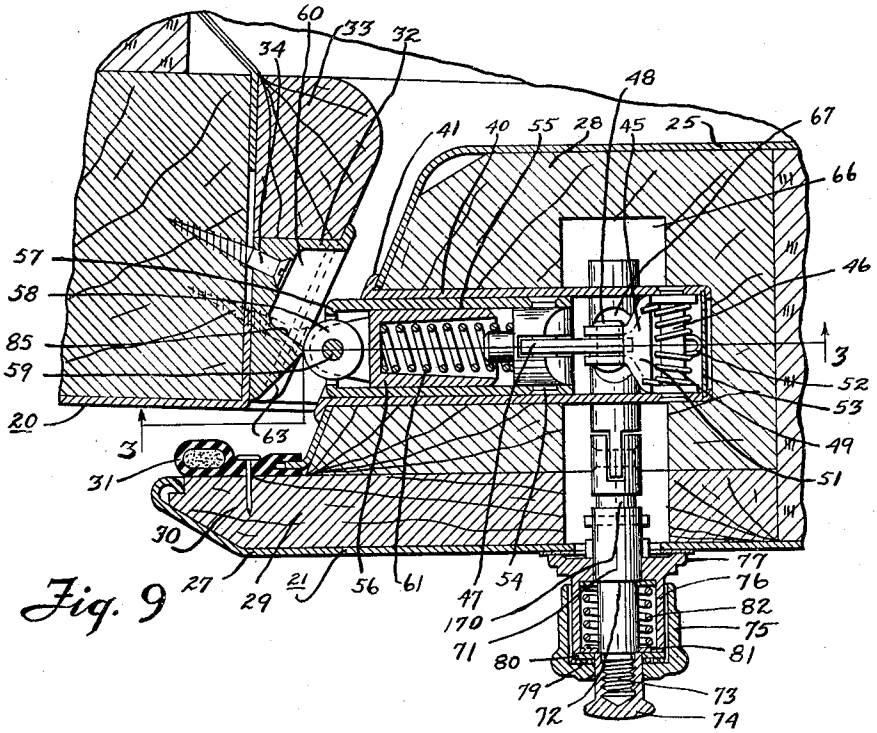


Fig. 9

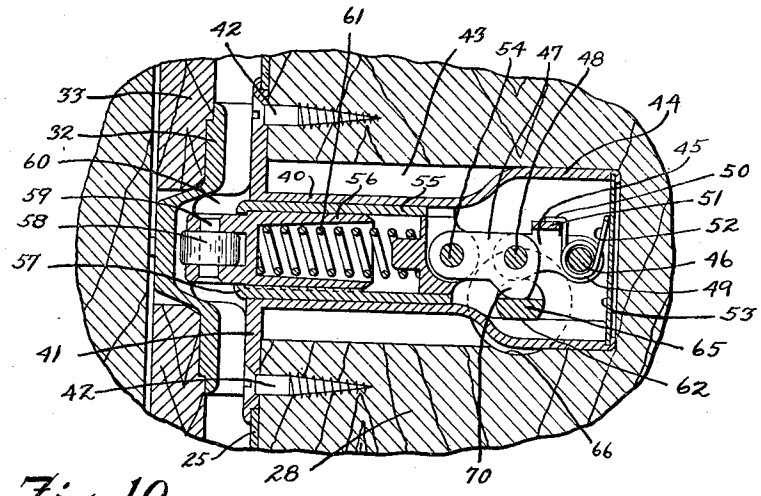


Fig. 10

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Patented Apr. 11, 1939 2,153,819

UNITED STATES PATENT OFFICE

2,153,819

LATCH

Harold E. Van Voorhees, Detroit, Mich., assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application August 30, 1934, Serial No. 742,124

8 Claims. (Cl. 292—164)

This invention relates to refrigerating apparatus and more particularly to refrigerator door latches.

Heretofore, refrigerator door latches have largely been of the pivot lever type in which by pulling outwardly on the handle of the lever, the door was opened. When approaching the refrigerator with both hands full of articles to be placed therein, no hand is available to open the door and such a latch cannot readily be operated without setting down some of the articles. Mechanisms have been provided wherein the door latch is operated by a push or pull, but such mechanisms have not been sufficiently neat, simple and compact for domestic refrigerators and often have not operated easily enough.

It is an object of my invention to eliminate the need for the setting down of any of the articles in such a case and to provide an improved, simple and compact, neat and attractive latch mechanism embodying a simple toggle mechanism actuated by either a light push or pull upon the latch operating mechanism for opening the door.

It is another object of my invention to provide an improved actuating mechanism for a door latch which is insulated from but connected to the bolt mechanism and which permits the opening of the door by either pushing or pulling but which also permits the proper closing of the door by pushing upon a portion of the actuating mechanism.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a front view of a refrigerator cabinet having a latch mechanism embodying my invention;

Fig. 2 is a sectional view of my latch mechanism taken along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 9 with the latch in opening position;

Fig. 4 is a sectional view along the line 3—3 with the latch in closing position;

Fig. 5 is a sectional view along the line 5—5 of Fig. 4;

Fig. 6 is a sectional view along the line 6—6 of Fig. 2 showing the latch actuating mechanism;

Fig. 7 is a sectional view similar to that shown in Fig. 2 excepting that the latch is shown in opening position as actuated by pushing upon the actuating mechanism;

Fig. 8 is a sectional view similar to Figs. 2 and 7 with the exception that the latch is shown in opening position as actuated by pulling upon the actuating mechanism;

Fig. 9 is a sectional view somewhat similar to the sections shown in Figs. 2, 7 and 8 but showing the door as being closed by pushing upon a portion of the latch mechanism; and

Fig. 10 is a sectional view along the line 10—10 of Fig. 2.

Referring to the drawings and more particularly to Fig. 1, there is shown an insulated refrigerator cabinet 20 having an insulated cabinet door 21 pivotally supported on the hinges 22 and 23 and provided with a refrigerator door latch 24 for normally holding the door in closed position.

Referring now more particularly to Figs. 2 to 10 inclusive, there is shown the refrigerator cabinet door 21 provided with an inner sheet metal pan portion 25 extending within the door opening 26 of the refrigerator cabinet 20 and an outer sheet metal portion 27 which is connected to the pan portion 25 by a wooden rectangular frame structure including the members 28 and 29. Within the frame structure and between the inner and outer sheet metal members 25 and 27, insulating means 35 is provided for preventing heat leakage. The member 29 of the door frame structure, together with the outer sheet metal member 27 provide a flange portion 30 for the door which extends over a portion of the outer face of the cabinet surrounding the door opening. This flange portion is provided with a resilient rubber gasket seal 31 which is fastened to the member 29 by nails as shown, or other suitable means. When the door is in closing position, this rubber gasket seal 30 is compressed from the shape shown in Figs. 7, 8 and 9 to the shape shown in Fig. 2, so that air is prevented from passing either into or out of the refrigerator cabinet through the door opening when the door is closed.

This rubber gasket seal when compressed in this manner also provides a considerable force tending to open the door. This, however, is resisted by the latch mechanism 24 which is provided within and upon the door 21 and which engages a recessed catch 32 provided within a recess in the door molding 33 and which is fastened by a screw 34 which extends into the frame work of the cabinet.

The latch includes a generally cylindrical guide member 40 provided with flanges 41 at its open end which are fastened by screws 42 to the peripheral portion of the pan portion of the door 21. This cylindrical member extends within a

recess or notch 43 provided within the wooden frame member 28 of the door 21. At the inner end of this cylindrical member 40 is an enlarged portion 44 which encloses a simple toggle mechanism including a primary link 45 pivoted upon a pin 46 extending through the cylindrical member 40 and a secondary link 47 connected thereto by a pin 48. The primary link 45 is normally urged in a counter-clockwise direction by a torsion type of coil spring 49 which is wrapped around the pin 46 and which has a pair of ends 50 bearing upon a connecting web 51 of the primary link 45 and which has its intermediate looped portion 52 bearing against the rear wall 53 of the cylindrical member 40. This rear wall 53 is formed by a separate piece which is held by providing an inner flange at the rear edge of the inner end of the cylindrical member 40 and by bending over the extending portion over the edges of the member 53 to bind the edges of the member 53 against the shoulder formed by the flange.

The secondary lever 47 is connected by a pin 54 to a cylindrical slide member 55 forming part of the bolt mechanism and which receives the cylindrical bolt 56 or bolt proper which is prevented from being removed from the cylindrical member 55 by a flange 57 which is formed by bending over the outer edges of the cylindrical member 55. The bolt proper 56 is provided with a kerf which receives a roller 58 held by the pin 59. This roller 58 is adapted to rest within the recess 60 formed in the catch 32 as shown in Fig. 2 when the door is in closed position.

The bolt proper 56 is also provided with a recess which receives a stiff compression type coil spring 61 which is held at its opposite end by the closed end portion of the cylindrical member 55. This provides a stiff resilient connection between the bolt proper 56 and the remainder of the latch mechanism which permits the forcible closing of the door by slamming the door shut, when the latch is in the normal closed position. This is done by the inclined surface 63 upon the catch 32 upon which the roller 58 rides to its closing position in the recess 60.

The toggle mechanism is controlled and operated by an actuating rod or bolt 65 better shown in Fig. 6 which is located within a recess 66 extending through the frame portion of the door from the outer face thereof to the recess 43. This bar 65 is provided with a flat side 62 for preventing rotation and a notch 67 which forms the inclined cam faces or surfaces 68 and 69. This notch and the cam faces thereof cooperate with a depending portion 70 of the secondary link 47 of the toggle mechanism to limit the counter-clockwise movement of the primary link 45 of the toggle mechanism. When this depending portion 70 engages the bottom portion of the notch 67, the primary and secondary links 45 and 47 of the toggle mechanism are virtually in alignment with the connecting pin 48 at or slightly below the center line connecting the pins 46 and 54 as shown in Figs. 4 and 10. This virtually locks the cylindrical slide member 55 of the bolt mechanism and prevents any movement of the bolt 56 except by compressing the stiff compression spring 61. Because of the gradual angle of the incline 63, the forcible retraction of the bolt 56 may be accomplished against the pressure of the stiff compression spring 61 by the normal slanting of the refrigerator door to closing position. This is illustrated in Figs. 4, 9 and 10.

The actuating rod or bar is connected by a loose pin and slot connection to an insulating member 170 which in turn is connected by a transversely arranged pin connection to a second metal member 71 which is provided with a shoulder 72 and a threaded end portion 73 which receives a button 74 having an enlarged head. The insulating member 170 with its transversely arranged pin and slot connections forms a sort of universal joint or connection to accommodate a limited misalignment. Surrounding the button 74 and held in place by the enlarged head of the button is a gripping member 75 which receives and is guided by a rectangular boss 76 projecting from the escutcheon plate 77 which is fastened to the door by screws 78. The gripping member 75 is resiliently held against the flange formed by the enlarged head of the button 74 by a conical compression type coil spring 79 which extends between the gripping member and a plate 80 which is fastened to the end of the boss 76 and which holds a washer 81 and inner spring 82 which acts against a shoulder formed by the button in order to normally hold the button 74 and the members 71, 170 and 65 in the position shown in Fig. 6 so that the depending portion of the secondary link rests in the bottom of the notch 67. The toggle mechanism assumes this locked position shown in Figs. 2, 4, 6, 9 and 10 when the door is in closed position or in the open position and no actuation of either the bolt mechanism or the bolt actuating mechanism is performed.

When it is desired to open the door by pushing, the button 74, as well as the gripping member 75 are pushed inwardly as shown in Fig. 7. This breaks the lock formed by the toggle when in the locking position as shown in Figs. 4 and 10, and moves the toggle mechanism from the position shown in Figs. 4 and 10 by causing the cam face 68 of the notch 67 in the bar 65 to move the depending portion 70 of the secondary link 47 upwardly as shown in Fig. 3. Under these conditions the resilient force exerted upon the door because of the compression of the resilient gasket 31 overcomes the light torsion spring 49 and the entire bolt mechanism including the bolt proper 56 and the sliding cylindrical member 55 is retracted by the cooperation of the inner inclined face 85 with the roller 58 to collapse the toggle mechanism to the position shown in Fig. 3. The movement thus given to the door by the resilient gasket seal 31 is sufficient to retract the bolt mechanism under such conditions as well as to move the door to open position. In this way, the door may be opened easily by simply bumping the button 74 lightly with the elbow or any other part of the body.

The door may also be opened by pulling outwardly upon the gripping member 75 which in turn pulls out upon the button 74 and the rod or bar 65 connected thereto which causes the cam face 69 of the notch 67 to similarly force the depending portion 70 of the secondary lever 47 upwardly so that it, together with the remainder of the toggle mechanism, assumes the collapsed position shown in Fig. 3 in which the bolt mechanism may be readily retracted by the force of the resilient gasket seal through the cooperation of the inner inclined surface 85 upon the catch 32 with the roller 58 of the bolt mechanism. This permits the door to open.

However, it should be borne in mind that the force of the resilient gasket seal 31 is insufficient to compress the stiff spring 61. In order to close the door, any portion of the door may be grasped to slam the door to closed position. The force of the slamming is sufficient to cause the roller

58 to ride over the inclined surface 63 in front of the catch 32 and retract the bolt 56 proper against the force of the stiff compression spring 61 in order to permit the door and the bolt mechanism to move into closed position with the roller 58 in the recess of the catch 32 which holds the door in closed position.

However, provision is also made for closing the door by pressing or pushing upon the gripping member 75 without pushing upon the button 74 as shown in Fig. 9. By pushing upon the gripping member 75 without pushing upon the button 74, no movement of the bar or rod 65 will take place and the door is moved to closed position in a like manner as if it had been slammed shut by grasping or pushing the door in another place. By using the gripping member to close the door, wear upon the finish of the door is avoided.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A latch mechanism including a bolt mechanism, a toggle link mechanism for operating the bolt mechanism, means cooperating with the toggle link mechanism for locking the bolt mechanism, means for moving the toggle link mechanism into locking position, one of said means including means for unlocking the toggle link mechanism for unlatching the bolt mechanism, said bolt mechanism including a movable casing containing a bolt and a spring means.

2. A refrigerator latch mechanism including a manipulating mechanism for the outer face of the door, a bolt mechanism located within the outer confines of the cabinet and subjected to the colder temperatures within the cabinet, and an insulating link capable of transmitting force for operatively connecting the manipulating mechanism with the bolt mechanism, said link having a loose connection with one of said mechanisms.

3. A latching mechanism including a bolt and means for operating the bolt comprising a reciprocable member operable in both directions for operating the bolt, and a gripping member movable in one direction for engaging and moving said reciprocable member in one direction and movable in another direction without moving the reciprocable member.

4. A latch mechanism including a bolt mechanism, a toggle link mechanism for operating the bolt mechanism, means cooperating with the toggle link mechanism for locking the bolt mechanism, means for moving the toggle link mechanism into locking position, one of said means including means for unlocking the toggle link mechanism for unlatching the bolt mechanism, said bolt mechanism including a movable casing containing a bolt reciprocably mounted therein and a spring means acting between said bolt and said movable casing.

5. A latch mechanism including a bolt mechanism, a toggle link mechanism for operating the bolt mechanism, means cooperating with the toggle link mechanism for locking the bolt mechanism, means for moving the toggle link mechanism into locking position, one of said means including means for unlocking the toggle link mechanism for unlatching the bolt mechanism, said bolt mechanism including a movable casing containing a bolt reciprocably mounted therein and a spring means acting between said bolt and said movable casing, said movable casing being provided with means for retaining a portion of the bolt therein.

6. A latching mechanism including a bolt and means for operating the bolt comprising a reciprocable member operable in both directions for operating the bolt, and a reciprocably mounted gripping member movable in one direction for engaging and moving said reciprocable member in one direction, said gripping member being movable in another direction to disengage itself from the reciprocable member.

7. A latch mechanism including a bolt mechanism, a toggle link mechanism for operating the bolt mechanism, means cooperating with the toggle link mechanism for locking and unlocking the bolt mechanism, said means including double acting means movable in opposite directions transversely to the direction of movement of the toggle link mechanism, for unlocking the bolt mechanism and spring means for moving the toggle link mechanism into locking position.

8. A latch mechanism including a bolt mechanism, a toggle link mechanism for operating the bolt mechanism, means cooperating with the toggle link mechanism for locking and unlocking the bolt mechanism, said means including a double acting cam means movable in a plurality of directions for unlocking the bolt mechanism.

HAROLD E. VAN VOORHEES.