This invention relates to latch structure and, more particularly, to improvements in refrigeration latches.

Abandoned refrigerators have caused many tragic accidents and deaths among children who, in play, become locked within the refrigerators. While some latch structures have been proposed which can be operated from without the cabinet, such structures do not provide the complete solution, because a panic-stricken youngster may well be incapable of operating the latch to free himself from suffocating confinement.

It is the primary object of this invention to provide a latch or lock mechanism for the door of either an electrically energized or gas energized refrigerator which mechanism is capable of retaining the door in an air-tight, closed position and which is particularly adapted to become inoperable or incapable of retaining the door in air-sealed, closed position when the refrigerator is disconnected from its source of energy or when the source of energy fails.

The foregoing and other objects and advantages of the invention will become apparent to those skilled in the art from the following specification taken in connection with the accompanying drawings wherein:

Fig. 1 is a front view of a refrigerator which utilizes a latch mechanism incorporating the features of this invention;

Fig. 2 is an enlarged detail sectional view taken as indicated by the line 2—2 of Fig. 1 to illustrate the keeper structure forming a part of the latch mechanism;

Fig. 3 is an elevational view of the keeper structure, parts being shown in section to illustrate details;

Fig. 4 is a view similar to Fig. 3 but showing the keeper structure when the refrigerator is disconnected from its source of energy; and

Fig. 5 is a detail sectional view taken as indicated by line 5—5 of Fig. 1 to illustrate door biasing means which cooperate with the latch mechanism.

A refrigerator latch or lock mechanism incorporating the features of this invention may be described generally as comprising a conventional latch actuating structure and a novel latch keeper structure. The mechanism does not depend for operation in accordance with the present invention upon any particular form of actuating structure and, therefore, the actuating structure shown is to be considered as merely exemplary. The keeper structure includes a movable member and means for retaining the movable member in fixed position for engagement with or by the latch bolt for the purpose of holding the refrigerator door in closed, sealed position on the refrigerator cabinet. The aforesaid retaining means is adapted to be automatically disengaged from the movable member when the refrigerator is disconnected from its source of energy, or when the source of energy fails, whereupon the movable member is incapable of further retaining the latch bolt so that the refrigerator door can no longer be held in closed position.

It will be quite apparent that a disconnected refrigerator having the latch mechanism of this invention cannot provide the “death chamber” for suffocating a child at play. Should a child confine himself within the refrigerator, for example during a game of “hide-and-seek”, the door cannot become inadvertently latched or locked in closed position. The child can at times escape from confinement by merely pushing the door open. To assure that the door will remain at least slightly ajar when the refrigerator is disconnected, means are incorporated in the refrigerator and/or door structure to bias the door from its closed, airtight position. This biasing means is operatively associated with the latch mechanism by reason of the fact that in biasing the door from closed position, the said means also biases the latch bolt so that the latter will shift the movable member into inoperative or non-retaining position.

In more detailed explanation of the invention, attention is invited first to Fig. 1 of the drawing wherein a refrigerator cabinet is designated by the reference numeral 10 and the refrigerator door by the numeral 12.

In this exemplary embodiment, the latch actuating structure is mounted upon the door 12 and includes a handle 14 and a latch bolt 16 operated thereby. The latch keeper structure is mounted upon the cabinet 10 and is designated generally by the reference numeral 18 and the means for biasing the door 12 from closed position are also mounted on the cabinet at the top and bottom of the door opening and comprise two similar units designated by the numerals 20, 20.

The exemplary latch actuating structure shown is arranged upon the door 12 so that when the door is closed the latch bolt 16 will be aligned with keeper structure 18 which is located within an opening provided in the inner wall 22 of the door opening in the cabinet 10. While the latch actuating structure shown is particularly adapted for association with keeper structure arranged in the particular location shown, it should be understood that the said actuating structure is not in itself novel and requires no detailed disclosure. It should also be understood that the keeper structure may be otherwise located and will require a differently located and/or modified actuating structure, but such modified structure will also be conventional.

An important element of the keeper structure 18 is a pivotably movable member 24 which normally functions as a combination strike and keeper for the bolt 16. The said movable member or keeper 24 is generally rectangular in configuration and is normally positioned as shown in Fig. 2 to engage and retain the latch bolt 16 so as to hold the door 12 in closed, airtight position on the cabinet 10. That is, the keeper 24 is normally located to project through the previously mentioned opening in the door opening wall 22 so that the latch bolt 16 can be engaged behind the projecting portion of the said keeper member. The front face of the projecting portion of the keeper 24 is rounded as shown at 26 to provide a strike surface for the latch bolt so that the latch bolt can be cammed to retracted position and then to extended position during closing of the door without manipulating the operating handle 14.

The means for supporting the keeper member 24 includes a generally U-shaped bracket 28 and a pivot pin 30 extending between the opposed walls of the bracket 28 and through a suitable opening or bore in the said keeper member. The bracket 28 is arranged in the opening of the wall 22 so that the pin 30 is disposed substantially vertically whereby the keeper member 24 is pivotable in a substantially horizontal plane. A plate 32 having an opening 34 for the projecting portion of the keeper 24 is welded or otherwise secured to the cabinet wall 22 over its opening and is welded or otherwise secured to the bracket 28 to hold the same in the aforesaid position.
As previously mentioned, means are included in the keeper structure to retain the keeper member 24 in what has been hereinbefore referred to as its "normal" position. The said retaining means comprises a substantially vertically movable pin 36 projecting through a suitable opening in the lowermost wall of the bracket 28 and engageable within a socket or recess 38 provided in the keeper member 24. The pin 36 can only be engaged within the socket 38 when the keeper member 24 is in the full line position shown in Figs. 2 and 3, i.e., the "normal" position for retaining the latch bolt 16. While the pin 36 is in the full line position for the keeper member the one in which the retaining pin 36 may be engaged, the said retaining pin is biased to a retracted position out of engagement with keeper member as shown in Fig. 4. When the pin 36 is disengaged, the keeper member 24 is free to pivot on the pivot pin 30 and, accordingly, any force on the door 12 tending to open the same will cause the latch bolt 16 to shift the keeper member toward the position shown in Fig. 4 and in broken lines in Fig. 2.

The means biasing the retaining pin 36 out of engagement is a helical spring 40 surrounding the said pin and disposed to compress the bracket 28 and a flange 42 provided on the bottom end unit of the pin.

In accordance with the present invention, the retaining pin 36 is engaged with the keeper member 24 to position the same for door locking only when the refrigerator 10 is connected to its source of energy. While there apparently are other energy-actuated means for engaging the retaining pin, I have shown an actuating bellows 44 which contains a thermo-sensitive liquid or gas. More specifically, the bellows 44 is seated upon a base 46 in a substantially vertical position with the top end of the bellows secured to the bottom end of the retaining pin 36. When the bellows is expanded as shown in Fig. 3, it will thrust the retaining pin 36 upwardly against the force of the spring 40 so that the said pin may be engaged within the socket 38.

The thermo-sensitive liquid or gas for expanding the bellows 44 is supplied from a well or bulb 48 which is connected to the bellows by means of a capillary tube 50. The bulb and bellows are connected to define a closed system and that amount of liquid or gas is provided in the system such as will permit the bellows to collapse as shown in Fig. 4 to retract the retaining pin when the liquid or gas is relatively cold. It is an important aspect of the present invention that the source of energy for operating the refrigerator 10 also supplies the heat energy for expanding the thermo-sensitive liquid or gas which expands the bellows 44. In the specific example shown wherein the refrigerator 10 is electrically energized from a power source connected to the lines L1 and L2, the thermo bulb or well 48 is surrounded by a heating coil 52 which is connected across the lines L1 and L2 and in parallel with the motor and other electrical elements of the refrigerator.

Accordingly, when the refrigerator 10 is connected to its source of power the heating coil 52 will be energized and heat the thermo bulb 48 causing the thermo-sensitive liquid or gas to expand, thereby expanding the bellows 44 to thrust the retaining pin 36 upwardly. When the refrigerator is disconnected from its source of energy, the liquid or gas column will collapse, the bellows will collapse, and the retaining pin will be spring biased to retracted position.

The aforesaid keeper structure 18 is equally applicable to a gas energized refrigerator. The only change necessitated is in the location of the thermo bulb 48. In gas refrigerators there will be no energizing source for a heating coil and the bulb 48 is located closely adjacent the pilot light of the gas system and derives heat energy therefrom to expand the liquid or gas. When the refrigerator is disconnected or if the pilot light is otherwise extinguished, the fluid column and bellows will collapse.

It will be apparent that the retaining pin 36 will engage the keeper member 24 at all times during the operation of either a gas or electrically energized refrigerator and it will also be apparent that the keeper structure 18 should require no servicing during the life of the refrigerator. During the refrigerator life, the keeper structure can be depended upon to hold the latch bolt 16 when the door 12 is closed. The only maintenance for the keeper structure 18 occurs when the refrigerator is being connected to its source of energy. At such time, the refrigerator is connected to its energy source and then the keeper member 24 is manually held in the position shown in Fig. 3 while the thermo-sensitive liquid or gas is heated. Upon being heated the fluid will expand the bellows to engage the retaining pin with the keeper member.

As previously mentioned, the latch mechanism of this invention is particularly adapted to avoid tragic accidents with abandoned refrigerators by making it impossible to lock a refrigerator door after the refrigerator is disconnected from its source of power. In this connection it is important to observe that the conventional rubber-like sealing strip 54 carried by the door 12 to engage the cabinet door seal 58 will bias the door from closed position after the locking force has been removed by disconnection of the energy source. However, in addition to the sealing strip 54, biasing units 20, 20 are provided, respectively, at the top and bottom of the door opening to force the door 12 from its closed air tight position. Each such biasing unit comprises a plunger 56 which is slideable in piston-like fashion within a cylindrical housing 58. The housing is mounted within the front wall 60 of the refrigerator and has a forwardly facing open end through which one end of the plunger 56 projects. The said plunger is biased forwardly by a spring 62 located within the housing 58 and the projecting end of the plunger is engaged by the door 12 when the door is closed. When the power source is disconnected and the latch mechanism thereby rendered incapable of holding the door closed, the spring biased plungers 56, 56 at the top and bottom of the door opening will force the door 12 outwardly to assure air flow into the refrigerator chamber or compartments.

Another, less apparent, advantage of the aforesaid latch mechanism and door biasing units resides in the warning given a housewife when the energy or power source fails. If the power supply should fail, the latch mechanism will become incapacitated and the door will be forced ajar. This will advise the housewife of the power failure and she can take prompt action to have the fault remedied.

In the foregoing description of this invention no specific thermo-sensitive liquid or gas was mentioned, it being understood that a variety of commercially available fluids will meet the purposes of the invention. However, care should be exercised to select a fluid which will not expand so as to engage the retaining pin at room or ambient air temperatures.

Furthermore, there was no specification of force set forth in connection with a description of the springs used to open the refrigerator door, it being understood that no critical value should be set. However, in selecting the springs, care should be exercised to provide springs capable of partially opening and supporting the door in partially open position even when the refrigerator is set on its back with its door uppermost.

While the invention has been described with reference to a presently preferred embodiment, it should be understood that the invention is not limited to the specific form described otherwise than indicated by the claim which follows.

I claim:

In an automatically operable latch mechanism, the improvement comprising a movable keeper which, when secured in one position, is held in position to be en-
gaged by the latch mechanism but which, when not secured, is freely pivotable to a second position wherein it will not be engaged by the latch mechanism, a movable retaining pin engageable with the keeper to secure the same in said one position, automatically operable means adapted to engage said retaining pin with said keeper including a bellows connected to said pin, a spring biasing said bellows toward collapsed position to disengage the pin, a source of thermo-sensitive fluid in communication with the interior of said bellows, and heat generating means associated with said fluid source and connectible to a source of energy whereby to expand said bellows and to engage said pin at all times when said heat generating means is energized.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Inventor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>518,119</td>
<td>Schnepf</td>
<td>Apr. 10, 1894</td>
</tr>
<tr>
<td>1,323,007</td>
<td>Brunette</td>
<td>Nov. 25, 1919</td>
</tr>
<tr>
<td>1,854,768</td>
<td>Schneider</td>
<td>Apr. 19, 1932</td>
</tr>
<tr>
<td>1,949,830</td>
<td>Willard</td>
<td>Mar. 6, 1934</td>
</tr>
</tbody>
</table>