Nov. 25, 1952 A. G. JANOS ET AL 2,618,934

DEFROST INDICATOR FOR REFRIGERATORS

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Fig. 1.

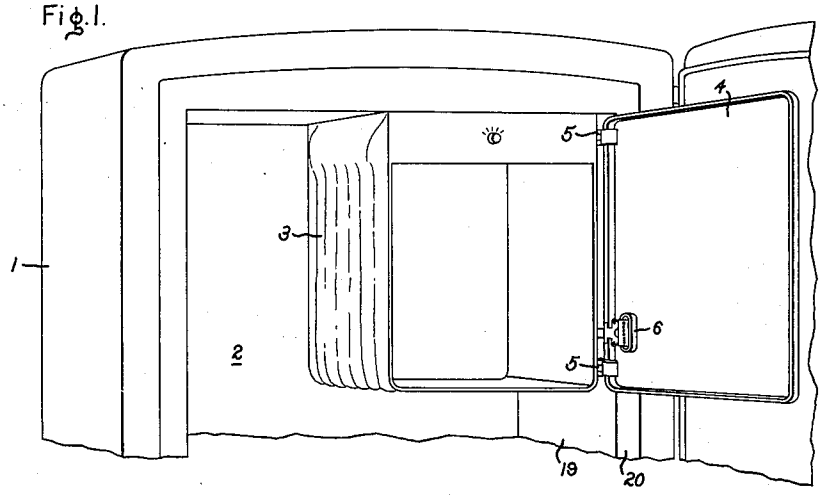


Fig. 3.

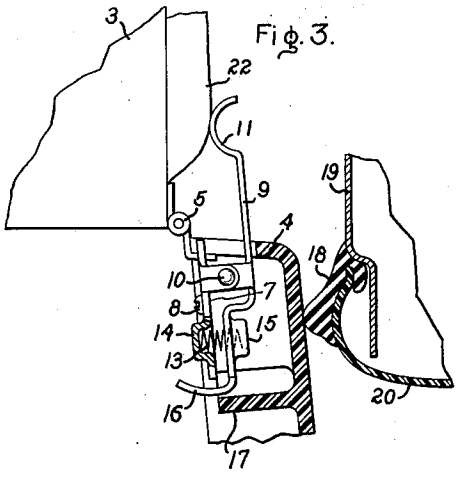


Fig. 2.

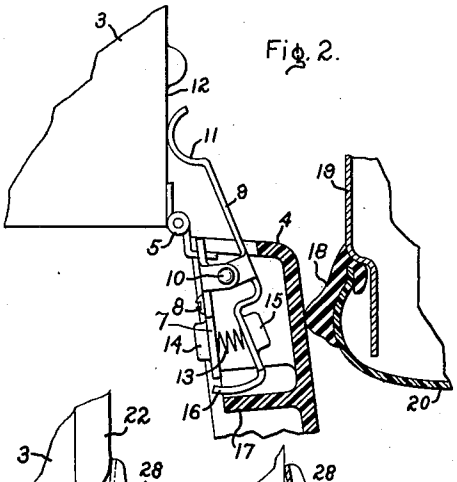


Fig. 4.

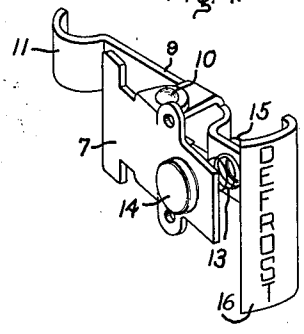


Fig. 6.

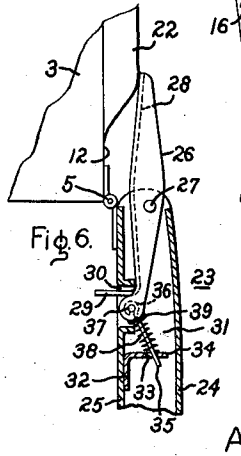
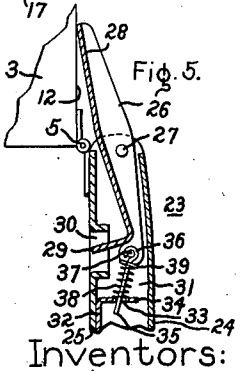


Fig. 5.



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DEFROST INDICATOR FOR REFRIGERATORS

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7 Claims. (Cl. 62—1)

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This invention relates to refrigerators and more particularly to defrost indicators for refrigerators.

The cooling unit or evaporator in many household refrigerators is exposed to the air in the food storage compartment and, because of the low temperature of the evaporator, moisture in the air in the storage compartment condenses on the evaporator and forms frost. To maintain the refrigerating apparatus operating at a relatively high efficiency, it is necessary to remove this frost from time to time. In order to indicate to the user when the amount of frost collected is such that the evaporator should be defrosted, some form of indicating or signalling device may be employed. To impress the need for defrosting more forcibly upon the user, it is advantageous to employ a defrost indicator which provides a "live" signal, that is, an indicator which moves in the area of the user's vision during his use of the refrigerator. Accordingly, an arrangement is provided whereby, when the frost is of some particular thickness, an indicating element is positively moved into an exposed position in clear view of the user. This makes it more difficult for the user to overlook the need for defrosting than in a case where a static indicator is employed.

It is an object of this invention to provide an improved arrangement for indicating the thickness of frost collected on a cooling unit or evaporator.

It is another object of this invention to provide an improved arrangement for indicating when the frost on the cooling unit has reached a predetermined maximum thickness.

It is a further object of this invention to provide an improved arrangement associated with an evaporator door and actuated when the evaporator door is opened for indicating frost thickness or desirability of defrosting.

It is still another object of this invention to provide an improved defrost indicator actuated so as to attract the user's attention thereto.

Further objects and advantages of this invention will become apparent as the following description proceeds and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of the specification.

In carrying out the objects of this invention a pivoted element is mounted on the evaporator in such a manner as to engage the frost on one of the walls of the evaporator when the door is moved to its open position. The pivoted element

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is resiliently biased toward its frost-engaging position, and it includes an indicating portion normally concealed by a portion of the door and movable to an exposed position by a predetermined thickness of frost when the evaporator door is in its open position.

For a better understanding of this invention reference may be had to the accompanying drawings in which Fig. 1 is a view of a portion of a refrigerator illustrating an embodiment of this invention; Fig. 2 is an enlarged sectional view of the defrost indicator of Fig. 1, showing the indicator in its normal concealed position; Fig. 3 is a view similar to Fig. 2 showing the indicator in an exposed position; Fig. 4 is an enlarged perspective view of the pivoted indicating element; Fig. 5 is a view similar to Fig. 2 showing the modified form of this invention; and Fig. 6 is a view similar to Fig. 5 showing the modified form of indicating element in its exposed position.

Referring now to the drawing there is shown a refrigerator 1 including a food storage compartment 2 and an evaporator or cooling unit 3 mounted in the upper portion of the food storage compartment for cooling this compartment. The front of the evaporator 3 is closed by a door 4 which is hinged, as indicated at 5, to one side of the evaporator 3.

In order to indicate the amount of frost collecting on the evaporator 3 and thereby to indicate the need for defrosting, a defrost indicator 6 is mounted on the door 4. This defrost indicator is shown in greater detail in Figs. 2, 3 and 4. The indicator includes a plate 7 which is secured by screws 8 or other suitable fastening devices to the body of the door 4. A pivoted indicating element 9 is mounted on the plate 7 by a pin 10. The indicating element 9 includes an arm 11 which is adapted to engage frost collecting on the side wall 12 of the evaporator 3. The element 9 is biased in a direction in which the arm 11 engages the frost by a spring 13. The ends of the spring 13 are received within cup-shaped receptacles 14 and 15 formed in the plate 7 and the pivoted element 9 respectively. In order to provide a visible element for indicating to the user the amount of frost collected on the evaporator, the pivoted element 9 includes an indicating portion 16 at the opposite end from the frost-engaging arm 11. The door 4, which is preferably molded from some suitable plastic material, is formed with an upstanding rib 17 adjacent the indicating portion 16 of the pivoted element 9. When the indicating element 9 is in the position shown in Fig. 2, that is, when there is substan-

tially no frost on the evaporator 3, the indicating portion 16 is substantially concealed from the user's view by the rib 17 of the door.

In order to limit the opening movement of the door 4 to the position shown, a rubber bumper 18 is mounted between the inner liner 19 of the refrigerator cabinet and a breaker strip 20 which closes the space between the inner liner 19 and the outer wall 21 of the refrigerator cabinet adjacent the access opening of the refrigerator cabinet. Since the pivoted element 9 is biased by the spring 13 in a counter-clockwise direction, each time the evaporator door 4 is opened the arm 11 of the pivoted element 9 is brought into engagement with the frost collected on the wall 12 of the evaporator 3. Since the open position of the door 4 is fixed by its engagement with the rubber bumper 18, the position of the pivoted element 9 and, hence, of its indicating portion 16, is determined by the amount of frost on the side wall 12 of the evaporator. In the position shown in Fig. 2, for example, where there is substantially no frost collected, the indicating portion 16 of the pivoted element 9 is substantially concealed by the upstanding rib or member 17 on the door 4. On the other hand, under the condition shown in Fig. 3 where a substantial amount of frost 22 has collected on the evaporator 3, the pivoted element 9 has been shifted in a counterclockwise direction against the bias of the spring 13 by the engagement of the arm 11 with the relatively thick layer of frost 22. Under this condition the indicating portion 16 of the pivoted element 9 extends a substantial distance beyond the end of the rib 16 and hence, the face thereof is exposed to the user's view. The front face of the indicating portion 16 may be inscribed with a suitable legend such as "Defrost" or it may merely be painted with some conspicuous color, such as red, so as to attract the user's attention readily. Further, since the distance which the indicating portion 16 extends beyond the rib 17 is directly dependent upon the varying thickness of frost on the evaporator 3, the face of the indicating portion may, if desired, be inscribed with suitable marking so that the exact thickness of the frost can be noted by the user; thus inscriptions such as "⅛", "¼", etc., may be placed on the face of the indicating portion 16, and the user can then note the thickness of frost on the evaporator by noting the numeral which appears adjacent the front edge 22 of the rib 17.

In the form of defrost indicator just described, it has been pointed out that the position of the pivoted element 9 and, hence, of the indicating portion 16 in the open position of the door 4 varies directly and progressively with the thickness of the frost 22 on the evaporator 3. In Figs. 5 and 6 there is shown a modified form of this invention which differs from that previously described in that the indicating portion is concealed from view until the frost has reached a predetermined thickness at which defrosting is desirable for efficient operation of the refrigerating apparatus. The same numerals have been used to designate corresponding parts in Figs. 5 and 6 and in Figs. 1 through 4 inclusive. Referring to Figs. 5 and 6 there is shown an evaporator door 23, which is hinged, as indicated at 5, to the evaporator 3. The evaporator door 23 is formed of metal and is of a spaced wall construction including an outer wall 24 and an inner wall 25 spaced therefrom. In order to provide an indication of the thickness of frost and, hence, of the need for defrosting, a pivoted element 26 is mounted on the door 23 by a pin 27. This pivoted element 26 includes an arm 28 which is adapted to engage frost collecting on the side wall 12 of the evaporator 3. The pivoted element 26 further includes an indicating portion 29 at the opposite end thereof, this indicating portion serving the same function as the portion 16 of the pivoted element 9 in the form previously described. The inner wall 25 of the door 23 is shaped to provide an opening 30 through which the indicating portion 29 of the pivoted element is adapted to project.

In the form shown in Figs. 5 and 6, the pivoted element 26 occupies only two positions, one, as shown in Fig. 5, in which the indicating portion 29 is concealed within the door and the second, as shown in Fig. 6, in which the indicating portion 29 extends beyond the inner wall 25 of the door to give an indication of the need for defrosting. To cause the pivoted element 26 to occupy these two extreme positions and to snap from one to the other under predetermined conditions, a snap-acting overcenter mechanism 31 is provided. This mechanism includes an L-shaped bracket 32 which is welded or otherwise secured to the inner wall 25 of the door. The L-shaped bracket 32 includes an opening 33 in its leg 34 and one end of a rod 35 extends through this opening 33. The other end of the rod 35 is shaped to provide a hook 36 which is pivotally supported on a pin 37 secured to the pivoted element 26. A spring 38 is mounted between a shoulder 39 on the pivoted element 26 and the leg 34 of the bracket 32 to supply the force for snapping the pivoted element from the position shown in Fig. 5 to the position shown in Fig. 6 and vice versa.

Two extreme conditions of frost collection on the evaporator 3 are shown in Figs. 5 and 6. In Fig. 5 the evaporator 3 is substantially free from frost and, when the arm 28 of the pivoted element 26 engages the side wall 12 of the evaporator 3, the pivoted element 26 occupies a position in which the indicating portion 29 is concealed between the inner and outer walls 25 and 24 of the door 23. The spring 38, in the overcenter position shown, maintains the pivoted element 26 in the position shown. In the condition shown in Fig. 6, a substantial amount of frost 22 of predetermined maximum thickness has collected on the side wall 12 of the evaporator 3. Accordingly, when the door 23 is moved to its open position, the arm 28 engages the frost 22 and causes the pivoted element 26 to move in a clockwise direction past the point where the spring 38 moves over center, that is, where the pin 37 moves to the left of the line extending through the pin 27 and the opening 33. The force of the spring then immediately shifts the pivoted element 26 to the extreme position shown in Fig. 6 wherein the indicating portion 29 projects substantially beyond the inner wall 25 of the door. This indicating portion 29 may be inscribed with some suitable legend such as "Defrost" or it may be painted in some conspicuous color, such as red, so that the user's attention is directed thereto. Because of the location of the indicating portion 29 at a point where the user will readily notice it in the process of placing things or taking articles from the evaporator and because of the "live" effect of the movement of the indicating element to the exposed position as the door is opened, the indication of the need for defrosting is unlikely to be overlooked. After

defrosting the user may return the indicator to the position shown in Fig. 5 by pressing on the exposed end of the indicating portion **29**.

While for convenience the representation of the bumper **18**, the inner liner **19** and the breaker strip **20** has been omitted from the illustration in Figs. 5 and 6, it will be obvious that this arrangement for limiting the movement of the door in its open position is also employed in the arrangement illustrated in Figs. 5 and 6.

While specific embodiments of this invention have been shown and described, it is not desired that this invention be limited to the particular constructions shown and described and it is intended, by the appended claims, to cover all modifications within the spirit and scope of this invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In a refrigerating apparatus including a cooling unit upon which frost collects, a door for said cooling unit hinged for movement relative thereto, means for indicating the frost collected on said cooling unit, said means including a pivoted element mounted on said door at the hinged side thereof, said pivoted element including an arm moved toward said frost when said door is moved to its open position, and means for biasing said arm toward said frost, said pivoted element further including an indicating portion normally concealed and movable into an exposed position dependent upon the amount of frost on said cooling unit.

2. In a refrigerating apparatus including a cooling unit upon which frost collects, a door for said cooling unit hinged for movement relative thereto, means for indicating the frost collected on said cooling unit, said means including a pivoted element mounted on said door at the hinged side thereof, said pivoted element including an arm projecting beyond said door and moved toward said frost when said door is moved to its open position, and means for biasing said arm toward said frost, said pivoted element further including an indicating portion normally concealed and movable into an exposed position dependent upon the amount of frost on said cooling unit.

3. In a refrigerating apparatus including a cooling unit upon which frost collects, a door for said cooling unit hinged for movement relative thereto, means for indicating the frost collected on said cooling unit, said means including a pivoted element mounted on said door at the hinged edge thereof, said pivoted element including an indicating portion, means for biasing said element in one direction wherein said indicating portion is concealed by said door, said pivoted element including an arm engaging the frost on said cooling unit when said door is moved to its open position whereby said pivoted element is moved against its bias to force said indicating portion into an exposed position when said frost reaches a predetermined thickness.

4. In a refrigerating apparatus including a cooling unit upon which frost collects, a door for said cooling unit hinged for movement relative thereto, means for indicating the frost collected on said cooling unit, said means including a pivoted element mounted on said door at the hinged side thereof, said pivoted element including an arm moved toward said frost when said door is moved to its open position, and means for biasing said arm toward said frost, said pivoted element further including an indicating portion, said door including a member positioned adjacent said indicating portion for concealing said indicating portion, said indicating portion being moved, when said door is opened, into an exposed position beyond said member by an amount dependent upon the amount of frost on said cooling unit.

5. In a refrigerating apparatus including a cooling unit upon which frost collects, a door for said cooling unit hinged for movement relative thereto, means for indicating the frost collected on said cooling unit, said means including a pivoted element mounted on said door at the hinged side thereof, said pivoted element including an arm moved toward said frost when said door is moved to its open position, and means for biasing said arm toward said frost, said pivoted element further including an indicating portion normally concealed and movable, when said door is opened, to an exposed position by an amount dependent on the amount of frost on said cooling unit.

6. In a refrigerating apparatus including a cooling unit upon which frost collects, a door for said cooling unit hinged for movement relative thereto, means for indicating the frost collected on said cooling unit, said means including a pivoted element mounted on said door at the hinged side thereof, said pivoted element including an arm moved toward said frost when said door is moved to its open position, and means for biasing said arm toward said frost, said pivoted element further including an indicating portion normally concealed and movable, when said door is opened, into an exposed position when the frost on said cooling unit exceeds a predetermined amount.

7. In a refrigerating apparatus including a cooling unit upon which frost collects, a door for said cooling unit hinged for movement relative thereto, means for indicating the frost collected on said cooling unit, said means including a pivoted element mounted on said door at the hinged side thereof, said pivoted element including an arm moved toward said front when said door is moved to its open position, said pivoted element further including an indicating portion, and an overcenter spring for normally biasing said element to a position wherein said indicating portion is concealed, said spring being moved over center to snap said indicating portion to an exposed position upon opening of said door when the frost on the cooling unit exceeds a predetermined amount.

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