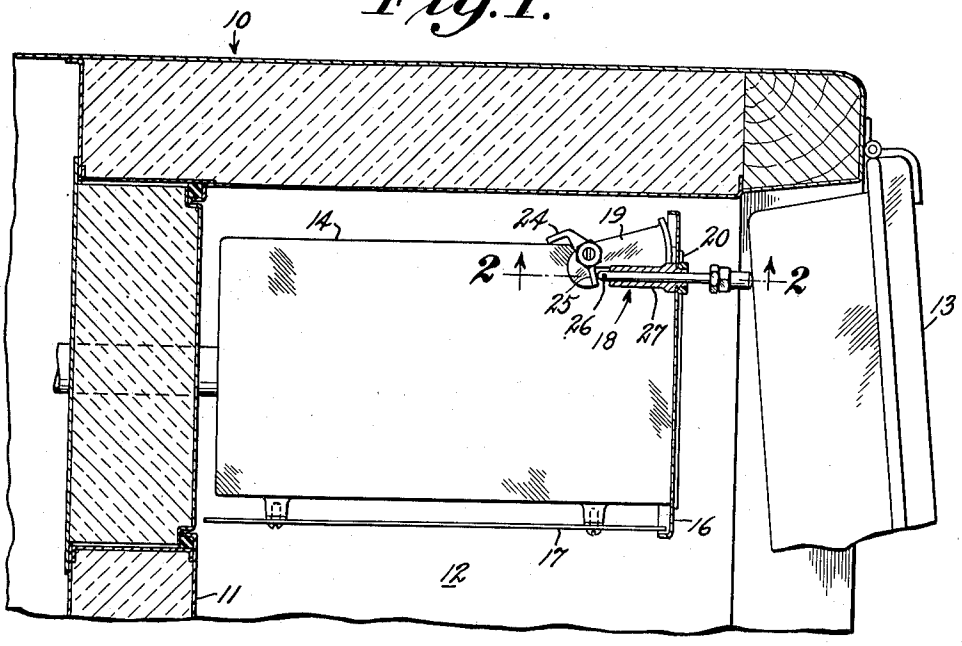
March 29, 1938. S. M. BÄCKSTRÖM 2,112,261

REFRIGERATION

Filed July 17, 1936 2 Sheets-Sheet 1

Fig. 1.



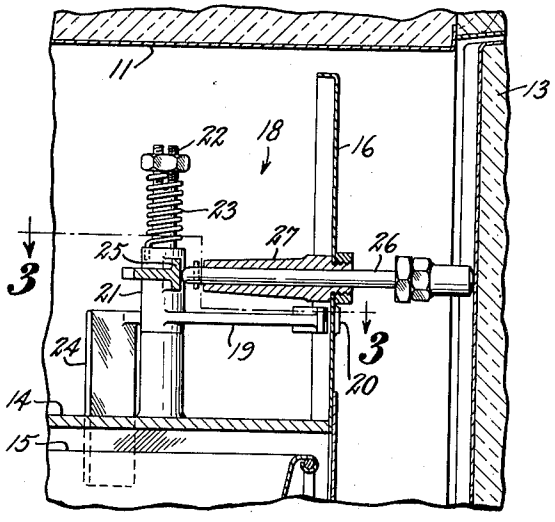
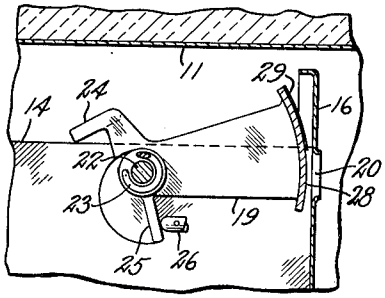


Fig. 2.

Fig. 3.



INVENTOR.
Sigurd Mathias Bäckström

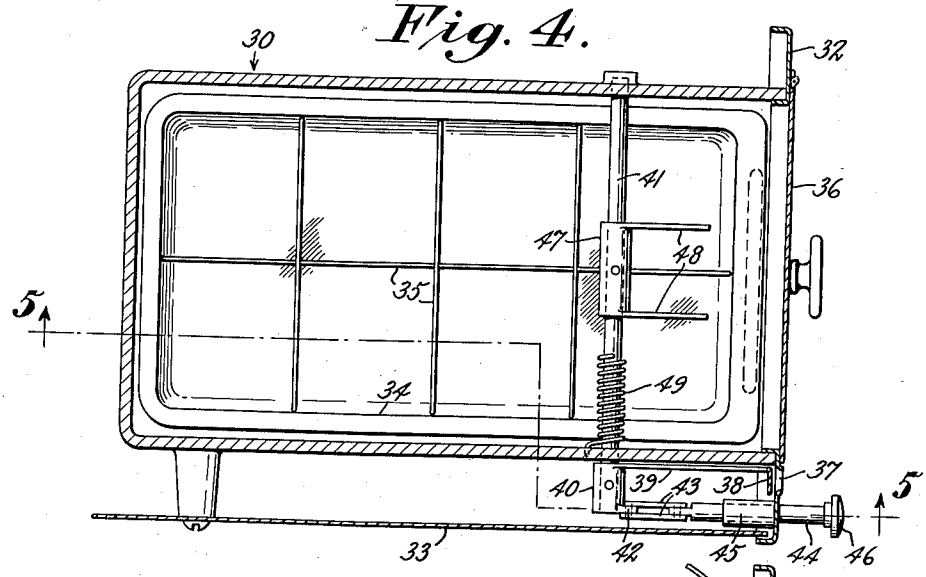
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March 29, 1938. S. M. BÄCKSTRÖM 2,112,261

REFRIGERATION

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Fig. 4.



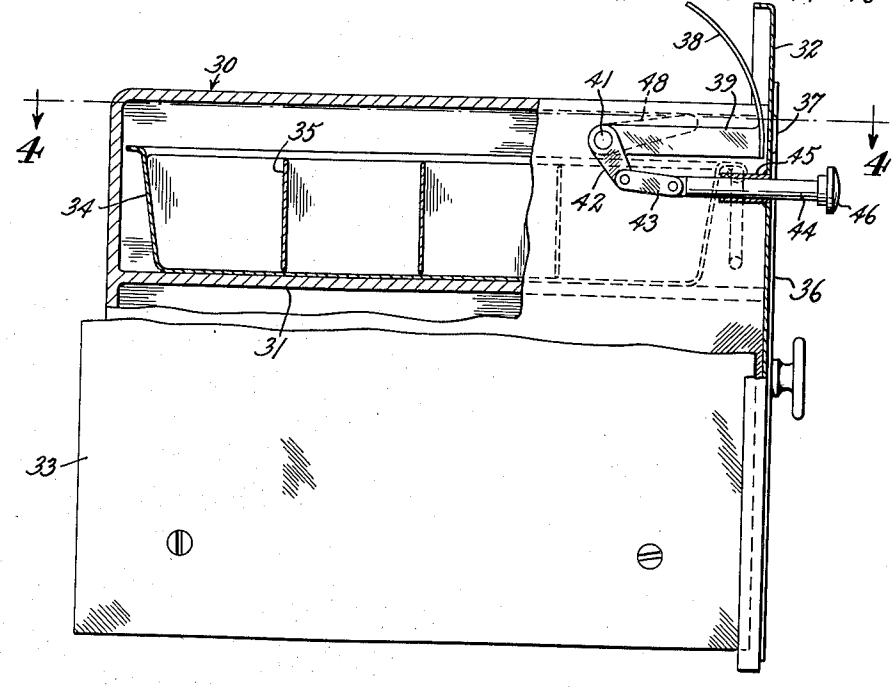


Fig. 5.

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Patented Mar. 29, 1938

2,112,261

UNITED STATES PATENT OFFICE

2,112,261

REFRIGERATION

Sigurd Mattias Bäckström, Stockholm, Sweden, assignor, by mesne assignments, to Servel, Inc., New York, N. Y., a corporation of Delaware

Application July 17, 1936, Serial No. 91,032
In Germany August 13, 1935

12 Claims. (Cl. 62—1)

My invention relates to refrigeration, and more particularly to a device for indicating the formation of ice on or in the cooling element of refrigeration apparatus.

The objects and advantages of my invention will become apparent from the following description and accompanying drawings and the various features of novelty which characterize my invention are pointed out with particularity in the claims forming a part of this specification.

In the drawings, Fig. 1 is a sectional view of a refrigerator cabinet provided with a device embodying my invention for indicating the formation of ice on a cooling element of refrigeration apparatus; Fig. 2 is an enlarged fragmentary sectional view taken on line 2—2 of Fig. 1 illustrating the device more clearly; Fig. 3 is a sectional view taken on line 3—3 of Fig. 2; Fig. 4 is a sectional view taken on line 4—4 of Fig. 5 illustrating a modification of the embodiment shown in Fig. 1 for indicating the formation of ice in a tray positioned within a cooling element; and Fig. 5 is a sectional view taken on line 5—5 of Fig. 4.

Referring to Figs. 1 to 3 inclusive, I have shown my invention in connection with a refrigerator cabinet 10 having thermally insulated walls 11 defining a storage compartment 12 into which access may be had by a door 13 hinged to the front of the cabinet. Within the storage compartment 12 is arranged a cooling element 14 of refrigeration apparatus for maintaining the storage compartment at a desired low temperature. The cooling element 14 may constitute the evaporator of refrigeration apparatus for producing cold in a well known manner. The cooling element 14 may be in the form of a shell adapted to receive a plurality of trays 15 for freezing water, only one of which is shown in Fig. 2. In the present embodiment the cooling element 14 is positioned in one corner of the storage compartment and provided with front and side baffle plates 16 and 17, respectively.

In accordance with my invention I provide a device, which is arranged within the storage compartment 12 and illustrated generally at 18, to indicate the formation of frost or ice on the cooling element 14. The device 18 comprises a horizontal plate 19 having a curved outer edge which is of greater thickness than the main portion of the plate and serves as an indicator. A portion of the curved outer edge of the plate 19 is visible through an opening 20 in the front baffle plate 16. The plate 19 is provided with a sleeve 21 which is loosely mounted on and rotatable about the reduced upper part of a vertical rod 22, the lower part of which is enlarged to provide a bearing surface for the sleeve 21. The rod 22 is mounted on the top of the cooling element 14 at one edge thereof and adjacent to the wall of the cabinet 10 at the hinge side of the door 13. Disposed about the rod 22 is a spring 23 having the upper end secured to the rod and the lower end secured to the sleeve 21.

A portion of the plate 19 adjacent the sleeve 21 is provided with two projecting parts 24 and 25. The projecting part 24, which is preferably non-metallic and may be formed of hard rubber, extends toward a wall of the cabinet 10 and projects downward at one side of the cooling element 14. The projecting part 25 extends in the opposite direction of the part 24 and is adapted to bear against the end of a rod 26. The rod 26 is movable in a sleeve 27 which is secured to the front baffle plate 16 and extends through an opening therein. The spring 23 is so wound about the vertical rod 22 that the horizontal rod 26 is urged or biased toward the inside of the door 13 when the latter is in its closed position. Upon opening the door 13 a forward movement is imparted to the rod 26 and the plate 19, due to the tension of the spring 23, moves counter-clockwise until the projecting part 24 contacts the surface of the cooling element 14.

When no frost or ice has accumulated on the cooling element 14 and the door 13 is closed, the projecting part 24 is spaced a few millimeters from the surface of the cooling element. Upon opening the door 13 the spring 23 causes the plate 19 to rotate in a counter-clockwise direction until the part 24 contacts the cooling element 14, whereby the portion 28 of the indicator is visible through the opening 20 in the front baffle plate 16. When a layer of frost or ice of considerable thickness has accumulated on the cooling element 14 and the door 13 is opened, the plate 19 moves in a counter-clockwise direction through a relatively small angle until the projecting part 24 contacts the frost or ice, whereby the portion 29 of the indicator is visible through the opening 20.

The portions 29 and 28 of the indicator may be colored red and white respectively, so that whenever the red portion 29 is visible upon opening the door 13 it will be immediately noted that a layer of ice or frost of considerable thickness has accumulated on the cooling element 14, and that the operation of the refrigeration apparatus should be modified to instigate defrosting of the cooling element.

By utilizing an indicating device of the character just described, the amount of frost or ice formed on the cooling element 14, which is concealed and not directly visible due to the baffle plates 16 and 17, can be readily noted. In many instances when a layer of frost or ice has formed on a cooling element, it is not desirable immediately to instigate defrosting of the cooling element, and this is especially true when it is desired to produce ice in the cooling element. With the provision of an indicating device the normal operation of the refrigeration apparatus is not

disturbed, and ice is produced in the cooling element in the usual manner. After the production of ice, however, the fact that the red portion 29 of the indicator is visible clearly indicates the formation of frost or ice whereby the operation of the refrigeration apparatus may be modified at will to instigate defrosting of the cooling element.

In the embodiment just described the different parts may be so arranged that the indicating device is manually operable independently of the opening and closing movements of the door 13 of the refrigerator cabinet. In such case the plate 19 is preferably biased by suitable resilient means so that the projecting part 24 is normally out of contact with the cooling element 14. The forward end of the rod 26 may be provided with a push-button marked in a suitable manner, as by the word "defrost", to suggest pushing the rod 26 rearwardly against the tension of the resilient means to move the projecting part 24 toward the cooling element 14 and thus determine whether or not a layer of frost of considerable thickness has accumulated on the cooling element 14. Such a modification is shown in Figs. 4 and 5 for indicating the formation of ice in a tray positioned within a cooling element of refrigeration apparatus.

In Figs. 4 and 5 the cooling element 30, which is similar to the cooling element 14 and adapted to be positioned within the thermally insulated storage space of a refrigerator cabinet, comprises a shell provided with a plurality of shelves 31, only one of which is shown. To the front and side walls of the cooling element 30 are mounted baffle plates 32 and 33, respectively, the front baffle plate 32 having a plurality of openings whereby trays 34 provided with grids 35 and adapted to contain water may be positioned on the shelves 31 for producing ice. In order to insure as rapid freezing of water as possible, the compartments into which the trays 34 are placed are closed by a door 36 which is hinged to the front baffle plate 32.

At one side of the door 36 adjacent to the side baffle plate 33, the front baffle plate 32 is provided with an opening 37 directly behind which is arranged a curved indicator 38 which is movable vertically in the space between the cooling element 30 and side baffle plate 33. The curved indicator 38 is secured to the forward end of an arm 39 provided with a sleeve 40 which is fixed to an end of a horizontal shaft 41. The shaft 41 extends across the cooling element 14 above the uppermost tray 34 shown, and is journaled in openings in the side walls of the cooling element. A lever arm 42 is formed at the outer end of the sleeve 40 and is pivotally connected to the ends of parallel levers 43, the opposite ends of which are pivotally connected to a rod 44 which is movable in a sleeve 45. The sleeve 45 is secured to the front baffle plate 32 at an opening formed therein. The rod 44 is provided with a push-button 46 at its outer end.

Intermediate the ends of the shaft 41 is fixed a sleeve 47 having two forwardly extending arms 48 which are angularly movable with the arm 39 and indicator 38 secured thereto. The arms 48 and indicator 38 are maintained in their uppermost position by a coil spring 49 disposed about the shaft 41, one end of the spring being secured to the shaft 41 and the other end being secured to a side wall of the cooling element 14. By pushing the rod 44 rearwardly the shaft 41 is rotated whereby the indicator 38 and arms 48 are moved downward against the tension of the spring 49.

With the indicator 38 and arms 48 in their uppermost position, as shown in Fig. 5, the lower portion of the indicator 38 is visible through the opening 37 in the front baffle plate 32. This portion of the indicator may be marked in any suitable manner, as by the word "ice", which suggests pushing the button 46 to determine whether or not ice has has been produced in the tray 34. When the button 46 is pushed rearwardly and ice has been produced in the tray 34, the rod 44 is only moved rearwardly a slight distance due to the arms 48 contacting the surface of the ice in the two forward sections of the tray 34. When the water in the tray 34 has frozen, therefore, the lower portion of the indicator 38 is visible through the opening 37, and this portion of the indicator may be marked in any suitable manner, as by the word "yes", to indicate that ice has been produced in the tray 34.

When the water in the tray 34 has not frozen the arms 48 will enter the body of water, and in this position of the arms 48 the upper portion of the indicator 38 is visible through the opening 37. The upper portion of the indicator 38 may be marked in some suitable manner, as by the word "no", to indicate that ice has not been produced in the tray 34.

In the modification just described the indicating device may be arranged in a manner similar to that shown in Fig. 1 so that it is rendered operative upon opening the door of the cabinet, whereby it will be immediately noted whether or not ice has formed in the tray 34. In the event that ice has formed in the tray 34 it is only necessary to push the rod 44 rearwardly until the arms 48 are clear of the tray 34 whereby the latter may be removed from the cooling element 30.

Although I have shown and described several embodiments of my invention it will be apparent to those skilled in the art that various modifications and changes may be made without departing from the spirit and scope of my invention. For example, instead of employing a movable member as an indicator, an electric lamp or other suitable signaling device may be employed to indicate the formation of ice. I therefore aim to cover all modifications or changes which come within the spirit of my invention, as pointed out in the following claims.

What is claimed is:

1. A refrigerator including a cooling element, a member arranged to be supported adjacent to said cooling element, resilient means for maintaining said member spaced from said cooling element, means for moving said member toward said cooling element, and means dependent upon the extent of movement of said member toward said cooling element for always indicating the amount of ice that may be accumulated thereon.

2. A refrigerator including a cooling element, said cooling element having a compartment adapted to receive a tray containing a body of liquid to be frozen, a member arranged to be supported for movement toward and away from the body of liquid in said tray when the latter is positioned in said compartment, means for moving said member toward the body of liquid in said tray, and means dependent upon the extent of movement of said member toward the body of liquid to indicate when the latter is frozen by said cooling element.

3. A refrigerator including a cooling element, a plate arranged to substantially conceal said cooling element, said plate having an opening, a

movable member arranged to be supported adjacent to said cooling element, resilient means for maintaining said member spaced from said cooling element, means for moving said member toward said cooling element, and means dependent upon the extent of movement of said member toward said cooling element for indicating the presence of ice accumulated thereon, said last-mentioned means including an indicator positioned at the rear side of said plate and movable past the opening therein.

4. A refrigerator including a cooling element, structure to substantially conceal said cooling element and including a part provided with a plurality of openings, a member movable toward and away from a region where said cooling element is capable of producing ice, said member normally being spaced from said region, means including a rod extending through an opening in said part for moving said member toward said region, and means dependent upon the extent of movement of said member toward said region for indicating the presence of ice that may be produced by said cooling element, said last-mentioned means including an indicator positioned at the rear side of said part and movable past another of the openings therein.

5. A refrigerator including a cooling element, structure including a part provided with an opening and arranged to substantially conceal said cooling element, a member arranged to be supported for movement toward and away from a region where said cooling element is capable of producing ice, resilient means for normally maintaining said member spaced from said region, means for moving said member toward said region, and means dependent upon the extent of movement of said member toward said region for always indicating the presence of ice that may be produced by said cooling element, said last-mentioned means including an indicator positioned at the rear side of said part and movable past the opening therein.

6. A refrigerator including a cooling element, a member arranged to be supported for movement with respect to said cooling element, means for causing movement of said member, and means dependent upon the extent of movement of said member for indicating the varying amount of ice that may be produced by said cooling element.

7. A refrigerator including a cabinet having a thermally insulated storage compartment provided with an opening, a door hinged to said cabinet for closing the opening, a cooling element arranged within the storage compartment, means to substantially conceal said cooling element and including a part provided with a plurality of openings, a member movable toward and away from a region where said cooling element is capable of producing ice, structure including a rod extending through one of the openings in said part so constructed and arranged that said member is movable toward said region upon opening said door and away from said region upon closing said door, and means dependent upon the extent of movement of said member toward said region upon opening said door for always indicating the amount of ice that may be produced by said cooling element, said last-mentioned means including an indicator positioned at the rear side of said part and movable past another of the openings therein.

8. A refrigerator including a cooling element, structure for substantially concealing said cooling element and including a part provided with an opening, said cooling element having a compartment adapted to receive a tray containing a body of matter to be frozen, a member arranged to be supported for movement toward and away from the body of matter in said tray when the latter is positioned in said compartment, resilient means for maintaining said member spaced from the body of matter, means for moving said member toward the body of matter, and means dependent upon the extent of movement of said member to indicate the frozen condition of the matter effected by said cooling element, said last-mentioned means including an indicator positioned at the rear side of said part and movable past the opening therein.

9. A refrigerator including a cooling element, a plate provided with a plurality of openings and mounted at the front of said cooling element, said cooling element having a compartment adapted to receive a tray containing a body of matter to be frozen, a member arranged to be supported for movement toward and away from the body of matter in said tray when the latter is positioned in said compartment, resilient means for maintaining said member spaced from the body of matter, means including a rod extending through one of the openings in said plate for moving said member toward the body of matter, and means dependent upon the extent of movement of said member toward the body of matter to indicate the condition thereof, said last-mentioned means including an indicator positioned at the rear of said plate and movable past another of the openings therein.

10. A refrigerator including a cooling element, a member arranged to be supported for movement toward and away from a region where said cooling element is capable of producing ice, means for normally maintaining said member spaced from said region, means for moving said member toward said region, and means dependent upon the extent of movement of said member toward said region for indicating the varying amount of ice that may be produced by said cooling element.

11. A refrigerator including a cooling element adapted to support a tray containing a body of matter to be frozen, a member movable toward and away from the body of matter, means for causing movement of said member, and means dependent upon the extent of movement of said member to determine the condition of said matter.

12. A refrigerator including a cabinet having a door, a cooling element, a member arranged to be supported for movement toward and away from a region where said cooling element is capable of producing ice, means including a part cooperating with said door to permit said member to move toward said region upon opening said door and to cause movement of said member away from said region upon closing said door, and means dependent upon the extent of movement of said member toward said region upon opening said door for indicating the varying amount of ice that may be produced by said cooling element.

SIGURD MATTIAS BÄCKSTRÖM.