

Aug. 24, 1948.

J. J. BAUMAN

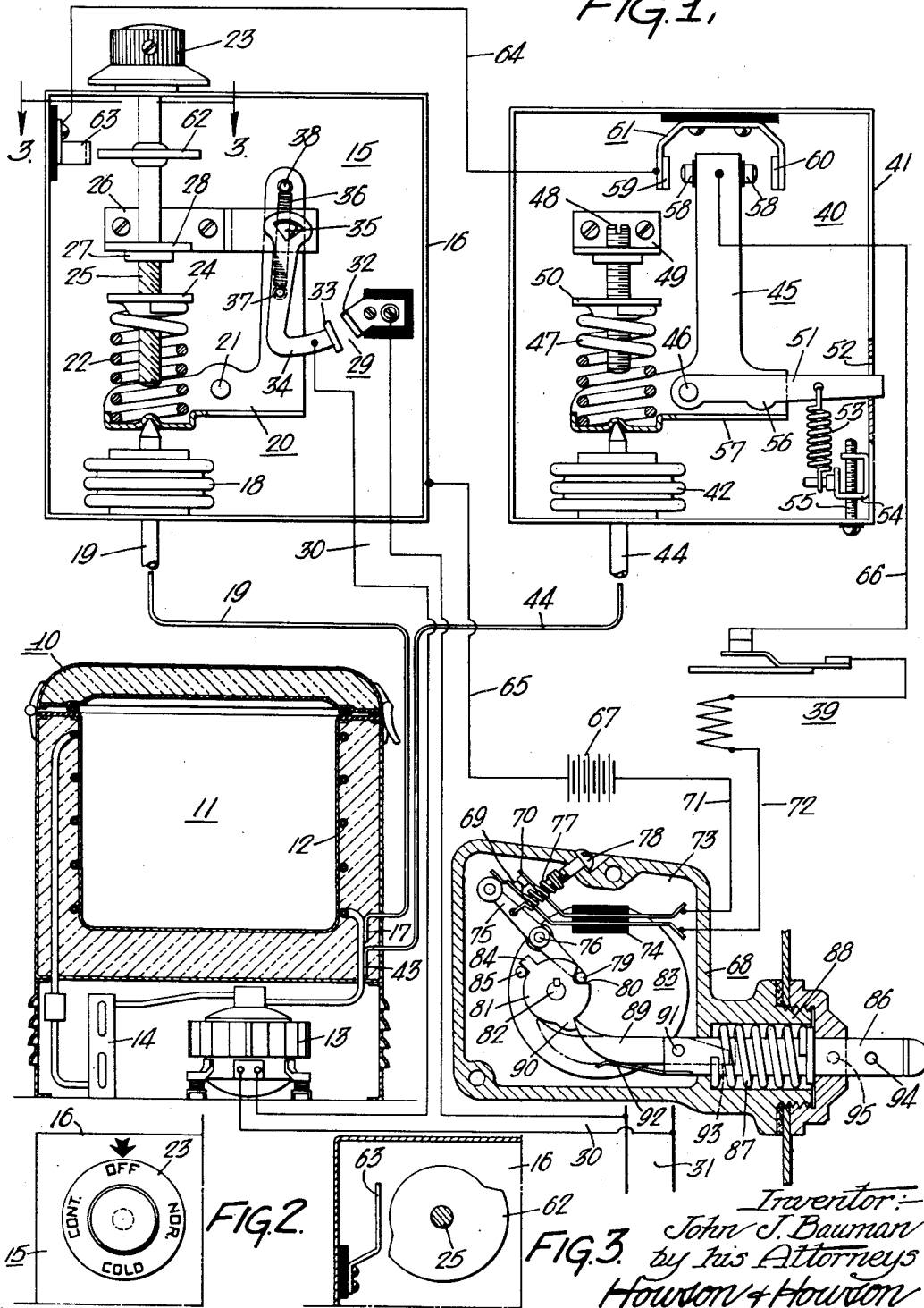
2,447,894

ELECTRIC REFRIGERATOR ALARM SYSTEM

Filed Aug. 30, 1944

3 Sheets-Sheet 1

FIG. 1.



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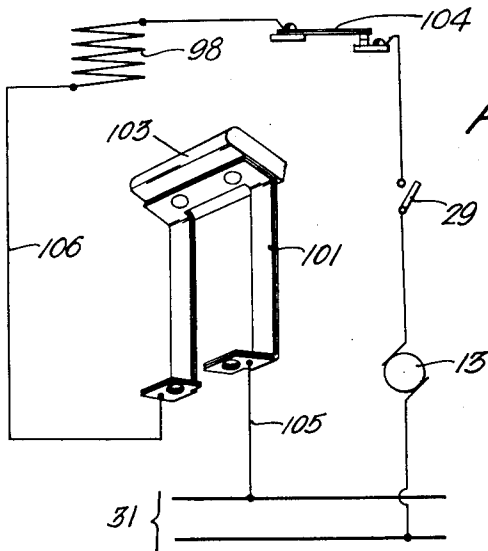


FIG. 5

FIG. 6.

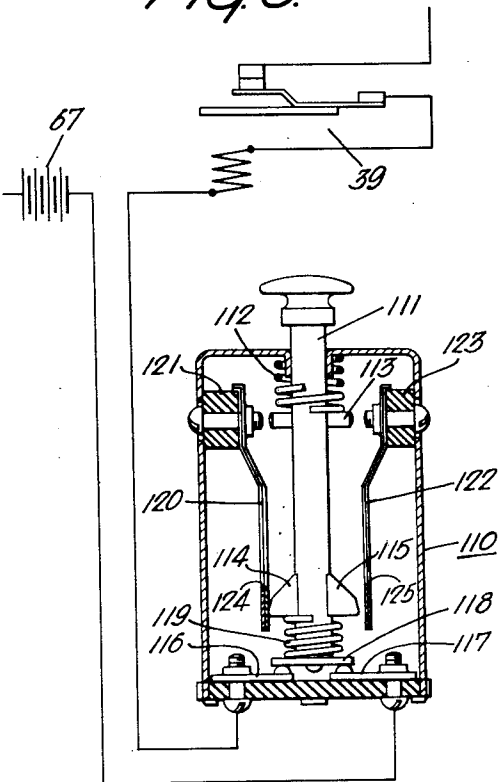
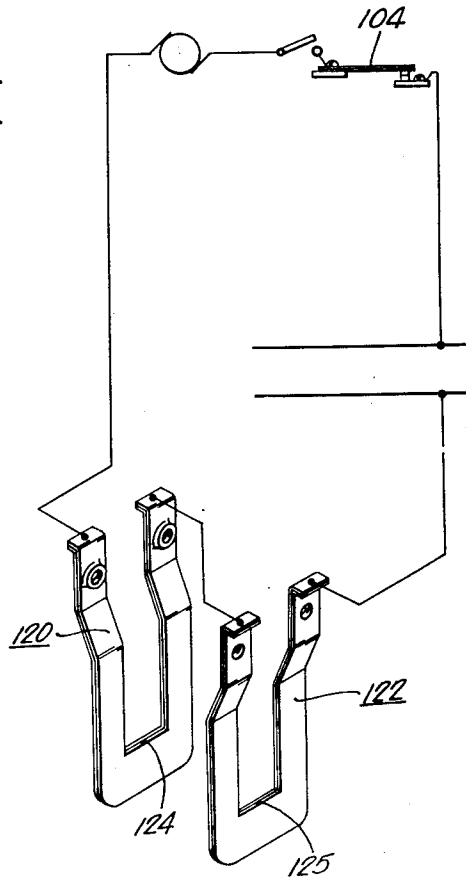


FIG. 7.



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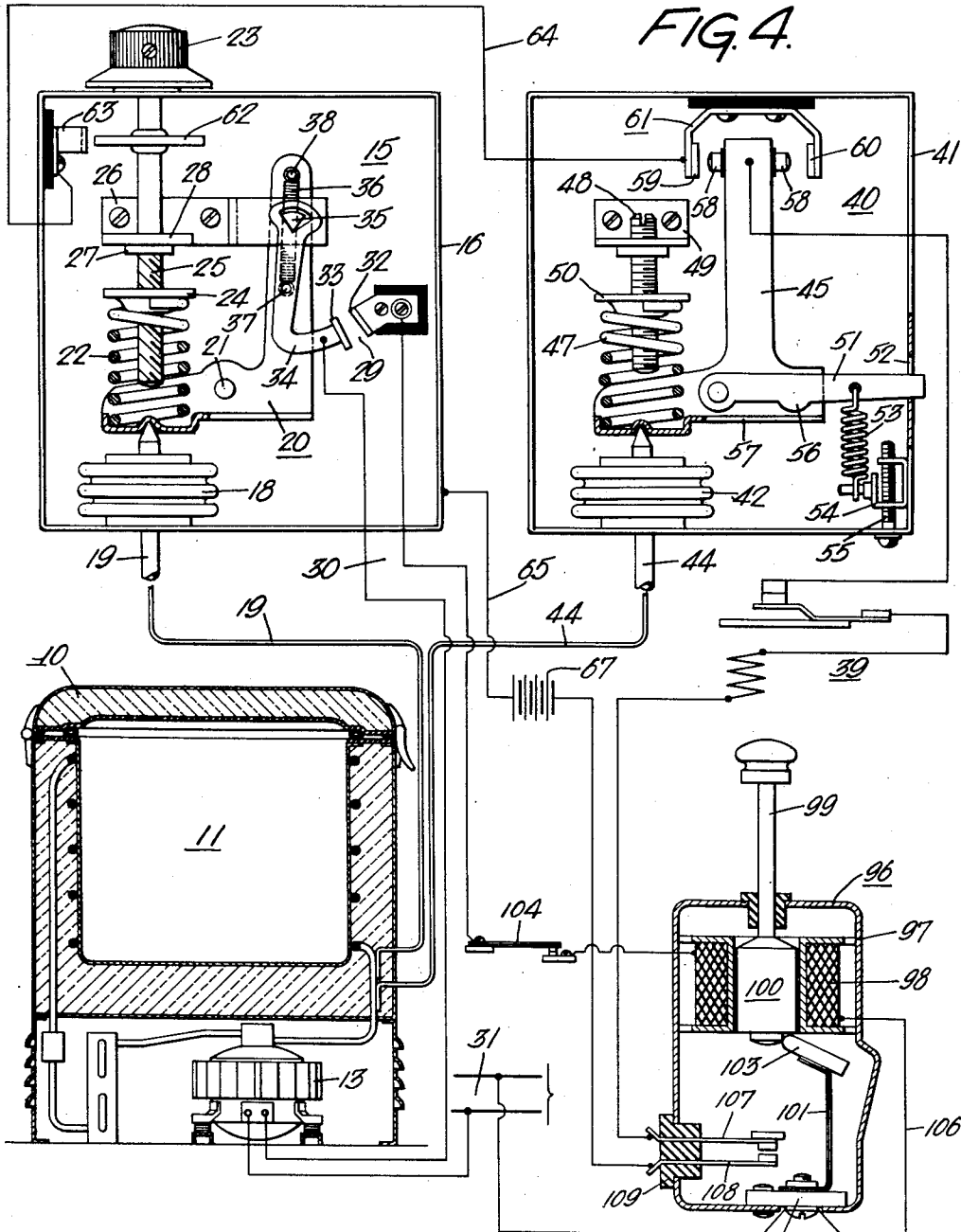
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ELECTRIC REFRIGERATOR ALARM SYSTEM

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,447,894

ELECTRIC REFRIGERATOR ALARM SYSTEM

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mesne assignments, to Philco Corporation,
Philadelphia, Pa., a corporation of Pennsyl-
vania

Application August 30, 1944, Serial No. 551,978

19 Claims. (Cl. 62-4)

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This invention relates to refrigerators and more particularly to novel means for indicating an abnormal or undesired condition of the refrigerating apparatus. The invention is especially applicable to that type of refrigerator having a freezer chest compartment for the storage of frozen food.

In the case of an ordinary household refrigerator which is used to store foodstuffs for daily use, any failure or abnormal condition would be readily noticed and therefore the provision of an alarm or indicator is not usually warranted. However, in the case of the refrigerator having provision for storing foodstuffs for use at some future time, the provision of such an indicator is highly desirable. An example of such a refrigerator is one having a freezer chest compartment in which a large quantity of foodstuffs may be stored. In such case, an abnormal condition is likely to go unnoticed and a resulting spoilage of foodstuffs may be very substantial. The desirability of a suitable alarm or indicator in such an apparatus is quite apparent.

The principal object of the present invention is to provide a novel apparatus for the purpose above indicated, which is adapted to give an indication of an abnormal condition that would, if undetected, cause excessively high or low temperatures in a refrigerated compartment.

Another object of the invention is to provide a novel alarm or indicator arrangement embodying means for rendering the alarm or indicating device inoperative at certain times and for automatically restoring the operative condition of said device after a time interval.

A further object of the invention is to provide an arrangement of this character embodying a mechanical timer for controlling the alarm or indicating device.

Still another object of the invention is to provide an alarm system embodying means for controlling the operativeness of the alarm or indicating device according to the refrigerating cycle.

A further object of the invention is to provide an apparatus of the stated character having simple provision for rendering the alarm or indicating device inoperative for an indefinite period of time.

Other objects and features of the invention will be apparent hereinafter.

In the accompanying drawings:

Fig. 1 illustrates a refrigerating apparatus or system embodying the present invention;

Fig. 2 is a plan view of the manual control knob showing the various settings or positions thereof;

Fig. 3 is a fragmentary sectional view taken along line 3-3 of Fig. 1;

Fig. 4 illustrates another embodiment of the invention;

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Fig. 5 is a supplementary illustration of a thermal element employed in the system of Fig. 4 and the circuit with which it is associated;

Fig. 6 illustrates a modified form of the interrupter employed in the system of Fig. 4; and

Fig. 7 is a supplementary illustration of certain parts of the modified interrupter showing the circuit with which such parts are associated.

Referring first to Fig. 1, there is shown on a greatly reduced scale an electric refrigerator 10 including a freezer chest compartment 11 having an associated cooling unit or evaporator 12. The refrigerating system includes the usual motor-compressor 13 and condenser 14. The present invention is not concerned with the details of the refrigerator cabinet structure or the refrigerating system, which may be of conventional form.

The refrigerating system is controlled by means of an adjustable thermostatic control device 15. The parts of this device are shown as being conveniently mounted on a support or casing 16 which may be suitably disposed as a part of the entire refrigerating apparatus. The thermostatic control is preferably effected by means of a feeler bulb 17 arranged to detect temperature variations within the compartment 11. As illustrated, the feeler bulb may be positioned in engagement with a portion of the refrigerant conduit whose temperature determines the temperature within compartment 11. The feeler bulb 17 operates a bellows 18 through the medium of an expansible fluid within the conduit 19, as will be well understood. The bellows 18 actuates a bell-crank lever 20, which is pivoted at 21, against the action of a spring 22 whose pressure is adjustable by the manual rotation of a control knob 23. The lower end of spring 22 engages lever 20, while the upper end of the spring abuts against a member 24 threadedly engaging a shaft 25 upon which the control knob 23 is mounted. The shaft 25 is rotatably supported by casing 16 and by a bracket 26 fixedly mounted on the casing. A flange or collar 27 on shaft 25 engages a flange 28 on bracket 26 to prevent upward longitudinal movement of the shaft, the flange 28 also serving as a journal for the shaft. Thus, it will be seen that rotation of shaft 25 by means of knob 23 varies the axial position of member 24, thereby varying the pressure of spring 22.

A switch 29 is operated by lever 20 and serves to control the motor circuit 30 which is connected to the supply line 31. Switch 29 comprises a stationary contact 32 suitably insulated from casing 16 and a movable contact member 33 carried by arm 34 which is pivoted on a knife-edge pivot 35 on the stationary bracket 26. A spring 36 has one end connected to arm 34 at 37, while the other end of the spring is connected to lever 20 at 38. Normally, the parts are positioned as shown with the axis of spring 36 to the left of

the pivot point, and the switch 29 is open. However, when the lever 20 moves clockwise about its pivot 21, the spring 36 is moved to the right of the pivot 35 and causes arm 34 to move so as to bring the contact 33 into engagement with contact 32. Thus, whenever the temperature within compartment 11 rises sufficiently to cause operation of the above-described parts, the refrigerating system is operated to lower the said temperature. It will be apparent that the adjustment of the pressure of spring 22 by means of knob 23 determines the temperature which will be maintained within compartment 11.

As shown in Fig. 2, the control knob 23 has four principal positions which are preferably designated, respectively, "off," "normal," "cold," and "continuous." The "normal" setting is used for ordinary refrigerator operation in the manner of the usual domestic refrigerator. This position might, for example, correspond to a temperature condition in the neighborhood of from 38 to 40° F. The "cold" setting is used to maintain stored foodstuffs at a lower temperature, such as to maintain the stored foodstuffs in a frozen condition (for example, from 0 to -5° F.). The "continuous" setting is used to quick-freeze foodstuffs by rapidly decreasing the temperature within compartment 11 to a substantially lower temperature than that which obtains during the "cold" setting.

In accordance with the present invention, provision is made for indicating abnormal conditions of the apparatus by means of the mechanisms now to be described. An electrically operable alarm or indicating device 39, which may take the form of a conventional buzzer or other audible or visual signaling device, is controlled by means of a thermal-responsive control device 40. This device also comprises a support or casing 41 for containing the elements or parts thereof. It is generally similar in construction to the device 15, but differs therefrom in certain respects, as will be apparent presently. A bellows 42 is arranged to be responsive to temperature variations detected by a second feeler bulb 43 which is connected to the bellows by a fluid-containing conduit 44. A bell-crank lever 45, pivoted at 46, is engaged by the bellows 42 and also by a spring 47 whose pressure is adjustable by means of a screw 48. The latter is supported for rotational movement only on a fixed bracket 49 mounted on casing 41. A member 50, threadedly engaging screw 48 and movable therealong in response to turning of the screw, engages the upper end of spring 47 and serves to vary the spring pressure.

A second lever 51 is also mounted on pivot 46 and has its free end disposed in a slot 52 in the casing wall. A spring 53 has its upper end connected to lever 51 and has its lower end connected to a bracket 54 which is adjustably mounted on a screw 55. The spring 53 normally maintains the lever 51 in its lowermost position against the lower edge of slot 52. A projection 56 on lever 51 is adapted to be engaged by a flange 57 on lever 45 when the latter rotates counter-clockwise. The purpose of this arrangement will be understood presently.

At the upper end of lever 45, there is provided a double contact member 58 which is insulated from its supporting lever. A pair of stationary contacts 59 and 60 are carried by a bracket 61 secured to casing 41 and insulated therefrom. The contacts 58-59-60 serve to energize the alarm or indicating device 39 whenever lever 45 moves sufficiently in either direction to cause con-

tact 58 to engage either of the stationary contacts 59 and 60.

Since the "normal" setting of the control knob 23 is utilized when the refrigerator 10 is operated in the manner of the ordinary household refrigerator, the alarm or indicating device is preferably rendered inoperative at the "normal" setting as well as the "off" setting. To this end, there is provided a switch comprising a cam 62 on shaft 25 of the control device 16 and a contact finger 63 which is insulated from the casing 16. As shown in Fig. 3, the cam 62 is so designed that it does not engage the contact finger 63 in the "off" and "normal" settings of the control knob but the said cam engages the contact finger when the control knob is in the other positions. The energizing circuit for the alarm or indicating device 39 includes a conductor 64 connected to the contact finger 63 and a conductor 65 connected to the casing 16. Since the cam 62 is electrically connected to casing 16 through shaft 25 and bracket 26, the conductors 64 and 65 are electrically connected together whenever cam 62 engages contact 63.

A system of the general character thus far described is disclosed and claimed in my copending application Serial No. 551,977, filed August 30, 1944.

The energizing circuit for the alarm or indicating device 39 also includes the conductor 66 extending between the device 39 and the double contact 58. The circuit further includes a suitable source of energy which may take the form of a battery 67.

In order to render the alarm or indicating device inoperative at certain times, as described more fully hereinafter, there is provided a control device or interrupter 68, which includes switch contact fingers 69 and 70 connected in the energizing circuit by means of conductors 71 and 72. The parts of the device 68 are suitably mounted on a support or casing 73, and the contact fingers 69 and 70 are carried by an insulating support 74 within the said casing. The contact finger 69 is so constructed that it tends to move away from contact finger 70 by virtue of its resilience, but the contacts are normally held in engagement by a lever 75, pivoted at 76, which is urged clockwise by a spring 77 interconnected between lever 75 and a screw 78 held by the casing 73. A projection 79 on lever 75 normally seats in a recess 80 of an associated cam 81 rotatably mounted on a shaft 82. Associated with cam 81 is a conventional clockwork mechanism 83 which tends to rotate shaft 82 and cam 81 counter-clockwise. A projection 84 on cam 81 normally engages a fixed pin 85 to retain the cam in the position shown.

A manually operable plunger 86 is normally maintained in its outermost position, as shown, by a spring 87 disposed within the plunger housing 88. At its inner end, the plunger 86 carries a pawl 89, which is normally in the solid line position in engagement with a projection 90 on cam 81.

When the plunger 86 is moved inward, the pawl 89 rotates cam 81 clockwise through a predetermined arc, causing projection 79 to ride out of recess 80 and thus causing the lever 75 to move counter-clockwise about its pivot, permitting the contacts 69 and 70 to open. The plunger 86 returns immediately to its normal outer position, upon being released, but the cam 81 is returned slowly to its normal position by the clockwork 83. Consequently, the contacts 69 and 70 remain open

for a predetermined time interval, at the end of which the projection 79 drops into recess 80 and causes lever 75 to reclose the switch contacts. During the interval when the contacts are open, the alarm or indicating device 39 is rendered inoperative, as will be readily apparent.

To permit the immediate return of plunger 86 as above mentioned, and to prevent its influencing the return movement of cam 81, the pawl 89 is pivoted at 91 and has an associated spring 92 urging it clockwise about its pivot. The plunger 86 is formed so as to permit the pivotal movement of pawl 89, and both the plunger and pawl have engageable stop portions at 93 to fix the normal position of the pawl, as shown.

To enable the rendering of alarm device 39 inoperative for an indefinite period of time, the plunger 86 is provided with an aperture 94 and the plunger housing also has an aperture 95. When the plunger is moved inward the two apertures are brought into alignment with one another and a suitable pin may be inserted in the aligned apertures to hold the plunger in its depressed position, thereby maintaining the contacts 69 and 70 open until the pin is removed. This feature may be utilized during shipping of the apparatus so as to positively prevent operation of the alarm device. Where a battery is used as the source of current for the alarm device, this feature prevents any possible drain of current from the battery, thereby preserving the life of the same.

With reference to the operation of the apparatus as a whole, the spring 47 of the alarm control device 40 is normally adjusted so that the lever 45 will be in the position shown when the temperature within compartment 11 is at a value corresponding to the "cold" setting of control knob 23. Therefore, when the control knob is adjusted to the "normal" setting, and the temperature within compartment 11 is at a substantially higher value, the bellows 42 will be expanded to such an extent as to cause engagement between contacts 58 and 60. However, at this time the switch 62-63 will be open so that the alarm device will be inoperative.

It will be noted also that the alarm device is inoperative whenever the temperature within compartment 11 is being reduced from ambient temperature to the "normal" temperature, i. e. when the control knob is adjusted from the "off" position to the "normal" position.

Assume that the apparatus has been operating at the "normal" temperature setting and that the operator desires to lower the temperature within compartment 11 to the "cold" setting. Adjustment of the control knob 23 to the "cold" setting effects closure of switch 62-63, thereby completing the energizing circuit of the alarm device since the contact 58 is in engagement with contact 60 due to the relatively high temperature at which the apparatus has been operating. Accordingly, the operator presses plunger 86 inward to render the alarm device inoperative for a predetermined interval. The timing period is preferably such that the temperature within compartment 11 is lowered to the "cold" value, and the lever 45 attains its normal position as shown, before the contacts 69 and 70 are closed.

With the apparatus operating at the "cold" temperature setting, the alarm device will be operated in the event that the temperature within compartment 11 rises above a safe value for maintaining the stored foodstuffs in a frozen condition. Such rise in temperature will cause suf-

ficient expansion of bellows 42 to cause engagement of contacts 58 and 60.

Assume now that the operator wishes to lower the temperature still further to the "continuous" setting and adjusts the control knob 23 to such setting. As the temperature within compartment 11 is lowered further, the bellows 42 contracts, causing lever 45 to move counter-clockwise, thus moving contact 58 toward contact 59. Engagement of these contacts is prevented, however, by the lever 51 and its associated spring 53. As the lever 45 moves counterclockwise, its flange 57 engages the projection 56 on lever 51 and consequently the lever 45 encounters the resistance of spring 53 which prevents lever 45 from moving sufficiently to effect engagement of contacts 58 and 59.

In the event, however, that the bellows 42 loses its charge and its internal pressure decreases substantially to zero, the force of spring 53 will be overcome by that of spring 47, causing lever 45 to move counter-clockwise sufficiently to effect engagement of contacts 58 and 59. Thus, the operator will be apprised that an abnormal condition exists. The operator may interrupt the alarm circuit either by turning the control knob 23 to "off" or "normal," or by actuating the interrupter, and the period of inoperativeness may be maintained indefinitely in the manner hereinbefore described.

In Figs. 4 and 5, there is illustrated an alternative embodiment of the apparatus employing a different type of interrupter. In this instance the refrigerator 10, the thermostatic control device 15 and the alarm control device 40 are identical with the corresponding devices of Fig. 1 and the elements are numbered correspondingly. It is unnecessary, therefore, to describe further the structure and operation of those devices.

In this instance, however, the interrupter for the alarm device is differently constructed and is inter-connected with the circuit of the refrigerating system. The interrupter 96 comprises a support or casing 97 in the upper part of which is a stationary coil or winding 98. The casing 97 supports a manually operable plunger 99, at the lower end of which is a magnetic core 100 disposed within the coil 98. A U-shaped bimetal member 101 (see Fig. 5) has its ends secured to an insulating block 102 at the lower part of casing 97. At its upper end, the U-shaped bimetal member 101 carries an insulating member 103, which is normally positioned in the path of the vertically-movable plunger so as to maintain the latter in its raised position, as shown in Fig. 4.

The coil 98 and the bimetal member 101 are serially included in the circuit of motor 13, as may be clearly seen in Fig. 5. If desired, an overload relay 104 of the conventional form may be included in the motor circuit. As illustrated, the motor circuit extends from one side of the supply line 31 through conductor 105, bimetal member 101, conductor 106, coil 98, the overload relay 104, switch 29, and through the motor 13 to the other side of the supply line.

A pair of normally open switch contacts 107 and 108 are mounted on an insulating block 109 at the lower part of the casing 97 and are arranged so as to be in the path of the plunger core 100. The switch 107-108 is included in the energizing circuit of the alarm device 39, as will be readily apparent.

Prior to the placing of the refrigerating apparatus in operation, as during shipping of the

same, the plunger 99 may be lifted to its raised position and it will be retained in such position by the stop member 103, thereby positively preventing operation of the alarm device and preventing any drain of current from the battery 67.

When the refrigerating apparatus is placed in operation, and the motor circuit is energized, the consequent energization of coil 98 serves to lift the plunger core 100 to its central position so that it is out of engagement with the stop member 103. The current flowing through the bimetal member 101 causes the latter to flex toward the right as viewed in Fig. 4, thus moving the stop member 103 out of the path of the plunger core after a predetermined interval. If the overload relay 104 should operate during this interval, the plunger 100 will be prevented from dropping. At the end of the refrigerating cycle, switch 29 opens to interrupt the motor circuit and consequently coil 98 is deenergized, permitting the plunger to drop and close contacts 107—108. At this time, of course, the stop member 103 is out of the path of the plunger. Thereafter, the alarm device is rendered operative, except during such times as the switch 62—63 may be open, as above described. It will be apparent that the bimetal member 101 must be capable of moving the stop member 103 out of the path of the plunger within the time required to decrease the temperature within compartment 11 from the "normal" setting to the "cold" setting.

The operation of the apparatus shown in Fig. 4 is generally similar to that of the apparatus of Fig. 1. From the preceding description it will be apparent that when the operator adjusts the control knob 23 to the "cold" setting, it is necessary to raise plunger 99 to prevent operation of the alarm device while the temperature is being lowered to the "cold" value. The interrupter 96 will then prevent operation of the alarm device until after the refrigerating cycle has been completed, at which time the plunger 99 will have dropped and will have closed contacts 107—108.

In Figs. 6 and 7, there is shown another form of interrupter employing two bimetal elements. In this instance, there is provided a casing 110 which slidably supports a manually operable plunger 111. A spring 112 engages the upper part of the casing and a transverse pin 113 on the plunger rod, the spring serving to urge the plunger downward. At the lower portion of the plunger rod there are provided a pair of oppositely disposed projections 114 and 115 whose purpose will appear presently. A pair of contacts 116 and 117 are mounted in the lower part of the casing and insulated therefrom. A contact member 118 is loosely carried at the lower end of the plunger rod and is adapted to bridge the contacts 116 and 117. A spring 119 is interposed between the contact member 118 and the projections 114—115, and serves to maintain firm engagement between the contact elements when the plunger 111 is in its lowermost position, as shown.

A U-shaped bimetal member 120 (see Fig. 7) has its ends secured to the casing 110 and insulated therefrom as at 121. A second U-shaped bimetal member 122 is similarly mounted on the opposite wall of the casing as at 123. The first bimetal member 121 is disposed so that its lower portion presses against the projection 114 when the plunger is in its lowermost position while the second bimetal member 122 is disposed so that its lower portion is in spaced relation to the projection 115.

The bimetal members are so constructed that

they move toward the left, as viewed in Fig. 6, in response to an increase in their temperature. Furthermore, the bimetal member 122 is somewhat smaller in cross-section, particularly in thickness, to provide a more rapid movement of this member than that of bimetal member 120. Bimetal member 122 may also be of higher resistance than bimetal member 120 for the same purpose. The reason for the different rates of movement of the two members will be shown presently.

The contacts 116 and 117 are connected to the energizing circuit of the alarm device 39. As shown in Fig. 7, the bimetal members 120 and 122 are serially included in the circuit of the refrigerating motor along with the other elements previously described.

Prior to the placing of the apparatus in operation, as during shipping, the plunger 111 may be raised until the lower edge of projection 114 is engaged by the edge 124 of bimetal member 120, and the latter will then hold the plunger in its raised position, thus maintaining contact 118 out of engagement with contacts 116—117.

When the apparatus is placed in operation, and the motor circuit is energized, the current flowing through the bimetal members 120 and 122 causes them to move toward the left. Since the bimetal member 122 moves faster than bimetal member 120, the edge 125 of the former engages the lower edge of projection 115 before bimetal member 120 becomes disengaged from projection 114. If the motor circuit should be interrupted temporarily by the operation of the overload relay 104, the contacts 116—117—118 will be held open, due to the time required for bimetal member 122 to cool sufficiently to release the plunger, which time is generally greater than that which the overload relays require to reclose.

When the motor circuit is opened at the end of the refrigerating cycle, the bimetal members return to their normal positions. Since bimetal member 122 moves faster than bimetal member 120, the plunger is released before the latter member engages projection 114. The consequent closure of contacts 116—117—118 renders the alarm device operative unless, of course, the switch 62—63 is open.

Assuming that the refrigerating apparatus has been operating at the "normal" temperature and the control knob 23 is adjusted to the "cold" setting, the alarm device is prevented from operating by raising the plunger of the interrupter 110. This device will then operate as above described, and when the refrigerating cycle is completed, the alarm device will be rendered operative.

The interrupter just described, employing two bimetal members, maintains the alarm device inoperative for a short period following the interruption of the motor circuit and thus it prevents the alarm device from operating in the event that the overload relay opens the circuit temporarily at any time during the initial refrigerating cycle following raising of the plunger 111.

From the foregoing description, it will be seen that the invention provides a novel alarm system which serves to give an indication of any possible failure or abnormal condition that may occur. Lever 45 of the alarm control device will move excessively clockwise causing energization of the alarm by bringing contact 58 into engagement with contact 60 if any one of the following failures takes place: motor failure; failure of switch 29 to close; compressor failure; loss of charge in the refrigerating system; or complete

power failure, and the like. Any of these failures will cause the temperature in compartment 11 to rise, thereby causing the bellows 42 to expand and thus move lever 45 clockwise until contact 58 engages contact 60.

Lever 45 will move counter-clockwise and will bring contact 58 into engagement with contact 59 in response to loss of the charge in bellows 42 or in the event of failure of the motor switch 29 to open.

While the invention has been described with reference to certain specific embodiments, it will be understood that, in the broad aspects, various other embodiments and modifications are possible. For example, the interrupter may take any suitable form as long as it performs the desired function. Likewise, the details of the other parts of the apparatus may be modified as long as their intended functions are preserved.

I claim:

1. In an apparatus for indicating excessively high or low temperature within a refrigerated area, switch means operable in response to predetermined excessively high and low temperatures within said area, indicating means operable by said switch means, additional switch means for rendering said indicating means inoperative, and means for automatically actuating said additional switch means in predetermined timed relation to the refrigerating cycle to render said indicating means operative.

2. In an apparatus for indicating excessively high or low temperature within a refrigerated area, thermal-responsive means arranged for actuation according to the temperature within said area, a member movable by said means in opposite directions in response to temperature variations about a predetermined optimum temperature, contact means carried by said member, other contact means arranged cooperatively with said first contact means and engageable thereby whenever the temperature within said area is excessively high or low, electrical indicating means operable by the engagement of said contact means, switch means for rendering said indicating means inoperative, and means for automatically actuating said switch means in predetermined timed relation to the refrigerating cycle to render said indicating means operative.

3. In a refrigerator system including a storage compartment, adjustable control means for controlling the operation of the refrigerator, indicating means, means for actuating said indicating means in response to abnormal temperatures within said compartment, switch means for rendering said indicating means inoperative, and means for automatically actuating said switch means after a time interval to render said indicating means operative.

4. In a refrigerator system including a storage compartment, adjustable control means for controlling the operation of the refrigerator, indicating means, means for actuating said indicating means in response to abnormal temperatures within said compartment, switch means for rendering said indicating means inoperative, and timing means for automatically actuating said switch means after a time interval to render said indicating means operative.

5. In a refrigerator system including a storage compartment, adjustable control means for controlling the operation of the refrigerator, indicating means, means for actuating said indicating means in response to abnormal temperatures within said compartment, means for ren-

dering said indicating means inoperative, and means for automatically actuating said last-named means after completion of a refrigerating cycle to render said indicating means operative.

6. In an electrical refrigerator apparatus including a storage compartment, a refrigerating system including an electric motor, a thermostatically-operable switch in circuit with said motor to control the operation of the refrigerating system, indicating means, means for actuating said indicating means in response to excessively high or low temperatures within said compartment, a switch for rendering said indicating means inoperative, manual means for opening said last-named switch, and means in circuit with said motor for effecting closure of said last-named switch after completion of a refrigerating cycle.

7. In an electrical refrigerator apparatus including a storage compartment, a refrigerating system including an electric motor, a thermostatically-operable switch in circuit with said motor to control the operation of the refrigerating system, indicating means, means for actuating said indicating means in response to excessively high or low temperatures within said compartment, a switch for rendering said indicating means inoperative, a plunger movable between raised and lowered positions and adapted to close said last-named switch when in its lowered position, and means in circuit with said motor for retaining said plunger in its raised position and for releasing the plunger after completion of a refrigerating cycle.

8. In an electrical refrigerator apparatus including a storage compartment, a refrigerating system including an electric motor, a thermostatically-operable switch in circuit with said motor to control the operation of the refrigerating system, indicating means, means for actuating said indicating means in response to excessively high or low temperatures within said compartment, a switch for rendering said indicating means inoperative, a plunger movable between raised and lowered positions and adapted to close said last-named switch when in its lowered position, and thermal-responsive means in circuit with said motor for latching said plunger in its raised position and for releasing the plunger after completion of a refrigerating cycle.

9. In an electrical refrigerator apparatus including a storage compartment, a refrigerating system including an electric motor, an adjustable thermostatic device for controlling the operation of the refrigerating system so as to maintain a desired temperature within said compartment, indicating means, a thermostatic control device adapted to actuate said indicating means in response to predetermined temperatures within said compartment, manually-operable switch means for rendering said indicating means inoperative, and means for automatically actuating said switch means after a time interval to render said indicating means operative.

10. In an electrical refrigerator apparatus including a storage compartment, a refrigerating system including an electric motor, an adjustable thermostatic device for controlling the operation of the refrigerating system so as to maintain a desired temperature within said compartment, indicating means, a thermostatic control device adapted to actuate said indicating means in response to predetermined temperatures within said compartment, manually-operable switch means for rendering said indicating means inop-

erative, and a timing mechanism for automatically actuating said switch means after a time interval to render said indicating means operative.

11. In an electrical refrigerator apparatus including a storage compartment, a refrigerating system including an electric motor, an adjustable thermostatic device for controlling the operation of the refrigerating system so as to maintain a desired temperature within said compartment, electrical indicating means, a thermostatic control device adapted to actuate said indicating means in response to predetermined temperatures within said compartment, manually-operable switch means for rendering said indicating means inoperative, and means for automatically actuating said switch means after completion of a refrigerating cycle to render said indicating means operative.

12. In an electrical refrigerator apparatus including a food storage compartment, a refrigerating system including an electric motor, an adjustable thermostatic device for controlling the operation of the refrigerating system so as to maintain a desired temperature within said compartment, electrical indicating means, a thermostatic control device adapted to actuate said indicating means in response to predetermined temperatures within said compartment, said last-named device including a member movable through a certain range corresponding to a range of temperatures within said compartment, and contacts operable by said member at the opposite ends of its range, manually-operable switch means for rendering said indicating means inoperative, and means for automatically actuating said switch means after a time interval to render said indicating means operative.

13. In refrigerator apparatus including a storage compartment, a refrigerating system, an adjustable device for controlling the operation of the refrigerating system so as to maintain a desired temperature within said compartment, an electrical indicating device, an energizing circuit for said indicating device, a switch device for closing said circuit in response to predetermined temperatures within said compartment, and a manually-operable circuit-interrupter adapted to open said circuit and maintain it in open condition for a predetermined time interval.

14. In refrigerator apparatus including a storage compartment, a refrigerating system, an adjustable device for controlling the operation of the refrigerating system so as to maintain a desired temperature within said compartment, an electrical indicating device, an energizing circuit for said indicating device, a switch device for closing said circuit in response to predetermined temperature within said compartment, and a manually-operable circuit-interrupter device adapted to open said circuit and maintain it in open condition for a predetermined time interval, said last-named device including means for maintaining said circuit open indefinitely when the apparatus is not being used.

15. In a refrigerator adapted to maintain food-stuffs in a frozen condition, a manual control member for initiating and controlling the operation thereof, said member being adjustable to a certain position to effect operation at sub-freezing temperature, electrically-operable signal means for indicating a substantial temperature rise above the sub-freezing temperature, a thermostatically-controlled switch in circuit with

said signal means to control the operation thereof, a manually-operable switch also in circuit with said signal means for rendering the signal means inoperative, whereby to prevent operation of the signal means during the time required to lower the refrigerator temperature to the sub-freezing value, and means for automatically closing said last-named switch after a time interval to render said signal means operative to indicate any abnormal temperature rise above the sub-freezing value.

16. In a refrigerator adapted to maintain food-stuffs in a frozen condition, a manual control member for initiating and controlling the operation thereof, said member being adjustable to a certain position to effect operation at sub-freezing temperature, electrically-operable signal means for indicating a substantial temperature rise above the sub-freezing temperature, a thermostatically-controlled switch in circuit with said signal means to control the operation thereof, a manually-operable switch also in circuit with said signal means for rendering the signal means inoperative, whereby to prevent operation of the signal means during the time required to lower the refrigerator temperature to the sub-freezing value, and means for automatically closing said last-named switch upon completion of the temperature-lowering cycle to render said signal means operative to indicate any abnormal temperature rise above the sub-freezing value.

17. In a refrigerator, a refrigerating system for maintaining a desired temperature, adjustable control means having a plurality of operating settings to effect operation at different temperatures including above-freezing and sub-freezing temperatures, electrically operable signal means for indicating a substantial temperature rise when the control means is set for operation at sub-freezing temperature, thermostatically-controlled switch means for actuating said signal means in response to such temperature rise, means controlled by said control means for preventing actuation of said signal means when the control means is set for operation at above-freezing temperature, a manually-operable switch for rendering said signal means inoperative during the time required to lower the refrigerator temperature to the sub-freezing value, and means for automatically closing said switch after a time interval to render said signal means operative to indicate any abnormal temperature rise above the sub-freezing value.

18. In a refrigerator, a refrigerating system for maintaining a desired temperature, adjustable control means having a plurality of operating settings to effect operation at different temperatures including above-freezing and sub-freezing temperatures, electrically operable signal means for indicating a substantial temperature rise when the control means is set for operation at sub-freezing temperature, thermostatically-controlled switch means for actuating said signal means in response to such temperature rise, a switch controlled by said control means for preventing actuation of said signal means when the control means is set for operation at above-freezing temperature, a manually-operable switch for rendering said signal means inoperative during the time required to lower the refrigerator temperature to the sub-freezing value, and means for automatically closing said last-named switch after a time interval to render said signal means operative to indicate any abnormal temperature rise above the sub-freezing value.

19. In a refrigerator, a refrigerating system for maintaining a desired temperature, adjustable control means having a plurality of operating settings to effect operation at different temperatures including above-freezing and sub-freezing temperatures, electrically operable signal means for indicating a substantial temperature rise when the control means is set for operation at sub-freezing temperature, thermostatically-controlled switch means for actuating said signal means in response to such temperature rise, means controlled by said control means for preventing actuation of said signal means when the control means is set for operation at above-freezing temperature, a manually-operable switch for rendering said signal means inoperative during the time required to lower the refrigerator temperature to the sub-freezing value, and means for automatically closing said switch

upon completion of the temperature-lowering cycle to render said signal means operative to indicate any abnormal temperature rise above the sub-freezing value.

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Disclaimer

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Hereby enters this disclaimer to claim 5 of said Letters Patent.
[Official Gazette October 25, 1949.]