July 20, 1954 J. W. JACOBS 2,683,970

INDICATOR FOR REFRIGERATING APPARATUS

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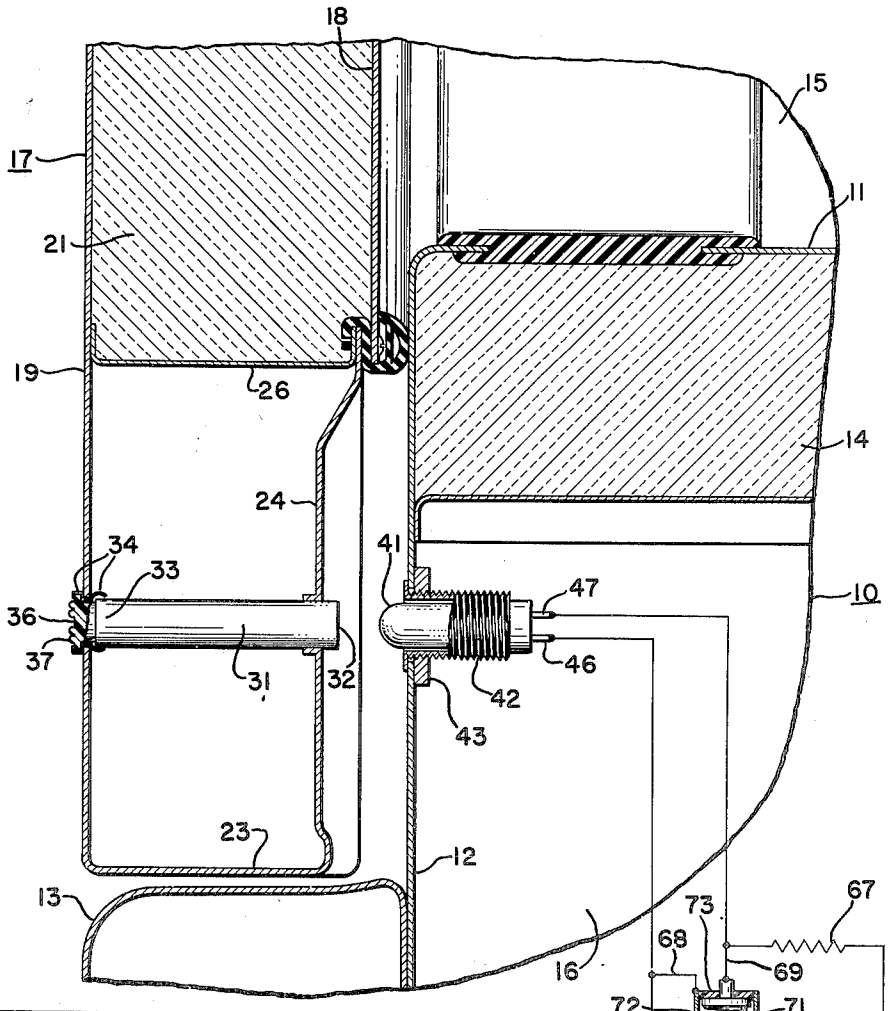


Fig. 2

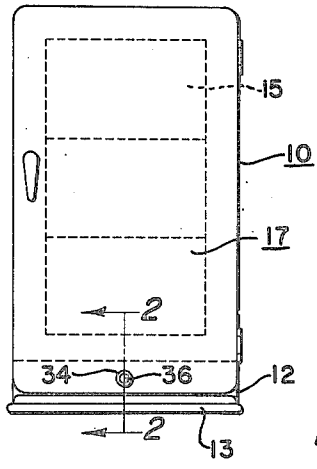


Fig. 1

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INDICATOR FOR REFRIGERATING APPARATUS

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2 Claims. (Cl. 62—4)

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This invention relates to refrigerating apparatus and particularly to signal devices therefor.

I am aware of the fact that heretofore food freezing or frozen food storage refrigerators such as home freezer cabinets or the like have been provided with a signal device of some sort to indicate to the user whether or not the refrigerating system associated with the refrigerator cabinet is operating properly. The purpose of such a signal device is to indicate or warn the user that the refrigerating system has been rendered inoperative for some reason or other so as to permit an immediate call for a serviceman whose prompt arrival may result in saving the frozen food contents of the freezer from completely thawing and causing spoilage thereof. Such warning devices have been in the form of an alarm bell and more recently in the form of a small light bulb which is continuously illuminated so long as the refrigerating system is operating correctly to maintain the predetermined desired low temperatures in the refrigerator cabinet. In most home freezers of the horizontal elongated type the machine compartment at one end of the cabinet housing the refrigerant translating device of a refrigerating system is provided with an air circulating opening or openings covered by a louvered or the like grille and a small signal light bulb has been located in or in back of this grille so as to be visible therethrough at the front of the cabinet. In producing home food freezing or frozen food storage refrigerators of the vertically elongated type wherein a small machine compartment located below the food storage compartment houses the refrigerant translating device of a refrigerating system associated with the cabinet and of a design wherein the food storage access opening door at the front of the cabinet virtually extends throughout the entire height of the cabinet, the provision of a signal lamp thereon so as to be visible from the front of the cabinet becomes a problem. To extend wires from the machine compartment through the insulated walls of the cabinet and/or to pass such wires through the cabinet door hinges to a lamp mounted remote from this compartment is a troublesome and expensive task. I therefore contemplate the provision of a warning signal device and a novel manner of mounting the same on a vertical home freezer cabinet.

An object of my invention is to provide a means for transmitting light produced by a signal lamp located behind a wall of a refrigerator cabinet through the wall so that the light may be visible at the front of the cabinet.

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Another object of my invention is to mount a signal lamp on the front wall of the machine compartment of a vertically elongated home freezer cabinet which is concealed by a part of the food compartment access opening closing door and to provide the lamp concealing part of this door with a transparent rod in horizontal alignment with the lamp for transmitting the light produced thereby through the door to the front of the cabinet.

In carrying out these objects it is a still further object of my invention to mount a light diverging lens on the outer surface of the cabinet door adjacent the outer end of the light transmitting rod so that light produced by the concealed lamp may be seen from various angles and particularly at a substantial distance above the location of the signal device.

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

In the drawing:

Figure 1 is a front view of a vertical food freezing and frozen food storage refrigerator having my invention incorporated therein; and

Figure 2 is an enlarged fragmentary vertical sectional view taken on the line 2—2 of Figure 1 showing a signal lamp and a wiring diagram therefor.

Referring to the drawing, I have shown in Figure 1 thereof a vertically elongated rectilinear refrigerator of the front opening home food freezing and frozen food storage type, generally represented by the reference character 10. The refrigerator cabinet 10 includes inner and outer metal walls 11 and 12 respectively spaced apart and having any suitable or desirable insulating material 14 (see Figure 2) disposed therebetween and forming relatively thick walls of a food storage compartment 15 in the upper portion thereof. The outer walls 12 of cabinet 10 extend downwardly below the bottom insulated wall of compartment 15 and form relatively thin walls of a small machine or machinery compartment 16 in the lower portion of the cabinet. Compartment 15 has its access opening in the front of cabinet 10 normally closed by a relatively thick insulated door structure, generally represented by the reference character 17, hingedly mounted upon the cabinet for horizontal swinging movement. It will be noted that the top and side edges of door 17 are flush with the outer top and side walls of cabinet 10 and that this door covers sub-

stantially the entire front of the cabinet. A toe plate or trim molding 13 is located below door 17 at the level of the floor of the room in which cabinet 10 is installed. The door structure 17 includes inner and outer panels 18 and 19 respectively spaced apart and having suitable insulating material 21 therebetween. A part of door 17 depends below the bottom wall of compartment 15 to a point adjacent the toe plate 13 and over the front wall 12 of machine compartment 16. This depending part of door 17 has its front flush with and formed as a continuation of the front face thereof and is provided by bending the outer panel 19 inwardly as at 23 and upwardly as at 24 where it is attached to a cross brace 26 and to the inner door panel 18 in any suitable or conventional manner. An aperture in the door front panel 19 and a horizontally aligned aperture in the upwardly extending back portion 24 thereof provides or forms a hole through the door structure 17. A means is located in this hole, in the depending part of door 17, capable of transmitting light from the back side of the door to the front side thereof. This means in the present disclosure is a round transparent rod 31 having its one end 32 exposed at the inner side of door 17, for a purpose to be hereinafter described, and has its outer end 33 fitted or supported in a metal ferrule 34 secured to door panel 19. Rod 31 is preferably formed of polymerized methyl methacrylate. Ferrule 34 carries a jeweled glass or plastic lens 36 having beads or the like 37 on its outer surface adapted to diverge light rays transmitted thereto by rod 31 in various angular directions.

A closed refrigerating system is associated with the refrigerator cabinet 10 and includes the usual refrigerant translating device, a refrigerant evaporator and thermostatic means for controlling the refrigerant translating device. The refrigerant translating device of the refrigerating system may be in the form of a motor-compressor-condenser unit (not shown) located in the machine compartment 16. The motor and the control therefor of such a unit is indicated diagrammatically in Figure 2 of the drawing. The refrigerant evaporator (not shown) of the refrigerating system may be of any conventional or well-known form and is preferably a conduit having flat coils secured to and extending along the outer surface of the food storage compartment walls or liner 11. The evaporator of the refrigerating system has sufficient surface contact with compartment walls 11 to maintain the interior of compartment 15 at temperatures far below freezing, say, for example, between —5° F. and +5° F. It is desirable to provide such a low temperature frozen food storage refrigerator with some sort of signal device to indicate to the user thereof that the refrigerating system employed to cool the food compartment 15 is operating properly to produce the desired temperatures in this compartment. I therefore provide an electric lamp which is continuously illuminated as long as the refrigerating system operates to maintain the interior of food compartment 15 between —5° F. and +5° F. and which is short-circuited to cause it to go out upon the occurrence of an abnormal rise in temperature within the food compartment.

The signal lamp in the present disclosure comprises a ¼ watt neon light bulb or lamp 41 located within the machine compartment 16 in close relationship to the refrigerant translating unit of the refrigerator system and preferably mounted on the front wall 12 of this compartment so as to project outwardly a short distance therefrom. Bulb or lamp 41 is carried by a socket or the like member 42 which is secured in an aperture provided in front wall 12 of compartment 16 by a lock nut 43. Socket member 42 is provided with two electric connectors or thermals 46 and 47 forming a part of an electric circuit for the lamp 41. This electric circuit includes wires 51 and 52 suitably connected to a source of electric power and attached to the thermals 46 and 47 respectively. The motor of the motor-compressor-condenser unit of the refrigerating system is indicated at 53, the thermostatic control for energizing and deenergizing motor 53 and the means for short-circuiting lamp 41 is shown diagrammatically. The lamp shorting means and the thermostatic control may be separate and independent switches but they are preferably combined into a single control device as is disclosed and fully described in the copending application of Albert O. Grooms, S. N. 154,246, filed April 6, 1950, and entitled Electrical Apparatus.

For the sake of simplicity and for illustrating the present invention I show the thermostatic control as being in the form of a snap switch having a movable arm 54 secured to the free end of a bellows 55 having its other end rigidly mounted upon a stationary U-shaped bracket 56. Suitable toggle plates are provided between arm 54 and the legs of U-shaped bracket 56 to cause snap-action movements of arm 54 as is well-known in the electric switch art. The stationary end of bellows 55 has one end of a tube 57 soldered or sealed thereto in any suitable manner and the other end of tube 57 is soldered or sealed to a bulb 58. Any suitable volatile fluid is charged into the bellows 55, tube 57 and bulb 58 to form a closed or sealed power unit as is also well-known in the art. The bulb 58 is placed within food storage compartment 15 of cabinet 10 or it may be placed in thermal contact with the evaporator of the refrigerating system associated with cabinet 10 so as to render the power unit of the thermostatic control switch effective to actuate the same in accordance with the temperature within the food storage compartment or of the evaporator therefor as is common practice. Arm 54 of the thermostatic switch has attached thereto a movable spring member 59 carrying a contact 61 adapted to engage a stationary contact 62. A wire 63 connects contact 62 with the one wire 51 of the electric circuit for lamp 41. A wire 64 connects movable spring member 59 to motor 53 and another wire 66 leads from motor 53 to the other side of the line or wire 52 of the electric circuit. Thus the thermostatic control switch is connected in series relation with the motor 53 and both this switch and motor 53 are connected in parallel relation with the electric lamp circuit. Wire 52 has a 200,000 ohm voltage dropping resistor 67 interposed therein and located between lamp 41 and the wire connector 66 to motor 53. A second switch is connected in parallel relation with wires 51 and 52 by wires 68 and 69 intermediate lamp 41 and the thermostatic control switch and intermediate lamp 41 and the resistor 67 respectively. This second switch includes a metal contact member 71, insulated from a metal collar 72 by a Bakelite or rubber-like plug 73, a spring 74 and a plunger 75. Spring 74 normally biases plunger 75 away from collar 72 so as to prevent this second switch from shorting out the lamp 41. Any suitable or conventional means may be

employed to stop and retain plunger 75 in a predetermined spaced relation to the arm 54 of the thermostatically operated snap switch whereby arm 54 and spring member 59 may be moved to close and/or open contacts 61 and 62 without engaging the plunger 75 under normal operating conditions of the refrigerating system. Thus lamp 41 is continuously illuminated as long as electric current is supplied to the wires 51 and 52 and so long as the refrigerating system is operating correctly to produce the temperatures desired in food compartment 15 of cabinet 10.

It is to be understood that arm 54 of the thermostatically operated switch is adapted to engage and move plunger 75 of the second switch under certain conditions. For example the thermostatically operated switch may be set to close contacts 61 and 62 when the temperature within food compartment 15 is increased to 5° F. and to open the contacts 61 and 62 when the compartment temperature is decreased to —5° F. for starting and stopping the motor 53, which drives the compressor of the motor-compressor-condenser unit of the refrigerating system. Should the closing of contacts 61 and 62 fail to start motor 53 the temperature within compartment 15 will then rise considerably above 5° F. to say, for example, 10° or 12° F. The closed power unit, including bulb 56, tube 57 and bellows 55, will thereupon further expand bellows 55 of the thermostatically operated switch to move arm 54 into engagement with the plunger 75 of the second switch. This may be accomplished by arm 54 causing the movable leaf spring member 59 to be bowed, intermediate its mounting point and contact 61 thereon, after contacts 61 and 62 have been closed, or it may be carried out by either of the two structural arrangements incorporated in the switch structures disclosed in the copending application hereinbefore referred to. Further or continued movement of arm 54, as the temperature of compartment 15 continues to increase, will cause the same to move plunger 75 into contact with the collar 72 of the second switch whereupon electric current, instead of flowing through the resistance in lamp 41, will flow from resistor 67 through wire 69, contact member 71, spring 74, collar 72 and wire 68 to the power line 51. This shorts out the lamp 41 and its illumination ceases. As soon as the user notices that the lamp is no longer illuminated a serviceman should be called to correct any trouble that has created the abnormally higher temperature within the food compartment 15. After such correction or repair the motor 53 will operate the compressor and the refrigerating system will function to reduce the temperature in compartment 15 to the original desired low temperature limits. Arm 54 in the thermostatically operated switch will gradually be moved away from and out of contact with plunger 75 of the second switch even while contacts 61 and 62 are closed, to thus open the second switch and cause electric current to flow from resistor 67 to the other side 51 of the power line through lamp 41 to again illuminate the same. Normal movements of the thermostatically actuated switch to open and/or close contacts 61 and 62 does not interfere with continuous illumination of lamp 41.

From the foregoing it should be apparent that I have provided a unique signal device for a home food freezing and frozen food storage refrigerator which is located in close proximity to the thermostatically actuated switch and the electric motor of a portion of a refrigerating system

associated with the refrigerator cabinet. In this manner I eliminated the necessity of extending electric wires through the insulation surrounding the low temperature food compartment and/or extension of such wires through hinges of the door employed to close the food compartment access opening to thereby more strictly adhere to underwriter's specifications. While the signal lamp is within the lower machine compartment, mounted on its front wall below the level of a person's eye and concealed by the door of the refrigerator cabinet, I have provided means whereby the rays of light produced by the lamp are transmitted through the door and are visible at widely varying angles so as to prevent stooping on the part of the user to ascertain whether or not the lamp is illuminated.

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

What is claimed is as follows:

1. In combination, a refrigerator cabinet having inner and outer walls with insulating material disposed therebetween forming a food storage compartment provided with a forwardly facing access opening, a door hingedly mounted at the front of said cabinet for normally closing said compartment access opening, the top and side edges of said door being substantially flush with the top and side walls of said cabinet and concealing portions of the front cabinet wall adjacent said compartment access opening, the outer cabinet walls being extended downwardly beyond the bottom insulated wall of said food compartment to form a machine compartment therebelow, a closed refrigerating system associated with said cabinet including a refrigerant translating device located in said machine compartment and a refrigerant evaporator for cooling the interior of said food storage compartment, a signal lamp mounted in an aperture provided in the front wall of said machine compartment below the bottom insulated wall of said food compartment, a switch for starting and stopping said refrigerant translating device in response to temperatures in said food compartment, an electric circuit for said lamp and said switch, said door having its lower part depending below the insulated bottom wall of said food compartment and overlying said lamp in the aperture of said machine compartment front wall, said overlying part of said door normally concealing said lamp from view, light ray transmitting means carried by said depending part of said door and movable therewith, and said means being in alignment with and exposed to light emitted from said lamp when said door is closed to transmit the light through the door whereby the same is visible at the front of said cabinet.

2. In combination, a refrigerator cabinet having inner and outer walls with insulating material disposed therebetween forming a food storage compartment provided with a forwardly facing access opening, a door hingedly mounted at the front of said cabinet for normally closing said compartment access opening, the top and side edges of said door being substantially flush with the top and side walls of said cabinet and concealing portions of the front cabinet wall adjacent said compartment access opening, the outer cabinet walls being extended downwardly beyond the bottom insulated wall of said food compartment to form a machine compartment

therebelow, a closed refrigerating system associated with said cabinet including a refrigerant translating device located in said machine compartment and a refrigerant evaporator for cooling the interior of said food storage compartment, a signal lamp mounted in an aperture provided in the front wall of said machine compartment below the bottom insulated wall of said food compartment, a switch for starting and stopping said refrigerant translating device in response to temperatures in said food compartment, an electric circuit for said lamp and said switch, said door having its lower part depending below the insulated bottom wall of said food compartment and overlying said lamp in the aperture of said machine compartment front wall, said overlying part of said door normally concealing said lamp from view, means carried by said depending part of said door and movable therewith for transmitting light from said lamp through

the door whereby the same is visible at the front of said cabinet while said door is closed, said means comprising a polymerized methyl methacrylate rod having its inner end aligned with and exposed to the light of said lamp and its other end aligned with and exposed to a lens at the outer surface of said door, and said lens diverging the light transmitted through the door in a plurality of directions angularly relative to the disposition of said rod.

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