

1

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COMBINATION CASE HEATER AND ALARM CIRCUIT FOR REFRIGERATORS

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1 Claim. (Cl. 62—89)

The present invention relates to household refrigerators and particularly to a refrigerated cabinet including a storage compartment for storing foods at sub-freezing temperatures.

Household refrigerators and freezers generally comprise an outer metal case and an inner liner insulated from the case and defining a food storage compartment. Breaker strips extending around the access opening to the liner between the liner and the outer case are employed to decrease thermal conduction between the case and the liner but such insulating means have not been completely effective for preventing condensation and sweating of the outer case adjacent the access opening. Heat leakage through the breaker strip or the other insulating means, from the outer case to the interior of the storage compartment causes the temperature of the outer case to fall below the dew point of the surrounding atmosphere. The condensed moisture on the outer case causes discoloration and deterioration of the case finish. To prevent such condensation, suitable heating means such as an electrical resistance heater have been employed to maintain the temperature of the case about the access opening sufficiently warm so that such condensation cannot occur.

It is also highly desirable, particularly in connection with home freezers, to provide some sort of an alarm or indicator which will warn the user of any abnormal rise in the storage compartment temperature above that at which the contents thereof can be safely stored. For example a blown fuse or similar power failure or failure of the refrigerating system, unless noted in time, will cause the temperature of the storage compartment to rise to a point where the stored food will spoil.

Heretofore these two problems have been separately considered and, insofar as the construction of the refrigerator cabinet is concerned, separately solved. The present invention relates to and has as its principal object the provision of a combination case heater and visual alarm circuit which not only requires fewer elements than are required if separate circuits were provided but also permits the use of lower cost and longer life elements with no loss in the efficiency and effectiveness of the protective arrangement.

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

In carrying out the objects of the present invention, a refrigerated cabinet is provided with an electric resistance heater in heating relationship with the face portion of the refrigerator outer case adjacent the access opening to the freezer compartment. The power supply for a low voltage lamp circuit which serves as a visual alarm, is tapped off the electric resistance heater. This alarm circuit is in series with a portion of the heater and in parallel connection with another portion thereof so that a low voltage long life lamp can be employed. Energization of the heater and visual alarm circuit is controlled by a

2

single thermal switch responsive to the temperatures within the storage compartment so that any abnormal rise in the storage compartment temperatures will be indicated by deenergization of the circuit including the alarm light.

For a better understanding of the invention reference may be had to the accompanying drawing in which:

Fig. 1 is an elevational view partly in section of a refrigerated cabinet showing schematically one form of the present invention as embodied therein; and

Fig. 2 is an enlarged fragmentary sectional view taken along the line 2—2 of Fig. 1.

Referring to the drawing there is shown a refrigerated cabinet including an outer case 1 and an inner liner 2 forming a food storage compartment within the cabinet. A breaker strip 3 of suitable heat insulating material bridges the gap between the forward edge 4 of the liner and the face portion 5 of the outer case. The breaker strip 3 extends entirely around the access opening to the storage compartment formed by the liner 2 and may be of any suitable construction and material adapted to thermally insulate the liner 2 from the outer case 1. Suitable heat insulation 6 is also provided between the liner and the outer case 1.

A vertical door 7 is provided for closing the access opening to the storage compartment. This door includes an edge portion 8 overlapping the face portion 5 of the outer case and a gasket 10 engaging the face portion 5 and sealing the space between the door and the outer case 1.

It will be understood of course that a suitable refrigerating system (not shown) is provided for maintaining the space within the liner 2 at suitable food preservation temperatures which in the case of the freezer are ordinarily well below freezing. During operation of the refrigerating system due both to conduction and to convection currents within the space between the breaker strip 3 and the inner panel 11 of the door, there is a gradual cooling of the face portion 5 of the outer case to a point where moisture from the surrounding atmosphere condenses in this area of the cabinet.

In order to maintain the face portion of the outer case at temperatures which are sufficiently high to prevent this condensation, there is provided electrical heating means in the form of a resistance heater 12 which is preferably positioned within the space between the liner 2 and the outer case 1 in heat exchange relationship with the face portion 5 of the case. The positioning of the heater 12 is shown somewhat schematically in Figure 1 as extending along the two vertical sides of the cabinet adjacent the access opening to the storage compartment and similarly along the bottom of the cabinet. If desired the resistance wire may also extend along the upper face portion of the cabinet adjacent the access opening although the condensation problem with a vertical or upright type cabinet is not as great in this area as in the remaining face portions of the outer case.

The resistance heater 12 is connected to a suitable source of power 14 which in general will be the same source of supply as that used to operate the refrigerating unit.

In accordance with the present invention there is provided a visual alarm for indicating either power or refrigeration system failure. This alarm is in the form of a low voltage lamp 15 preferably positioned on the front of the cabinet below the door 7 so as to be visible from in front of the cabinet to inform the user of the refrigerated cabinet as to whether or not the unit is operating properly. For this purpose the lamp is connected in series-parallel relationship with the heater and the entire circuit including the heater 12 and the lamp 15 is controlled by a thermostat 16 which includes a switch 17, a bellows 18 and a feeler bulb 19 positioned within the storage compart-

3

ment and responsive to the temperatures therein. During normal operation of the refrigerating system serving the cabinet the switch 17 is closed so that heat is continuously supplied to the face portion 5 of the outer case and the indicator light 15 is continuously illuminated. Upon either a refrigeration system failure or a power failure, both of which result in an increase in the temperature of the cabinet and opening of switch 17 controlled by bellows 18, the lamp circuit is de-energized so that the user is warned of the failure by the fact that the light 15 is no longer illuminated.

By this arrangement in which the source of power for the indicator light is tapped off a portion of the heater 12, any desired voltage and current can be obtained for energizing the light 15 so that a low voltage bulb operating at lower than rated voltage and hence having a long life can be employed in the alarm system. In order to provide the desired voltage and current for the operation of the signal bulb 15, the resistance heater 12 preferably comprises one portion 21 in parallel with the signal bulb circuit and a second portion comprising the sections 22 and 23 in series connection with the lamp circuit.

From the foregoing, it will be seen that there has been provided a simple and low cost circuit including means for heating the outer case of a refrigerated cabinet and for indicating power and refrigeration failure.

The heater, as well as the indicator light, is energized only when the cabinet is at safe food preservation temperatures and does not supply heat to the cabinet during periods of power or system failure, which heat would accelerate the rate at which the cabinet and food temperatures rise during such critical periods. By employing a portion of the heater as means for controlling the voltage and current supplied to the signal bulb 15, a low voltage bulb can be employed as the visual alarm means without the use of additional resistances or transformer means which would otherwise be required if the alarm circuit

4

were connected directly to the normal power source. Furthermore less space is required in the cabinet structure for the alarm component of the circuit and as less heat is dissipated by the low voltage bulb, the bulb may be encased in or protected by a low cost decorative enclosure made of plastic material or the like.

While there has been shown and described the specific embodiment of the invention, it is not desired that the invention be limited to the particular construction shown and described and it is intended by the appended claim to cover all modifications within the spirit and scope of the invention.

What I claim as new and desire by Letters Patent of the United States is:

A refrigerated cabinet including an outer case, a liner insulated from said case defining a food storage compartment having an access opening thereto, a door for closing said access opening including a portion engaging the face portion of said outer case about said access opening, and a combination case heater and visual alarm circuit comprising a resistance heater in heating relationship with said face portion of said case, a low voltage alarm light connected in parallel with a portion of said resistance heater and in series with the remainder of said heater and a thermal switch responsive to the temperature within said storage compartment for controlling the energization of said circuit and adapted to interrupt said circuit upon an abnormal rise in said temperature.

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