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APPARATUS FOR PREVENTING FREEZE-UP OF REFRIGERATOR DOORS

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2 Sheets-Sheet 1

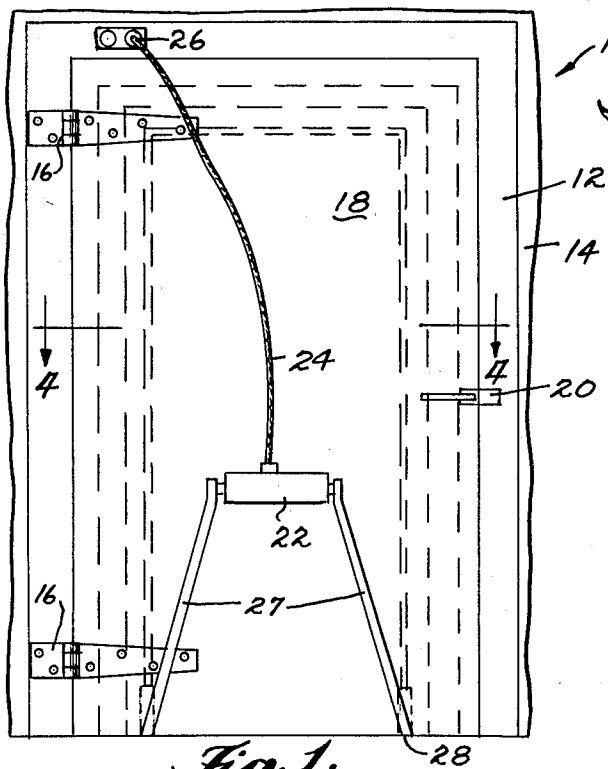


Fig. 2.

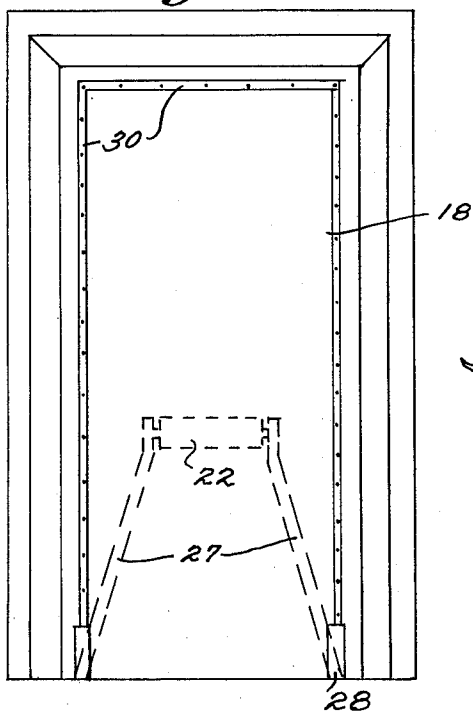
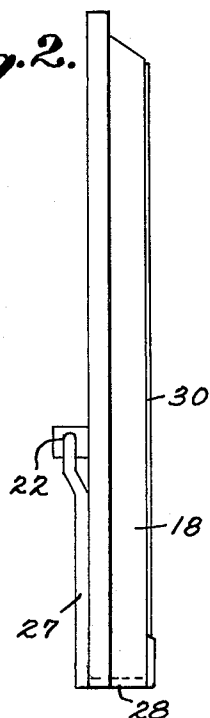


Fig. 3.

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Fig. 4.

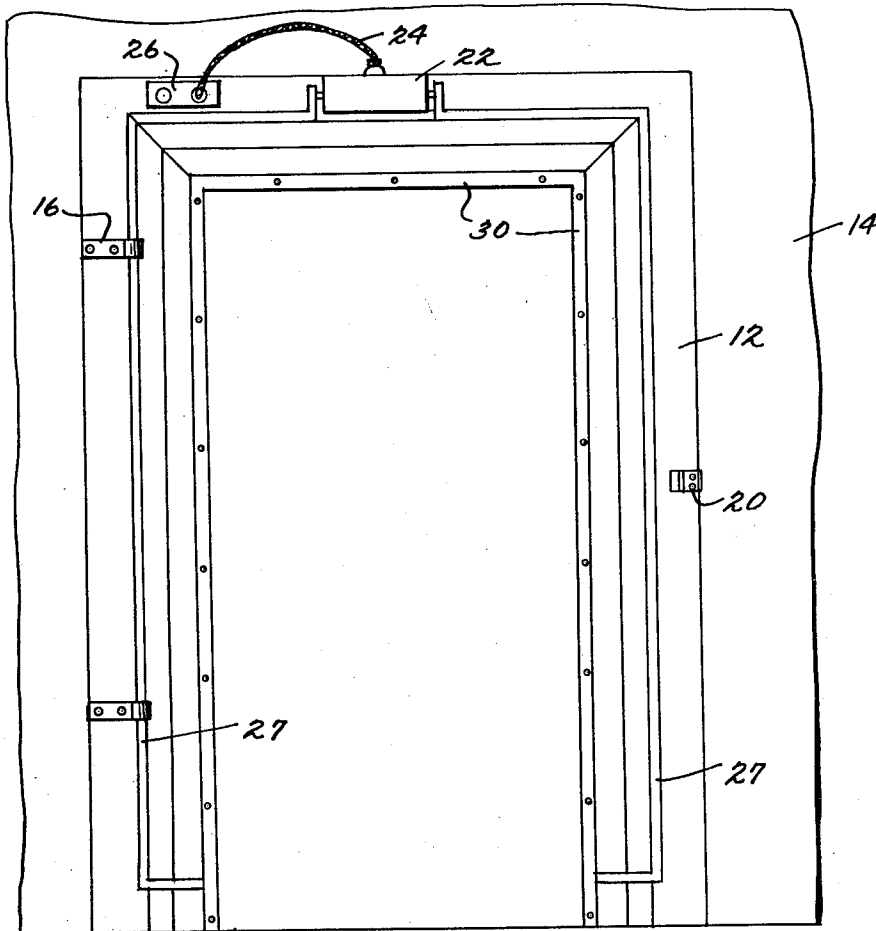
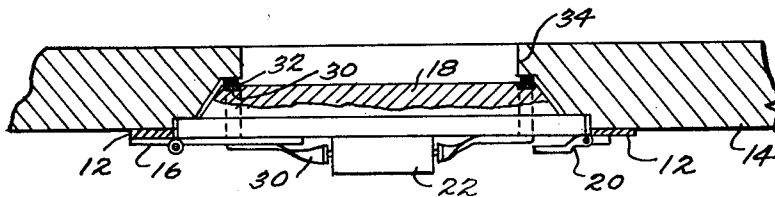


Fig. 5.

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APPARATUS FOR PREVENTING FREEZE-UP OF REFRIGERATOR DOORS

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7 Claims. (Cl. 62—275)

This invention relates generally to apparatus for preventing freeze-up of refrigerator doors, or the like, and more particularly, is directed to electrical means mounted on the door of a refrigerator which serves to heat the same, thereby preventing the formation of condensation and frost thereon.

It is a well-known phenomenon that a freezer or refrigerator cabinet tends to form condensation and subsequently frost about the door and opening providing access to the cabinet.

The interior of a freezer cabinet is maintained at a low temperature, and, in spite of insulation, the temperature about the door of a cabinet is usually below the temperature of the surrounding air. Moisture in the cooler air surrounding the cabinet opening thus condenses on the surfaces of the freezer adjacent the opening, and subsequently freezes, causing the door to adhere to the frame thus making it difficult to open and close the door. Although found with respect to all types of refrigerator doors, this sticking condition is especially prevalent in doors of the sliding type. It may arise while the freezer door is closed and is aggravated by repeated opening and closing of the freezer door.

In the past, various means have been employed to diminish or eliminate this condition, including the use of electrically heated strips of conducting material placed about the periphery of the door frame leading into the freezer, and about the door itself. It is well known that electrical voltages in excess of approximately 25 volts are painful and can cause harm when received by a human, and therefore, at the line voltages used in these prior art structures, it was necessary that the heating elements be completely insulated; otherwise, the devices would be very dangerous in use. The insulation employed in such constructions was often expensive and it was usually necessary to build the anti-frost device into the refrigerator itself. In an effort to improve the characteristics of these prior art devices, the present invention has been made.

The invention disclosed herein is directed to a frost preventing device which requires no insulation, can be inexpensively manufactured, and which can be applied to any presently existing refrigerator door as well as to a new door.

The invention is illustrated herein in a preferred embodiment which comprises a strip of uninsulated conducting material formed about the periphery of a freezer door such that it contacts the jamb of the door frame when the door is closed. A current transformer mounted on the door is provided with electrical leads connected to the primary winding therein adapted to be plugged into any suitable electrical outlet. The secondary winding of the transformer is connected to the electrical conducting material which thereby conducts electrical current at a low voltage which is sufficient to heat the strip but which at the same time will not present any element of danger to a person operating the freezer door. The preferred transformer contemplated is to have a primary winding adapted for connection to a typical 110 volt. A.C. source, and a secondary winding arranged to deliver 30–40 amperes of current at a voltage of 6–8 volts. Such an apparatus will maintain a typical conducting strip at a temperature of approximately 70° F. when the interior of the freezer compartment is maintained at a temperature

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of –5° F., thereby preventing the formation of condensation and frost around the door jamb and outer periphery of the freezer door.

Another feature of the invention is the fact that there is no necessity for a temperature regulating thermostat or switch to be used in combination with the transformer and conductor arrangement just described. The reason for this is that the circuit is of such a design that the current through the strip is automatically limited. This, in effect, provides the necessary temperature control.

Accordingly, it is an object of the present invention to provide an improved apparatus for defrosting a refrigerator door and door frame by means of a low voltage electrical current passed around the periphery thereof.

Another object of this invention is the provision of a defroster apparatus for use in combination with freezers and refrigerators, or the like, having an insulated door for entrance to or exit therefrom with a low voltage, high current electrical source mounted thereon and connected to uninsulated conductor means on the door or door frame whereby passage of the electric current through the conductor means will prevent the formation of frost on the door without harming one operating the door.

A further object of this invention is to provide door frame means having a resilient gasket secured to its periphery and uninsulated conductor means secured to the door adapted to engage the resilient gasket means when the door is in closed position.

Still another object of this invention is the provision of electrical apparatus to prevent the freeze-up of refrigerator doors which can be easily and inexpensively applied to existing as well as new refrigerator doors and door frames.

Other objects and advantages will become more apparent in the course of the following detailed description of an illustrative embodiment of the invention, which may be best understood with reference to the accompanying drawings in which like parts are designated by like reference numerals throughout the same.

In the drawings:

FIGURE 1 is a front elevation view of a walk-in type refrigerator door hingedly mounted on the door frame of a freezer and employing the heating apparatus which forms the basis of the present invention;

FIGURE 2 is a side elevation view of the refrigerator door illustrated in FIGURE 1;

FIGURE 3 is a rear elevation view of the door illustrated in FIGURES 1 and 2, and showing the electrical conducting means applied to the periphery thereof;

FIGURE 4 is a section view taken along lines 4—4 of FIGURE 1; and

FIGURE 5 is a front elevation view of a modified form of the invention wherein the transformer and the uninsulated conductor strip is mounted to the door frame.

Referring now more particularly to the drawings, the defroster apparatus of the present invention is generally indicated at 10. A door frame 12 is shown in FIGURE 1 and is suitably mounted in the wall 14 of a freezer or refrigerator. Pivotaly mounted by means of hinges 16 to the door frame 12 is an insulated refrigerator door indicated at 18 which may be opened or closed by means of a latch 20.

Although the refrigerator door 18 illustrated in the figures is of the walk-in type such as is found, for example, in large grocery store and warehouse freezers, it is to be understood that the apparatus to be described may be adapted for use in home refrigerators or freezers and also in the type of freezer cabinets employing sliding doors for access to the contents thereof.

A current-type transformer 22 is suitably mounted to the front side of the refrigerator door 18. An electrical lead 24 extends from the primary winding of the trans-

former 22 and has the other end thereof adapted to be plugged into the electrical outlet 26 which may be mounted on the door frame 12. The electrical outlet may be of a standard type delivering electrical current at a rated electromotive force of 110 volts.

Connected to the ends of the secondary winding of the transformer 22 are a pair of copper bus leads 27 which extend downwardly from the transformer and around the bottom of the refrigerator door as indicated at 28, thence upwardly a short distance on the rear side of the refrigerator as is clearly seen in FIGURES 2 and 3. Standard hard drawn brass weather stripping, or other suitable conducting material, as indicated at 30, may be applied to the rear of the door about the periphery thereof by nailing or by other suitable means. The weather stripping is preferably overlapped and soldered at the corners in order to provide a good electrical connection. At the base of the door the stripping is soldered to the copper bus leads 24 which connect with the secondary winding of the transformer 22. In operation, the busses 27 have been satisfactorily made of flat ribbon copper wire having a cross section of $\frac{1}{40}$ inch by $\frac{3}{40}$ inch, although it is to be understood that the busses may have other cross sectional areas and shapes as determined by an expert skilled in the art. Likewise, for a door having dimensions of approximately $6\frac{1}{2}$ feet by 3 feet, brass stripping having an over-all length of 16 feet and a cross section of $1\frac{1}{8}$ inches by $\frac{20}{1000}$ inch, has been found to be satisfactory.

Resilient gasket material 32 of rubber or other suitable material is secured to the door frame at 34 which includes the door jambs together with the horizontal members defining the entire doorway about the periphery thereof as is clearly seen in FIGURE 4. The gasket material 32 is mounted upon the door in such a manner that the gasket will be caused to engage the weather stripping 30 mounted on the rear side of the refrigerator door 18 when the door is in closed position.

When the electrical lead 24 is plugged into the outlet 26, for example, a 110 volt line, the transformer 22 generates current at low voltage in the secondary winding of the transformer which flows through the copper busses 27 and the brass stripping 30 connected thereto. The current thereby provided will maintain the stripping 30 at a temperature of approximately 70° F. when the interior of the refrigerator or freezer is held at a reduced temperature of approximately -5° F. Of course, it will be apparent that a transformer having a somewhat different ratio of primary to secondary winding turns might be desirably employed if the freezer temperature is to be substantially greater or less than the -5° F. temperature used herein by way of example.

The defroster apparatus which has been described can be applied to any existing freezer door easily and with a minimum of expense since the voltage is transformed from the 110 rating of the line current to a harmless low voltage, say, 6-8 volts. The stripping 30 may be completely uninsulated without presenting any element of danger to one entering or leaving the freezer. Furthermore, since the transformer inherently limits the current passing through the stripping 30, there is no necessity in providing the apparatus of this invention with a temperature regulating thermostat or switch.

Although the apparatus of the invention has been described as being mounted upon a door leading into a refrigerator or freezer, the invention is also deemed to encompass a modification as illustrated in FIGURE 5 wherein it is mounted to the door frame upon which the door is pivoted. The transformer 22 might conceivably be mounted upon the frame 12, the brass stripping 30 being suitably fastened to the jamb means 32

about the periphery of the door opening. Employing substantially the same structure as the apparatus mounted on the door, the frame-mounted embodiment would likewise serve to prevent the formation of condensation and frost in the closure zone of the door 18. At the same time, the voltages employed are preferably substantially less than 25 volts so that a person using the door would not be harmed thereby.

While an improved apparatus for eliminating frost or the deposit of moisture on the surfaces of a freezer and a door opening therein of the walk-in type, has been disclosed, it is to be understood, of course that the constructions shown are for purposes of description only, and may be modified in many and various respects, within the scope of the appended claims, without departing from the spirit or sacrificing any of the advantages of the invention, and that the invention is not limited in its application thereto, but may be employed in various other types of refrigerators and freezers wherever the use of an apparatus of this character is desirable or required.

What is claimed is:

1. Apparatus for preventing the formation of ice and frost about the junction of doorway members including a door leading into a refrigerated compartment and the frame thereof, said apparatus comprising a continuous electrically uninsulated conductive strip mounted upon the exterior surface of at least one of said doorway members along a substantial length of the doorway periphery and in close proximity to the closure zone between the door and frame whereat freezing of water from the air tends to occur as warm air moves past the door into the compartment, a source of electric current, and means connecting the ends of said strip to said source, the voltage of the source being related to the electrical resistance of the closed circuit formed by the strip and connecting means so that the maximum voltage across any two points of the uninsulated portion of said circuit is less than approximately 25 volts, and the source having capacity to drive current through said strip in amount sufficient to heat same sufficiently to prevent freezing of water in said closure zone.

2. The apparatus set forth in claim 1 wherein said source of electric current comprises step-down transformer means having a primary winding adapted for connection to an electrical outlet and a secondary winding adapted for connection to said connecting means.

3. The apparatus set forth in claim 1 wherein said uninsulated strip is mounted upon said door.

4. The apparatus set forth in claim 1 wherein said uninsulated strip is mounted upon said frame.

5. The apparatus set forth in claim 1 wherein said uninsulated conductive strip is mounted upon the surface of the door about the periphery thereof, and further comprising resilient sealing means mounted to said door frame and adapted to engage said conductive strip upon closure of said door.

6. The apparatus set forth in claim 1 wherein said uninsulated conductive strip is mounted upon the surface of said door frame about the periphery thereof, and further comprising resilient sealing means mounted on said door and adapted to engage said conductive strip upon closure of said door.

7. The apparatus set forth in claim 2 wherein said transformer is mounted upon said door.

References Cited in the file of this patent

UNITED STATES PATENTS

2,238,511	Thaxter	Apr. 15, 1941
2,731,804	Grubbs	Jan. 24, 1956
2,807,942	Dahlgren	Oct. 1, 1957
2,858,408	Barroero	Oct. 28, 1958