March 17, 1964 J. L. COLTEN 3,125,657

DEFROSTING UNIT

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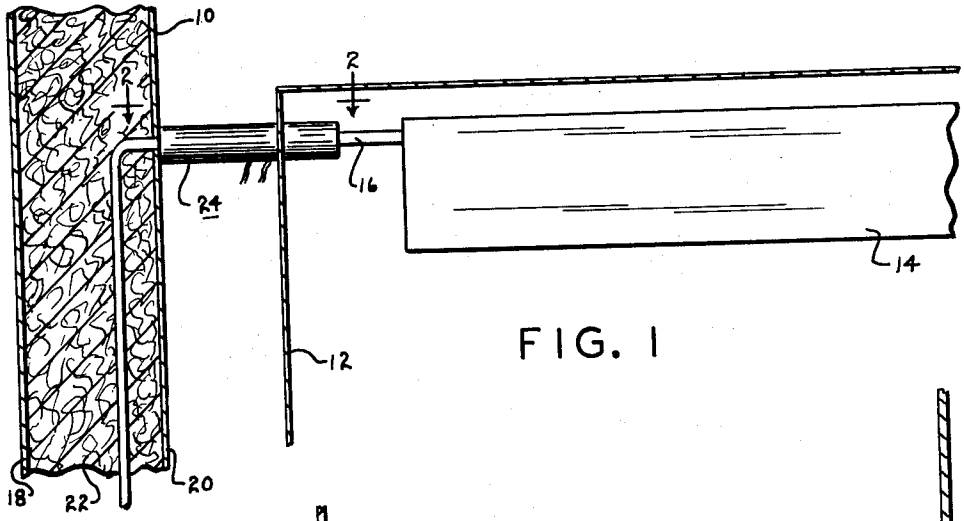


FIG. 1

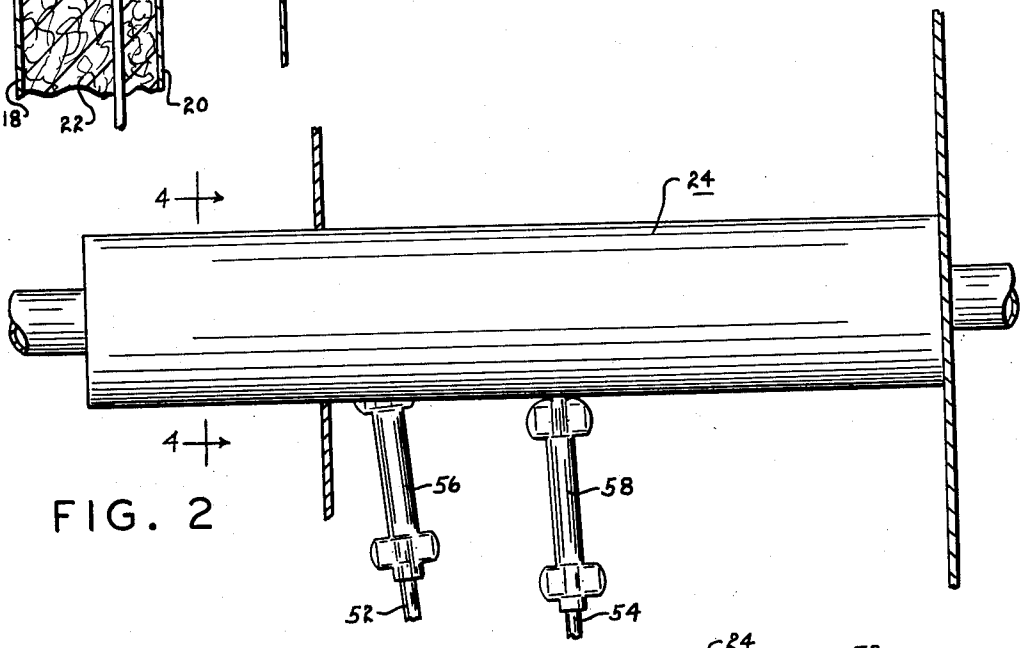


FIG. 2

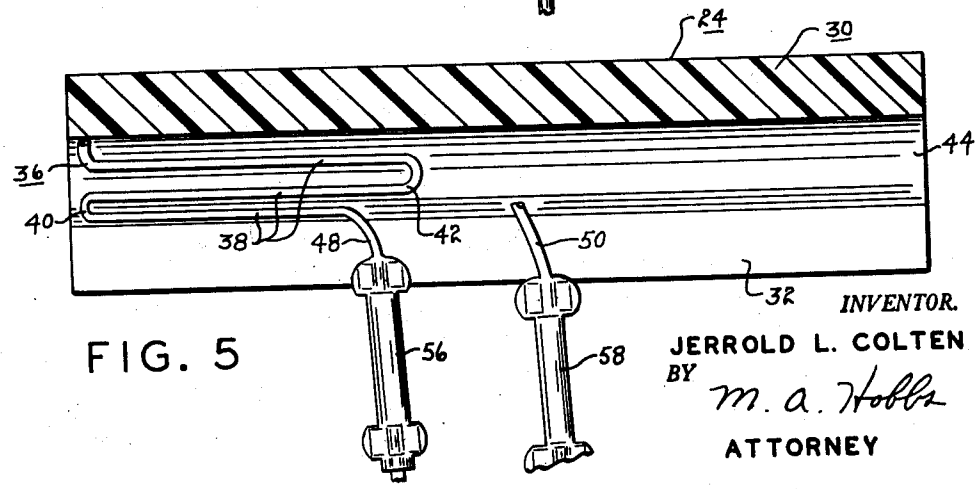


FIG. 5

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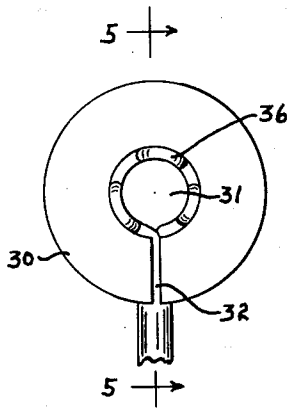


FIG. 3

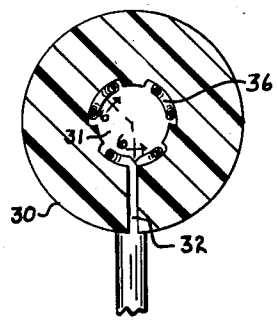


FIG. 4

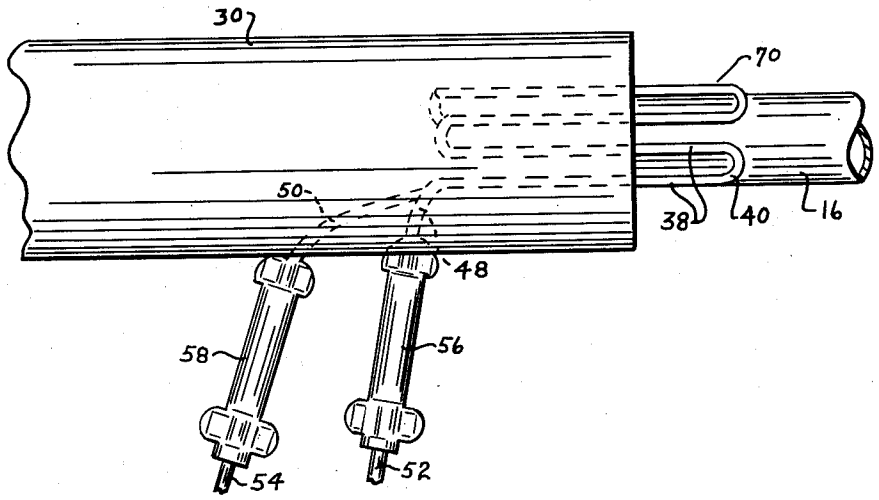


FIG. 12

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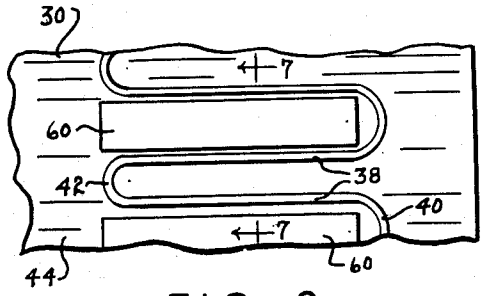


FIG. 6

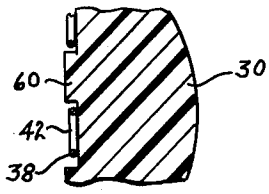


FIG. 7

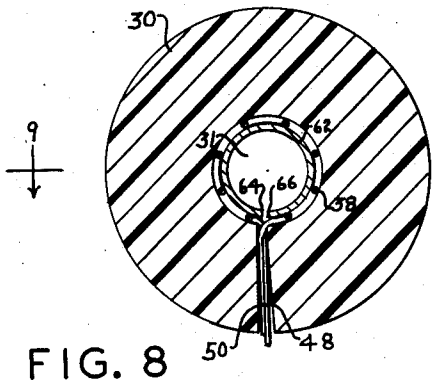


FIG. 8

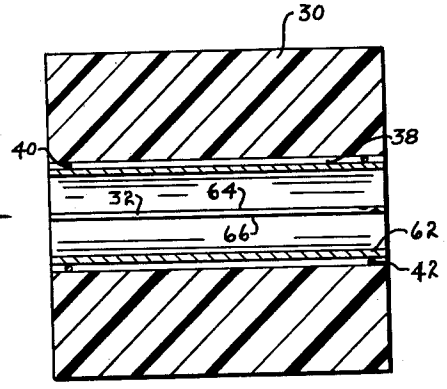


FIG. 9

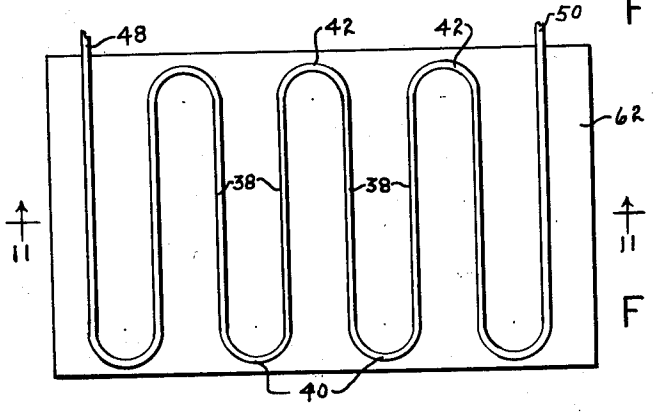


FIG. 10

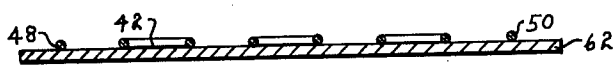


FIG. 11

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United States Patent Office 3,125,657 Patented Mar. 17, 1964

3,125,657

DEFROSTING UNIT

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Filed Feb. 23, 1960, Ser. No. 10,258
3 Claims. (Cl. 219—19)

The present invention relates to a heating unit and more particularly to an insulating and heating structure for use in heating tubes, pipes and the like.

In refrigerators and deep freeze units, electrical heating elements are frequently used to remove and prevent the formation of frost at various points in and around the cooling coils and on the refrigerant lines and connections therefor. The heating elements heretofore used for this purpose have either been difficult to install and expensive, or have been inefficient and uneconomical to operate. These previous units have at times resulted in inefficiency in the operation of the refrigerating or deep freeze units and interfered with the satisfactory operation of the units. One of the principal objects of the present invention is to provide a unit for defrosting and/or preventing the formation of frost on refrigerant lines and connections of refrigerators and deep freeze units, which combines an insulating member and heating element into a single integral structure.

Another object of the present invention is to provide a combination insulating member and heating element which can be handled as a single unit in packaging, shipping and installing and which can be placed completely around a pipe, tube, and other similar structures in a single simple operation without wrapping or winding it around the structure.

Still another object of the invention is to provide an insulating and heating unit of the aforesaid type in which the insulating member is preformed to fit a pipe or tube and which contains a heating element extending longitudinally therein and secured or otherwise connected to the internal wall of the insulating member so that the member and element can be placed simultaneously around a pipe or tube.

A further object is to provide a tubular shaped insulating and heating unit which can be slipped over and around a pipe or tube with the heating element thereof extending substantially around the entire surface of the enclosed pipe or tube and from which any water in the unit or on the pipe or tube can readily drain from the unit regardless of whether the pipe or tube is in vertical, horizontal or some intermediate position.

Another object of the invention is to provide a unit of the aforesaid type in which the insulating member is heat and moisture resistant and is preformed to hold the heating element in place adjacent the pipe or tube being protected and/or heated by the unit.

Additional objects of the present invention will become apparent from the following description and accompanying drawings, wherein:

FIGURE 1 is a fragmentary horizontal cross sectional view of a deep freeze unit, showing my insulating and heating unit in elevation installed in one position therein;

FIGURE 2 is an enlarged side elevational view of my insulating and heating unit and a fragmentary cross sectional view of the deep freeze unit, taken on line 2—2 of FIGURE 1;

FIGURE 3 is an end elevational view of my unit shown in the preceding figures;

FIGURE 4 is a vertical cross sectional view of the unit taken on line 4—4 of FIGURE 2;

FIGURE 5 is a longitudinal vertical cross sectional view of the present unit taken on line 5—5 of FIGURE 3;

FIGURE 6 is a fragmentary cross sectional view of the present unit taken on line 6—6 of FIGURE 4, illustrating one structural form for securing and retaining the heating element in place in the insulating member;

FIGURE 7 is a vertical cross sectional view of the fragmentary view shown in FIGURE 6, taken on line 7—7 of the latter figure;

FIGURE 8 is a cross sectional view of a unit illustrating another structural form for securing and retaining the heating element in place in the insulating member;

FIGURE 9 is a fragmentary vertical cross sectional view of the form of the invention shown in FIGURE 8, taken on line 9—9 of the latter figure;

FIGURE 10 is a plan view of a harness for the heating element which permits the element to be assembled in a preshaped condition into the insulating member;

FIGURE 11 is a horizontal cross sectional view of the harness shown in FIGURE 10, taken on line 11—11 of the latter figure; and

FIGURE 12 is a fragmentary side elevational view of a modified form of the present unit showing it mounted on a tube.

Referring more specifically to the drawings, portions of a deep freeze refrigerating unit are shown in FIGURE 1, including a portion of the rear wall 10, inner shell 12, and cooling coils 14 connected to the compressor by a tube 16 extending through the rear wall of shell 12 into and longitudinally through near wall 10. The rear wall 10 of the unit is spaced from the rear wall of shell 12 and consists of an outer plate 18 and an inner plate 20 with insulating material 22 between the two plates. Tube 16 extends from the rear wall inwardly to the cooling coils and is protected by the present insulating and heating unit 24 throughout the space between the rear wall and the shell and inwardly a substantial distance from the shell toward the cooling coils. The construction and arrangement of the parts of the refrigerating unit shown in the drawing are merely for the purpose of illustrating one of many specific uses of the present unit and do not constitute a limitation on the invention.

The embodiment of the insulating and heating unit 24 shown in FIGURES 1 through 5 consists of performed cylindrical shaped insulating member 30 of neoprene having a round longitudinal hole 31 therethrough and a slit 32 extending through one wall from end to end. The neoprene member is flexible and cellular in texture and is preformed into the tubular shape, usually in long lengths, and then cut into sections the desired length and thereafter slit lengthwise to provide opening 32. Neoprene has been found suitable as the body material for a large number of applications since it is heat resistant, flexible, and will withstand most chemicals coming in contact with it during normal use of the completed unit, and in the cellular form, has excellent heat and cold insulating properties and is not affected appreciably by changes in temperature and moisture conditions. However, other kinds of plastic materials and rubber can be used satisfactorily in a number of applications.

In the units of FIGURES 1 through 5, an electrical heating element 36 consisting of plastic insulated resistance wire is arranged back and forth in longitudinal sections 38 and connecting curved ends 40 and 42 and is secured to the inner wall 44 defining the longitudinal hole 31 through member 30. The resistance wire is held firmly against the internal wall of insulating member 30 by heat and moisture resistant cement or plastic material which is sufficiently flexible that the insulating member can be flexed substantially and the walls thereof separated at opening 32 without displacing the resistance wire from the internal wall of the member. This permits the section of unit 24 to be opened at opening 32 in order to place the unit on a tube or pipe and to follow

readily the curvature of the tube or pipe without any effective resistance in conforming to relatively sharp bends or joints. The resistance wire does not cross opening **32** or otherwise interfere with the mounting of the unit on a tube or pipe by slipping it over the conduit longitudinally through the opening. The two ends **48** and **50** of the resistance wire pass through opening **32** and are connected to cold leads **52** and **54** by connectors **56** and **58**, respectively, end **48** passing inwardly along the internal wall on one side of opening **32** and end **50** passing inwardly along the internal wall on the opposite side of the opening.

The heating element **36** can be placed throughout the entire length of the insulating member or it can be located at desired positions, as for example at one end or the other, as shown in FIGURES 1 through 5 or at some intermediate position, and two or more elements may be used in one insulating member either in parallel or series circuits. Normally the resistance wire comprising the heating element would be in the tortuous shape shown in the drawings, i.e. placed back and forth with relatively long longitudinal sections **38** and relatively short curved end sections **40** and **42**; however, other configurations or arrangements of the resistance wire can be employed in forming any particular heating element. In any alternate arrangement of the resistance wire, the wire should be so arranged that it does not cross opening **32**. In one suitable alternate arrangement, the resistance wire is placed with the longitudinal sections **38** extending circumferentially from one edge of opening **32** to the other edge, the longitudinal sections being connected on opposite sides of opening **32** by curved ends **40** and **42**. In either arrangement of resistance wire, the spacing between the longitudinal sections **38** may be varied to suit requirements.

FIGURES 6 and 7 illustrate a structure for assisting in arranging the resistance wire on the internal wall of insulating member **30** and for retaining the wire in place while the unit is being handled and assembled on a tube or pipe. This structure consists of a series of projections **60** formed integrally with member **30** and extending along the internal surface substantially the same length as sections **38**. The projections may be disposed between each longitudinal section or ever other section as shown in FIGURE 6. A variation of this structure consists in providing a series of recesses in the internal wall of the member for receiving the resistance wire. The recesses parallel the wire arrangement illustrated in the drawings, including connecting grooves at the ends of the longitudinal recessed portions. In either of these two arrangements the wire is normally secured in place with cement or any other suitable securing means.

In the embodiment of the present invention shown in FIGURES 8 through 11, the resistance wire is first secured to a carrier **62** consisting of fabric, aluminum foil, flexible plastic sheet material, wire screen, or the like, of the size required to cover the desired internal surface **44** of member **30**. The wire is held in place on carrier **62** by cement, stitching, or by any other suitable means, and if desired the wire can be molded in or otherwise formed integrally with the carrier. The carrier and resistance wire are formed as a flat unit and then rolled or curved to fit snugly in hole **31** with the resistance wire either in contact with internal wall **44** or facing inwardly toward the center.

The longitudinal edges **64** and **66** of the rolled carrier are spaced apart at opening **32** so that the carrier can readily be separated at the opening between the adjacent edges **64** and **66** at the same time member **30** is separated along opening **32** when the unit is being installed on a tube or pipe. The resiliency of member **30** closes opening **32** and simultaneously presses carrier **62** and the resistance wire around and in close proximity to the conduit.

As an alternative to the modified form disclosed in FIGURES 8 through 11, the sheet of material may consist of paper or other material covered with an electrical conducting film of known composition.

The modified form disclosed in FIGURE 12 is similar in most respects to the unit shown in FIGURES 1 through 5 with the exception that in the modified form, the resistance wire is not confined entirely within insulating member **30** but projects outwardly at one end as shown at numeral **70**. The portion of the heating element confined within member **30** is secured to the internal wall or otherwise attached to the unit by one of the methods previously described herein.

The present unit can be used in relatively small sections as shown in the drawings, or it can be used in long sections covering long spans of pipe or tubing, whether straight or curved. Opening **32** is preferably placed at the bottom or at the lowest point in the longitudinal position of the pipe or tube so that any moisture condensing on the pipe and any water formed during the defrosting operation of the heating element will readily drain from the insulating member **30**. While the present unit has special application in and around refrigerating equipment for eliminating and preventing frosting at various locations in the system, it can be effectively used to prevent freezing of water and drain pipes and similar structures.

Although only one embodiment and several modifications thereof have been described in detail herein, various changes may be made in the insulating and heating unit without departing from the scope of the present invention.

I claim:

1. An insulating and heating unit, comprising a preformed elongated cylindrical member having a longitudinal axial hole therethrough and a slit extending the full length of said member parallel to said hole and extending inwardly from the external surface to said hole, said cylindrical member being resilient and form retaining with the edges along said slit being substantial together, a heating element in said hole on the internal surface of said member consisting of an electrical resistance wire arranged in a plurality of parallel sections disposed in and connected in series by end portions, said element commencing at one edge of said opening and terminating at the other edge thereof, longitudinal means on the internal wall of said member disposed between and paralleling said sections of wire, and means for retaining said sections in a prearranged configuration.

2. An insulating and heating unit, comprising a preformed cylindrical member having an axial hole therethrough and a slit extending inwardly from the external surface to said hole, said cylindrical member being resilient and form retaining with the edges along said slit being substantially together, a heating element in said hole on the internal surface of said member consisting of an electrical resistance wire arranged in a plurality of sections disposed and connected in series by end portions, said element commencing at one edge of said slit and terminating at the other edge thereof, a lead connected to one end of said wire, another lead connected to the other end of said wire, longitudinal ribs on the internal wall of said member disposed between and paralleling said sections of wire, and means for retaining said sections in place in said hole.

3. An insulating and heating unit, comprising a preformed cylindrical member having an axial hole therethrough and a slit extending inwardly from the external surface to said hole, said cylindrical member being resilient and form retaining with the edges along said slit being substantially together, a heating element in said hole on the internal surface of said member consisting of an electrical resistance wire arranged in a plurality of sections disposed in said hole and connected in series by end portions, said element commencing at one edge of said slit and terminating at the other edge thereof, a lead connected to one end of said wire, another lead con-

nected to the other end of said wire, and longitudinal recesses in the internal wall of said member for receiving said sections of wire.

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