

Feb. 1, 1949.

M. RIFKIN ET AL

2,460,469

REFRIGERATOR HAVING A DOOR HEATING DEVICE

Filed Dec. 7, 1946

3 Sheets-Sheet 1

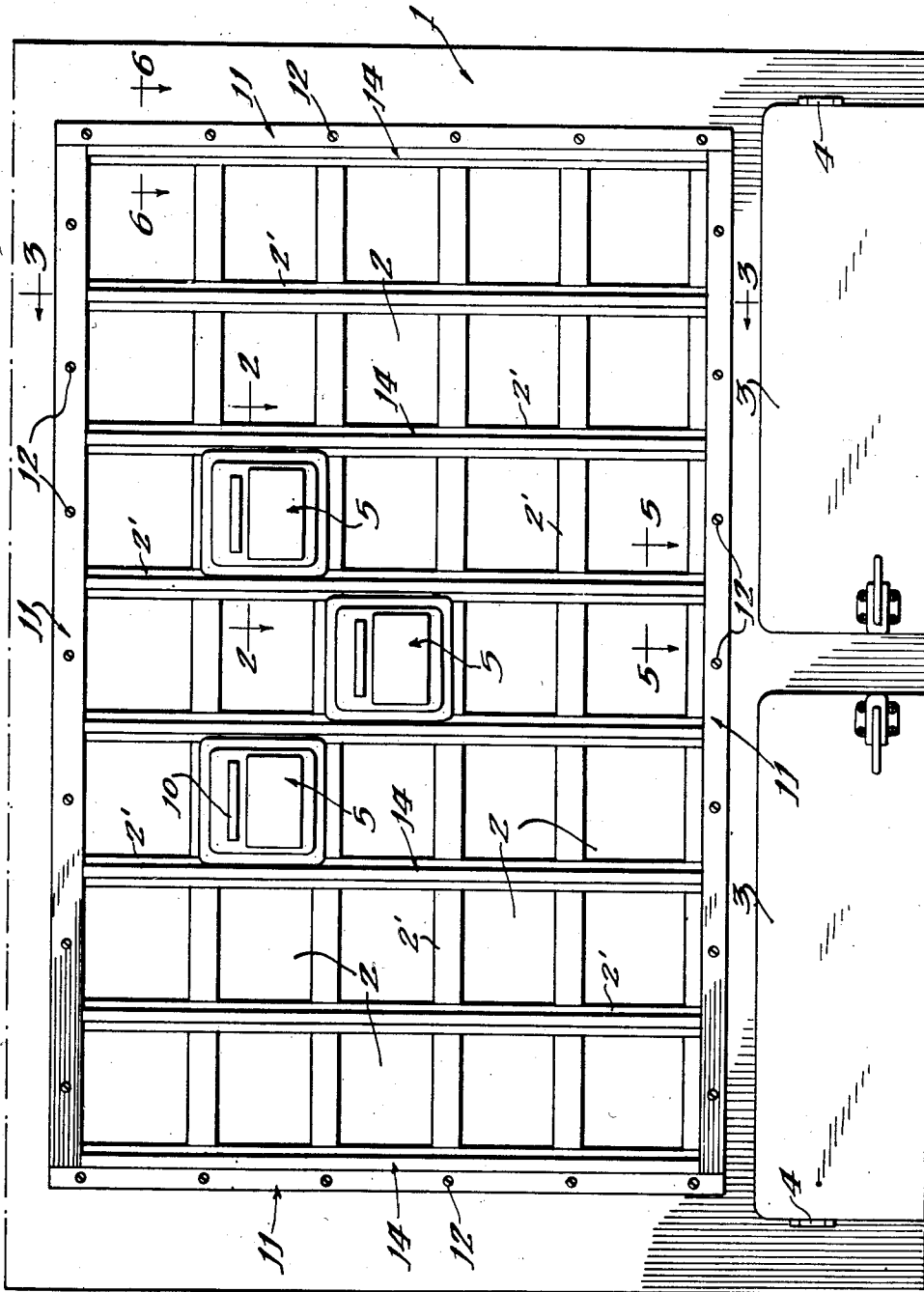


Fig. 1.

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3 Sheets-Sheet 2

Fig. 2.

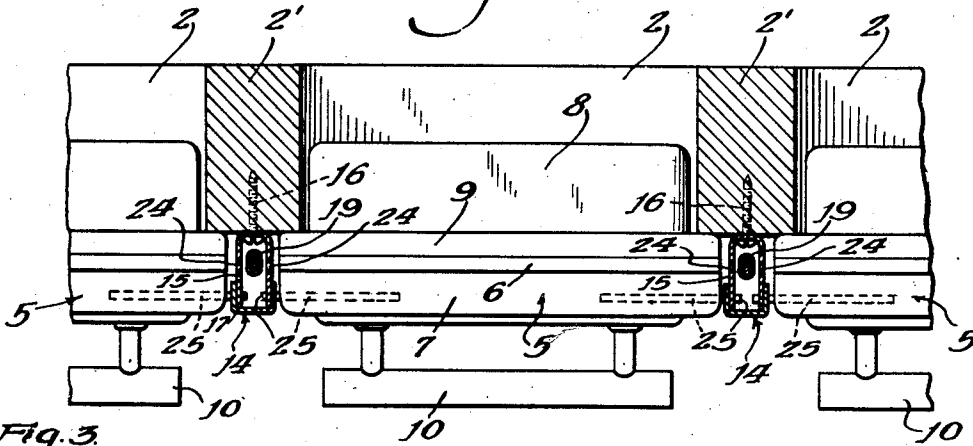


Fig. 3.

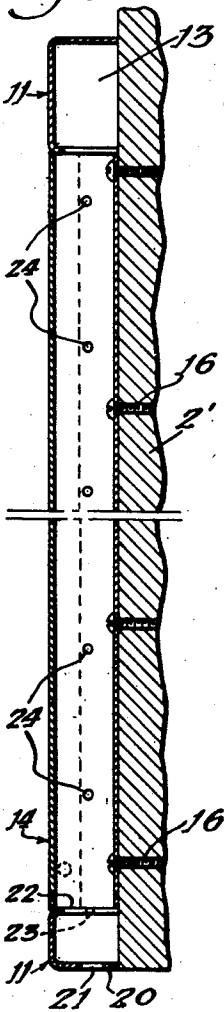


Fig. 4.

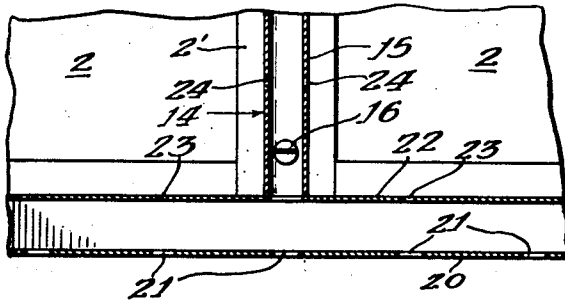


Fig. 5.

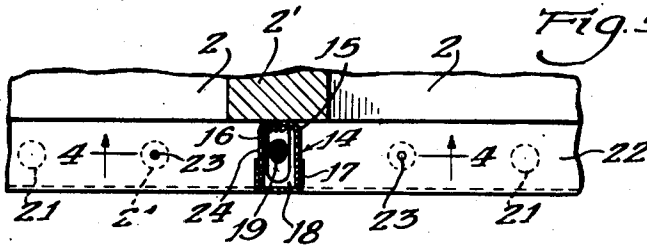
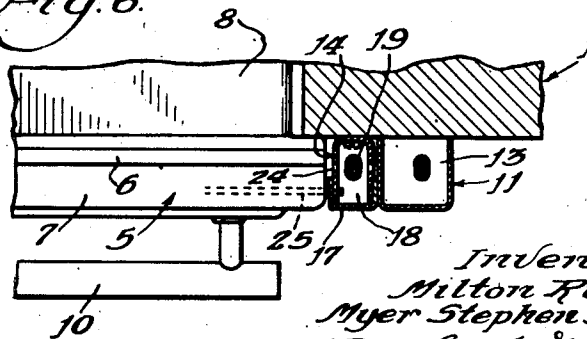


Fig. 6.



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3 Sheets-Sheet 3

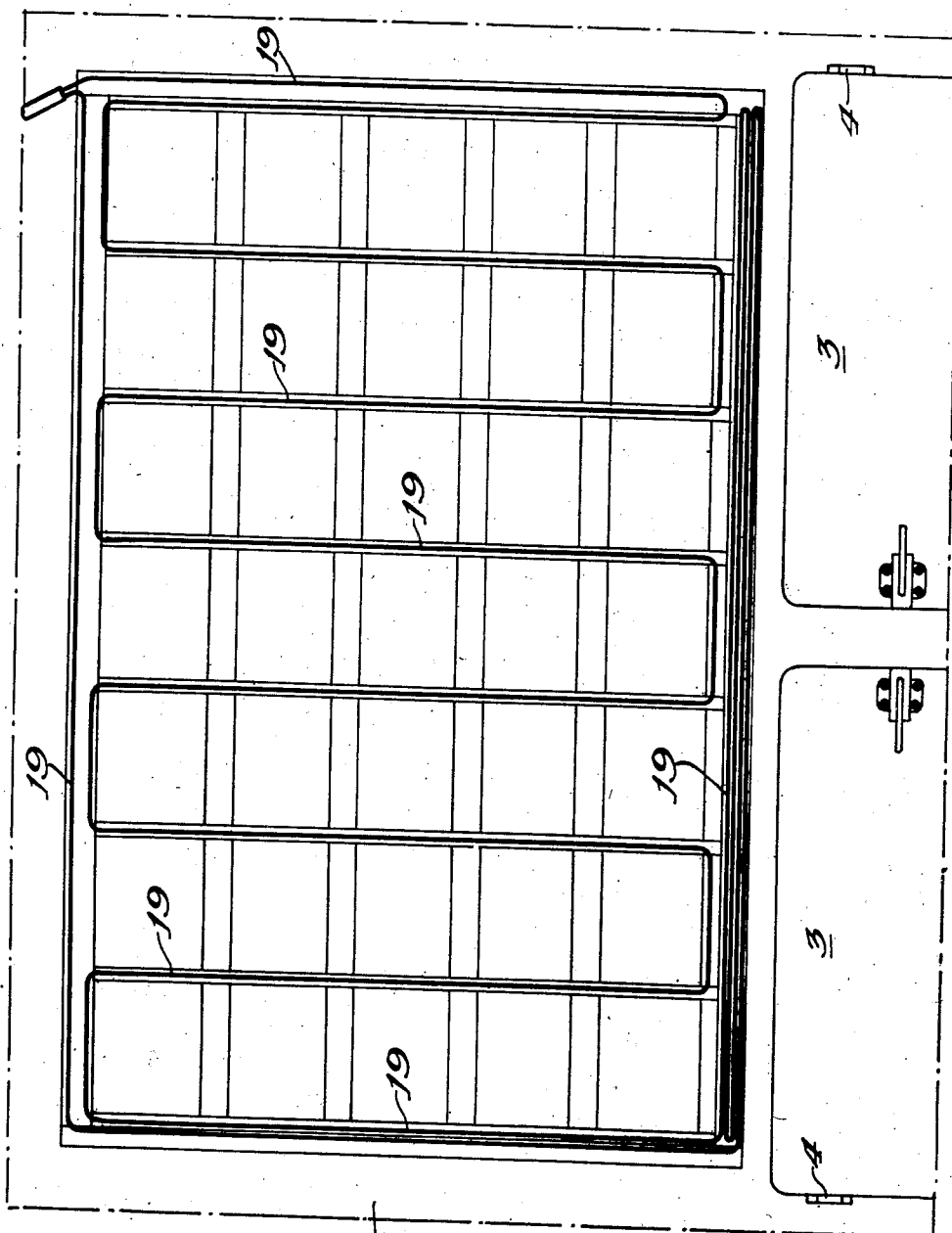


Fig. 2

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UNITED STATES PATENT OFFICE

2,460,469

REFRIGERATOR HAVING A DOOR
HEATING DEVICEMilton Rifkin, Chicago, Ill., and Myer Stephen
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10 Claims. (Cl. 62—89)

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This invention relates to improvements in refrigerating cabinet constructions and refers specifically to means for preventing the freezing of condensation adjacent the doors of a refrigerating cabinet of the type suitable for the dispensing of frozen foods.

In the dispensing type of refrigerating cabinets, a plurality of doors are usually provided which comprises closures for a plurality of compartments in which refrigerated merchandise, for instance, frozen foods are stored. In dispensing the foods it is necessary to open the doors frequently, each opening permitting the egress of refrigerated air from the compartments. The refrigerated air chills the marginal portions of the door, the door openings and the framework of the cabinet adjacent the doors and hence condensation tends to form upon these parts which, in turn, leads to frosting of the parts. The formation of condensation and the frosting thereof in themselves are detrimental and the condition may even arise where the doors may be frozen in closed position thereby, which, of course, is highly undesirable.

As a feature of the present invention, means is provided for efficiently heating the marginal portions of the door, door openings and adjacent parts thereby preventing the formation of condensation, frosting and the disadvantages attendant such conditions.

The objects and advantages of the present invention will be apparent from the accompanying drawing and following detailed description.

In the drawings,

Fig. 1 is a front elevational view of a refrigerated dispensing cabinet provided with the heating means comprising the concept of the present invention.

Fig. 2 is a detailed sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a detailed sectional view taken on the line 4—4 of Fig. 5.

Fig. 5 is a detailed sectional view taken on the line 5—5 of Fig. 1.

Fig. 6 is a detailed sectional view taken on the line 6—6 of Fig. 1.

Fig. 7 is a diagrammatic view of the front portion of the cabinet as illustrated in Fig. 1, showing the electric wiring of the heating system.

Referring in detail to the drawings, 1 indicates the front wall of a refrigerating cabinet which is provided with a plurality of dispenser openings 2 defined by frame members 2'. Each of the openings, in this type cabinet leads to a separate compartment in which is adapted to be stored for dispensing purposes, an item of perishable merchandise (not shown) such as frozen

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foods in packages or cartons. Such cabinets are usually provided with relatively large storage compartments adjacent the bottom thereof which are closed by means of doors 3 hinged, as at 4, to the front wall 1.

The type of cabinet hereinbefore described is particularly suitable for the dispensing of perishable foods, of the kind described, in so-called self-service stores, wherein the customer himself extracts the desired article of merchandise from the cabinet.

All of the openings 2 are closed by doors 5, only three of which are shown in Fig. 1 for purposes of illustration.

Each door 5 comprises a block 6, constructed of wood or other material having heat insulating properties, each of said blocks completely covering an opening 2. One side of the block 6 is covered by a metal face plate 7 which extends over a portion of the peripheral edges of the block. Adjacent the edges of the door the face plate 7 and the block 6 are flush. A second block 8, constructed of wood or other low heat conducting material, is secured to the inner face of block 6 and is of lesser width and length than block 6 but of greater thickness or depth. Circumscribing block 8 where it joins with block 6 is a flexible gasket 9 constructed of rubber or the like and adapted to seat the door snugly against the cabinet wall. A handle 10 is secured to the face of each door whereby the door may be conveniently opened. In this type of structure the doors are held closed under spring tension whereby after being manually opened they close under the influence of the spring (not shown).

As a feature of the present invention, the area of the front wall 1 occupied by the doors 5 is constructed of metal U-shaped channels and is secured to the wall 1 by screws or other suitable fastening means 12, the arrangement being such that an open channel space 13 is provided completely around the dispensing area of the cabinet.

Disposed adjacent the vertical sides of each vertical column of doors 5 is additional trim 14 which comprises channel members 15 which are mounted with their respective webs secured to the frame members 2' by means of screws 16 or the like, and their flanges extending outwardly from the outer face of wall 1. A second channel 17 embraces the flanges of each of the members 15 to provide closed spaces 18 within the channels.

At the junctures of the vertical trim members 14 and the upper and lower peripheral trim members 11, the spaces 13 and 18 connect whereby a completely communicating passageway is provided around a considerable portion of the edges of the doors 5.

An electrical heating cable 19 is positioned in the spaces 13 and 18, the same being connected to a source of electricity (not shown). The

cable 19 passes downwardly through one of the vertical peripheral trim members 11; upwardly through the adjacent vertical trim member 14 over the top of the first vertical column of doors through space 13 in the upper horizontal peripheral trim member 11; downwardly through the next vertical trim member 14; horizontally under the next vertical column of doors through the space 13 of the lower horizontal peripheral trim member 11; upwardly through the next vertical trim member 14, and so on to the last vertical trim member 14 wherein the cable passes horizontally through the lower peripheral trim member 11, looping therein upon itself twice, and returning through the peripheral trim members 11, as shown, to the source of current.

The lower flange 20 of the lower peripheral trim member 11 is provided with a plurality of openings 21 and the upper flange 22 of the same member is also provided openings 23 of smaller diameter than the openings 21. The flanges of each of the vertical trim members 14 are also provided with a plurality of openings 24 which face the vertical edges of the doors 5.

By the provision of the interconnecting spaces 13 and 18 and the openings 21, 23 and 24, a thermal current of air is set up within said trim members. Cool air enters the lower peripheral trim member 11 through the relatively large openings 21, said cool air being induced through said openings by the heat established by the cable 19. The entering air is heated by the looped cable in the lower space 18 and is caused to move upwardly by convection. Some of the air in moving upwardly is discharged through openings 23 and is thus directed toward the lower edges of the lowest horizontal column of doors 5. The remaining heated air passes upwardly through the spaces 18 in the vertical trim members and discharges toward the vertical edges of the doors 5. In this manner a considerable portion of the door peripheries is "wiped" or "bathed" with warm air inhibiting the formation of condensation and preventing frosting on the surfaces adjacent the openings 21.

As a further feature of the present invention a pair of hinge pins 25 carry each door in swingable position adjacent each opening 2, the ends of said hinge pins extending through the walls of the flanges of the channels 15 and 17. The hinge pins are in intimate thermal contact with the metal face plates 7 of the doors, as by welding, and hence, by conduction, heat is transferred from the vertical trim members and the moving hot air in the spaces 18 to the face plates of the doors. In this manner condensation upon the faces of the doors is inhibited and freezing of the hinge connections of the doors is prevented.

It is to be understood that the present invention, although particularly adaptable for use in connection with refrigerated dispensing cabinets, is not to be limited thereto, since, broadly, it is directed to the inhibition of the formation of condensation and the prevention of freezing or frosting of surfaces adjacent an opening where chilled air is likely to "wipe" such surfaces and where such surfaces are in a relatively warm room where the air carries a relatively high percentage of moisture.

We claim as our invention:

1. In a refrigerated cabinet having an opening in a wall thereof and a door comprising a closure for said opening, means for heating said door which comprises a plurality of conduits

bordering a portion of said door, an electric heating element for heating the air within, and the walls of said conduits, said conduits being provided with transverse apertures through which the heated air from said conduits is directed toward said door, and means thermally connecting said conduits and door whereby heat is conducted from the conduit walls to the door.

2. In a refrigerated cabinet having an opening in a substantially vertical wall thereof and a movable door comprising a closure for said opening, means for heating opposite side edges of said door and the corresponding defining edges of said opening comprising a hollow conduit, an electric heating cable positioned in said conduit for heating the air in said conduit and the walls thereof, said conduit being substantially vertically disposed adjacent opposite side edges of said opening and door, the conduit on each side of said door opening being provided with a restricted aperture whereby heated air passing through said conduits is discharged through said apertures toward the vertical edges of said door opening.

3. In a refrigerated cabinet having an opening in a substantially vertical wall thereof and a movable door comprising a closure for said opening, means for heating opposite side edges of said door and the corresponding defining edges of said opening comprising a hollow conduit, an electric heating cable positioned in said conduit for heating the air in said conduit and the walls thereof, said conduit being substantially vertically disposed adjacent opposite side edges of said opening and door, the conduit on each side of said door opening being provided with a restricted aperture whereby heated air passing through said conduits is discharged through said apertures toward the vertical edges of said door opening, and a hollow conduit positioned beneath the door opening, an electric heating cable disposed in said conduit for heating the air therein and the walls thereof, said last-mentioned conduit being provided with a restricted aperture facing upwardly to discharge heated air toward the lower edge of said door opening.

4. In a refrigerated cabinet having a plurality of openings in a substantially vertical wall thereof and a plurality of movable doors comprising closures for said openings, said openings and doors being disposed in a substantially vertical column, means for heating opposite side edges of said doors and the corresponding defining edges of said openings comprising a hollow conduit positioned adjacent the vertical edges of said doors, an electric heating element disposed in each hollow conduit to heat the air in said conduits and the walls thereof, said conduits being provided with restricted apertures for discharging heated air from the interior of said conduits toward the edges of said door openings.

5. In a refrigerated cabinet having a plurality of openings in a substantially vertical wall thereof and a plurality of movable doors comprising closures for said openings, said openings and doors being disposed in a substantially vertical column, means for heating opposite side edges of said doors and the corresponding defining edges of said openings comprising a hollow conduit positioned adjacent the vertical edges of said doors, an electric heating element disposed in each hollow conduit to heat the air in said conduits and the walls thereof, said conduits being provided with restricted apertures for discharging heated air from the interior of said conduits toward the

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edges of said door openings, and a hollow conduit positioned beneath the lowermost door opening, an electric heating cable positioned in said conduit, said last-mentioned conduit having a restricted aperture facing upwardly to discharge heated air toward the lower edge of said lowermost door opening.

6. In a refrigerated cabinet having a plurality of openings in a substantially vertical wall thereof and a plurality of movable doors comprising closures for said openings, said openings and doors being disposed in a substantially vertical column, means for heating opposite side edges of said doors and the corresponding defining edges of said openings comprising a hollow conduit positioned adjacent the vertical edges of said doors, an electric heating element disposed in each hollow conduit to heat the air in said conduits and the walls thereof, said conduits being provided with restricted apertures for discharging heated air from the interior of said conduits toward the edges of said door openings, and a hollow conduit positioned beneath the lowermost door opening, an electric heating cable positioned in said conduit, said last-mentioned conduit having a restricted aperture facing upwardly to discharge heated air toward the lower edge of said lowermost door opening, the hollow spaces in all of said conduits being intercommunicating.

7. In a refrigerated cabinet having an opening in a substantially vertical wall thereof and a hinged door comprising a closure for said opening, means for heating opposite side edges of said door and the corresponding defining edges of said opening comprising a hollow conduit, an electric heating cable positioned in said conduit for heating the air in said conduit and the walls thereof, said conduit being substantially vertically disposed adjacent opposite side edges of said opening and door, the conduit on each side of said door opening being provided with a restricted aperture whereby heated air passing through said conduits is discharged through said apertures toward the vertical edges of said door opening, metal hinge pins carried by said door, said hinge pins being supported by, and positioned in heat conductive relationship with the walls of said conduit whereby heat is transferred by conduction from the conduit walls to said door through said hinge pins.

8. In a refrigerated cabinet having a plurality of openings in a substantially vertical wall thereof, said openings being disposed in substantially vertical and substantially horizontal alignment, doors for each of said openings, said doors comprising a material of relatively high heat conductivity, means for heating opposite side edges of said doors and the corresponding defining edges of said openings comprising a hollow conduit positioned adjacent each of the substantially vertical edges of said doors, an electric heating cable disposed in each hollow conduit to heat the air in said conduits and the walls thereof, said conduits being provided with restricted apertures for discharging heated air from the interior of said conduits toward the edges of said door openings, metal hinge pins carried by said doors, said hinge pins being supported by, and positioned in heat conductive relationship with the walls of said conduits whereby heat is transferred by conduction from the conduit walls to said doors through said hinge pins.

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9. In a refrigerated cabinet having a plurality of openings in a substantially vertical wall thereof, said openings being disposed in substantially vertical and substantially horizontal alignment, doors for each of said openings, said doors comprising a material of relatively high heat conductivity, means for heating opposite side edges of said doors and the corresponding defining edges of said openings comprising a hollow conduit positioned adjacent each of the substantially vertical edges of said doors, an electric heating cable disposed in each hollow conduit to heat the air in said conduits and the walls thereof, said conduits being provided with restricted apertures for discharging heated air from the interior of said conduits toward the edges of said door openings, metal hinge pins carried by said doors, said hinge pins being supported by, and positioned in heat conductive relationship with the walls of said conduits whereby heat is transferred by conduction from the conduit walls to said doors through said hinge pins, and a hollow conduit positioned beneath the lowermost substantially horizontal column of door openings, an electric heating cable positioned in said conduit, said last-mentioned conduit having restricted apertures facing upwardly to discharge heated air toward the lower edge of the lowermost door openings.

10. In a refrigerated cabinet having a plurality of openings in a substantially vertical wall thereof, said openings being disposed in substantially vertical and substantially horizontal alignment, doors for each of said openings, said doors comprising a material of relatively high heat conductivity, means for heating opposite side edges of said doors and the corresponding defining edges of said openings comprising a hollow conduit positioned adjacent each of the substantially vertical edges of said doors, an electric heating cable disposed in each hollow conduit to heat the air in said conduits and the walls thereof, said conduits being provided with restricted apertures for discharging heated air from the interior of said conduits toward the edges of said door openings, metal hinge pins carried by said doors, said hinge pins being supported by, and positioned in heat conductive relationship with the walls of said conduits whereby heat is transferred by conduction from the conduit walls to said doors through said hinge pins, a hollow conduit positioned beneath the lowermost substantially horizontal column of door openings, an electric heating cable positioned in said conduit, said last-mentioned conduit having restricted apertures facing upwardly to discharge heated air toward the lower edge of the lowermost door openings, said last mentioned conduit being in communication with the remaining conduits and having a plurality of apertures in the wall thereof opposite the wall having said restricted apertures.

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