Aug. 28, 1962 K. A. ROBBIE 3,050,957

DEFROST WATER DRAIN SEAL

Filed Sept. 26, 1960

FIG. 1

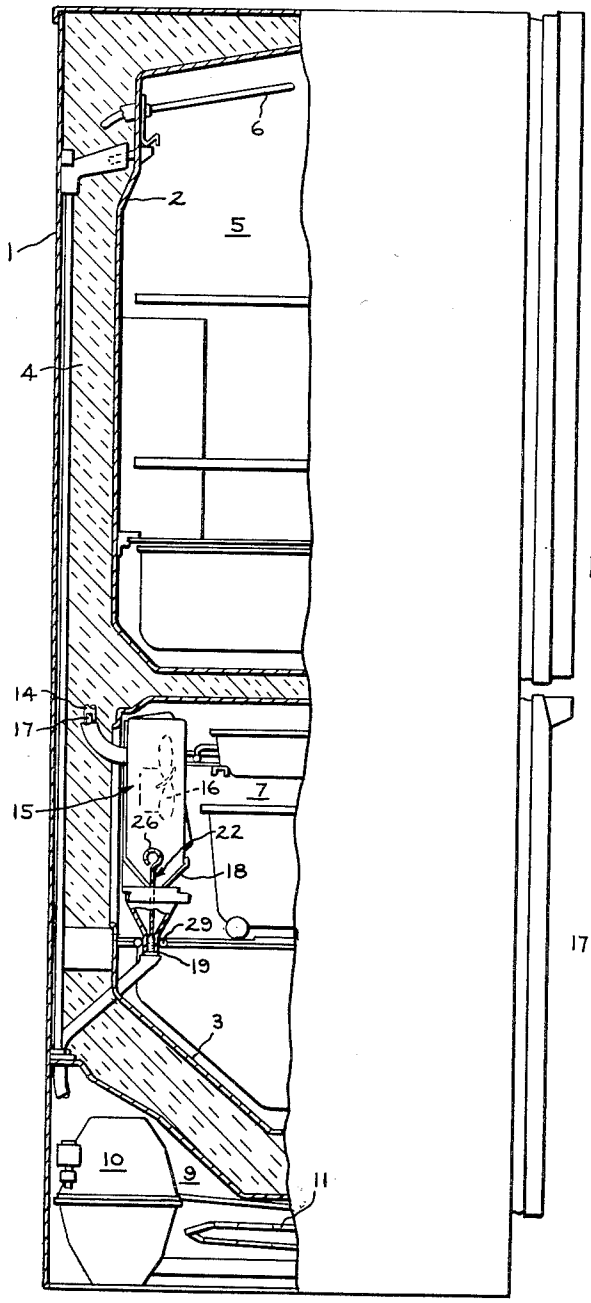


FIG. 2

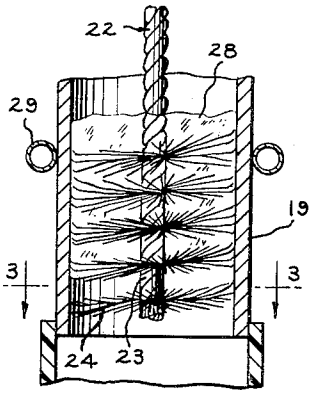


FIG. 3

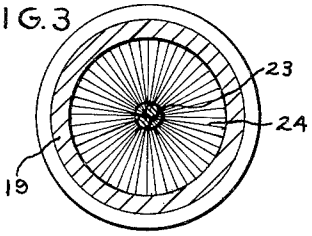
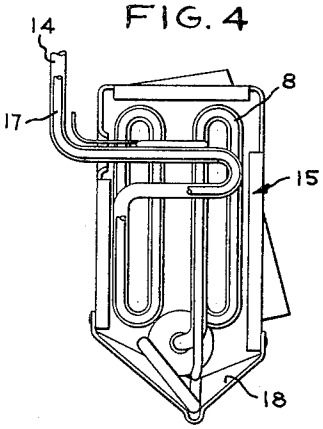


FIG. 4



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United States Patent Office 3,050,957 Patented Aug. 28, 1962

3,050,957

DEFROST WATER DRAIN SEAL

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Filed Sept. 26, 1960, Ser. No. 58,418
3 Claims. (Cl. 62—285)

The present invention relates generally to refrigerator cabinets and is more particularly concerned with an improved defrost water drain seal for such cabinets.

A refrigerator cabinet including a low temperature or freezer compartment and an evaporator for serving that compartment requires some means for collecting the defrost water flowing from the evaporator during the periodic defrosting thereof and for disposing of this water outside of the cabinet. To this end there is usually provided a trough or equivalent means associated with the evaporator for collecting the defrost water during the defrost operation and a drain for transferring the collected water to a point outside the freezer compartment. As such a drain provides a direct communication between the interior of the freezer compartment and the exterior of the cabinet, it is desirable to provide means for sealing the drain during normal operation of the refrigerator to prevent the flow of warm outside air into the freezer compartment or the flow of cold air from the compartment. The provision of some sealing means is particularly important in refrigerators in which a fan is employed to circulate air from the freezer compartment over the evaporator since the pressure differentials caused by the fan can force a relatively substantial amount of cold air out of the drain system resulting in a loss of refrigeration capacity or it can draw warm moist air into the freezer compartment with a resultant localized icing of the drain trough and adjacent portions of the evaporator. An additional requirement in refrigerators in which automatic means are provided for periodically defrosting the freezer evaporator is that the seal must be readily opened during the defrost operation in order to permit the free drainage of defrost water through the drain.

It is a primary object of the present invention to provide in a refrigerator cabinet an improved drain seal which will effectively seal the defrost water drain during normal operation of the freezer evaporator and which is so constructed and arranged that during defrost operation of the refrigerating system the seal will be easily broken to permit the drainage of defrost water.

A more specific object of the invention is to provide an improved low mass drain seal adapted, by the collection of frost thereon during normal operation of the evaporator, to seal the drain and prevent the flow of air therethrough and to be readily heated during the defrosting of the evaporator to open the drain for the disposal of defrost water therethrough.

A further object of the invention is to provide a drain seal which can be easily removed for cleaning and can also be employed for the purpose of periodically cleaning the drain system.

Further objects and advantages of the present 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 part of this specification.

In carrying out the objects of the present invention, there is provided a refrigerator cabinet including a freezer compartment, an evaporator for serving that compartment which operates at sub-freezing temperatures during normal operation of the refrigerator and means for periodically warming the evaporator to defrosting temperatures. In order to dispose of the defrost water outside the cabinet, there is provided means for collecting water including a drain extending through a wall of the cabinet

and having an upper portion disposed within the freezer compartment where it is subjected to the sub-freezing temperatures of that compartment. For the purpose of preventing the flow of air through the drain during normal operation of the refrigerating system there is provided a drain seal in the form of a brush having its bristle or head portion positioned within the upper drain portion in such a manner that the bristles extend across the drain and into contact with the side walls thereof. During normal operation of the system, warm moisture-laden air migrating from the outside of the cabinet through the drain results in the formation of a frost layer on the brush bristles which bridges the spaces between the bristles and effects an air tight sealing of the drain. In order to melt this frost seal during defrosting of the evaporator, means are also provided for warming the upper portion of the drain in the vicinity of the brush head during the defrost operation.

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

FIG. 1 is a side view, partially in section, of a refrigerator cabinet embodying the present invention;

FIG. 2 is an enlarged vertical sectional view of the improved drain seal of the present invention;

FIG. 3 is a horizontal sectional view of the drain system taken along line 3—3 of FIG. 2; and

FIG. 4 is an enlarged end view of the freezer evaporator unit.

Referring now to the drawing there is shown in FIG. 1 a household refrigerator of the two temperature type comprising an outer shell 1, and inner shells or liners 2 and 3 spaced from the outer shell 1 and from one another, the spaces being filled with suitable heat insulation 4. The upper shell 2 defines a fresh food storage compartment 5 which is maintained at fresh food storage temperatures by means of an evaporator 6 while the lower liner 3 defines a freezer compartment 7 maintained at sub-freezing temperatures by an evaporator unit 8. The refrigerator also includes a machinery compartment 9 below the freezer compartment, the machinery compartment containing a compressor 10 and a condenser 11 for supplying condensed refrigerant to the evaporators. The freezer evaporator unit 8 includes evaporator tubing 14 disposed within a louvered metal housing 15. Air from the freezer compartment is circulated through the housing and over the evaporator 14 by means of a fan 16 centrally positioned in the front wall of the housing.

During normal operation of the refrigerator, the freezer evaporator tubing 14 which operates continuously at sub-freezing temperatures becomes covered with an insulating layer of frost and ice condensed from the air circulated within the freezer compartment. In order to maintain this evaporator at the desired operating efficiency, means are provided for warming the evaporator periodically to defrosting temperatures in order that the frost and ice layer will melt from the evaporator tubing. This heating means may be an electrical heater or any of the various arrangements for conducting hot compressed refrigerant from the compressor 10 through or in heating relationship with the evaporator tubing. In the illustrated modification of the invention there is employed a defrost system of the type described and claimed in Patent 2,928,256 issued on March 15, 1960, to Clyde J. Nonomaque and assigned to the same assignee as the present invention. In accordance with the teachings of the Nonomaque patent, hot compressed refrigerant from the compressor is periodically directed through an auxiliary defrost line 17 which is in heat exchange with the evaporator tubing 14.

During defrost operation and as the evaporator tubing 14 is heated to frost melting temperatures, any frost collected on the evaporator or on the adjacent surfaces of the housing 15 is melted. The defrost water flowing from

these surfaces is collected in a V-shaped bottom wall 18 forming the bottom of the housing 15 from which it is discharged into a drain 19 extending through the bottom insulated wall of the cabinet for directing the defrost water into the machinery compartment 9 where a receptacle (not shown) may be provided for receiving the defrost water and evaporating it by means of the heat from the compressor and condenser.

For the purpose of sealing the drain 19 to prevent the flow of air therethrough during normal or refrigerating operation of the evaporator, there is provided in accordance with the present invention a drain seal in the form of a brush 22 having, as is more particularly shown in FIGS. 2 and 3 a head or bristle portion 23 of approximately the same size and shape as the upper portion of the drain 19. This head portion 23 is inserted into the drain in such a manner that the bristles 24, of metal, nylon or any other bristle material, extend transversely to the drain into contact with the walls thereof. In the illustrated embodiment of the invention the upper portion of the drain 19 is in the form of a tube so that a brush having a cylindrical head portion, such as a bottle brush of a diameter somewhat larger than the internal diameter of the drain provides a particularly useful drain seal. To facilitate removal of the brush 22 from the drain the handle portion 26 is preferably sufficiently long so that it extends above the drain where it can be easily grasped by the user for removal of the brush from the drain for cleaning the brush. Also by this arrangement the brush can be moved up and down through the upper portion of the drain during the defrost period in order to dislodge any particles of foodstuff or other material therefrom.

Warm air passing upwardly from the machinery compartment through the drain during normal or refrigerating operation of the refrigerating system will carry with it a substantial amount of moisture. This moisture, upon contacting the bristles 24 which are cooled by contact with the walls of the upper portion of the drain disposed within the freezer comparment 7, condenses on the bristles in the form of light hairy layers of frost and after a short time these frost layers will build up to a point where they bridge the spaces between the bristles 24 to form a continuous plug of frost 28 that completely seals the drain. Once the drain is thus sealed, air is prevented from thereafter passing in either direction through the drain tube.

In order to remove this sealing body of frost during each defrost period so that defrost water can freely drain, means are provided for warming the upper portion of the drain tube 19 at the same time that the evaporator is being warmed. This warming means may be part of the same means employed to warm the evaporator tubing 14 to defrost temperatures or it may be a separate heating means. In the illustrated embodiment of the invention, the drain 19 is warmed by a portion 29 of the defrost line 17 employed to conduct hot compressed refrigerant from the compressor into heat exchange relationship with the refrigerant tubing 14. Preferably, at least the upper portion of the drain 19 is composed of metal 1 for good heat conduction between the section 29 of the defrost tubing and the drain as well as between the drain and the bristles 24. Since the bristles 24 provide a relatively low mass seal, that is one having a low heat storage capacity, the sealing frost layers accumulated on these fibers will melt at an early stage during the defrost cycle before any substantial amount of water has drained from the higher mass evaporator. Melting of the frost plug 29 permits the defrost water to flow through the spaces between the bristles. Due to their relatively small diameters, water will not tend to adhere to or collect in any substantial amounts on these bristles. As a result, no substantial quantities of ice are formed thereon during the subsequent refrigerating cycle, which ice would require a longer period of time to melt and open the drain than does the light weight or low density frost accumulation of the type resulting from the condensation of moisture from the air passing through the drain following a defrost cycle and during the early stages of the subsequent refrigerating cycle.

While there has been shown and described a particular embodiment of the present invention, it will be understood that the invention is not limited to the particular form and it is therefore intended by the appended claims to cover all modifications coming within the spirit and scope of the invention.

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

1. A refrigerator cabinet comprising an evaporator normally operating at a sub-freezing temperature, means for collecting defrost water from said evaporator during defrosting thereof and disposing of the defrost water outside said cabinet including a drain extending through a wall of said cabinet and having an upper portion normally cooled by said evaporator to a temperature below freezing and combination means for cleaning said drain and for effecting a deposit of frost in said drain for closing said drain during normal operation of said evaporator comprising a bristle brush removably positioned in said upper drain portion with the ends of the bristles thereof contacting the inner walls of said drain.

2. A refrigerator cabinet comprising an evaporator normally operating at a sub-freezing temperature, means for periodically warming said evaporator to defrosting temperatures, means for collecting defrost water from said evaporator and disposing of the defrost water outside said cabinet including a tubular drain extending through a wall of said cabinet and having portion normally cooled by said evaporator to a temperature below freezing and a cylindrical brush removably positioned in said upper drain portion with the bristles thereof extending across said drain with the ends thereof contacting the side wall of the drain whereby frost collecting on said bristles during normal operation of said evaporator seals said drain.

3. A refrigerator cabinet comprising an evaporator normally operating at a sub-freezing temperature, means for periodically warming said evaporator to defrosting temperatures, means for collecting defrost water from said evaporator and disposing of the defrost water outside said cabinet including a drain extending through a wall of said cabinet and having an upper portion normally cooled to a temperature below freezing, and a bristle brush removably positioned in said upper drain portion with the ends of the bristles contacting the side wall of the drain whereby frost collecting on said bristles during normal operation of said evaporator seals said drain and means for warming said upper portion of said drain during defrosting of said evaporator to melt the frost accumulated on said bristles.

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