United States Patent

Canter

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[54] FLOAT ACTUATED EVAPORATOR HEATER

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[73] Assignee: **General Motors Corporation,** Detroit, Mich.

[22] Filed: **June 1, 1971**

[21] Appl. No.: **148,420**

[52] **U.S. Cl.**.....**219/272,** 62/291, 219/275

[51] **Int. Cl.**.....**F22b 1/28**

[58] **Field of Search**.....219/271, 272, 275; 62/275, 62/289, 291, 150; 200/81.9 M; 335/205

[56] **References Cited**

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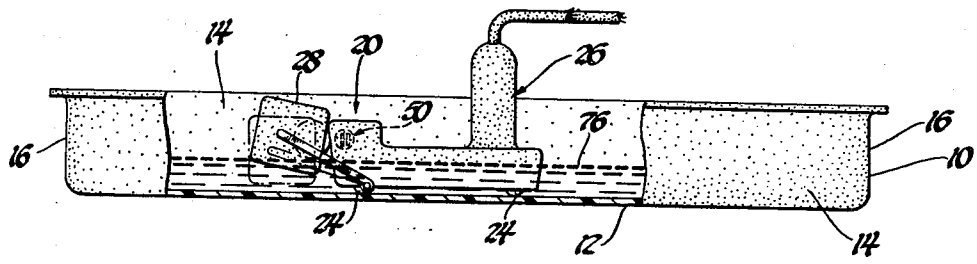
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[57] **ABSTRACT**

The range of motion of the arm of a float which controls the energization of electrical heater elements disposed within a condensate receiving refrigerator pan will vaporize condensate therein from refrigerator cooling coils automatically to insure sufficient immersion of the heater elements to prevent overheating of the pan. The float actuates a magnetic reed switch which deenergizes the heater elements when the condensate surface level is reduced a small amount to open the contacts of the switch and thereby deenergize the heater.

3 Claims, 5 Drawing Figures



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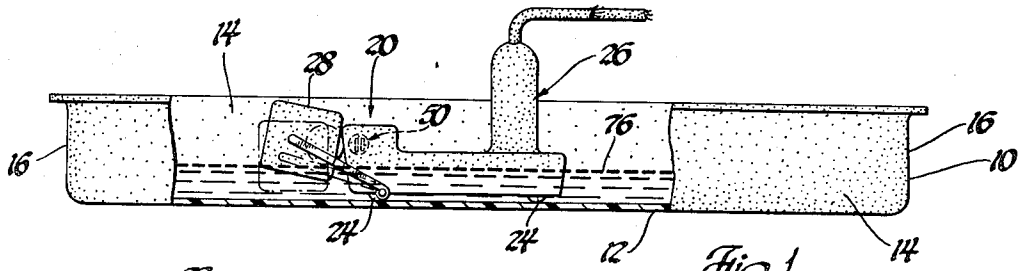


Fig. 1

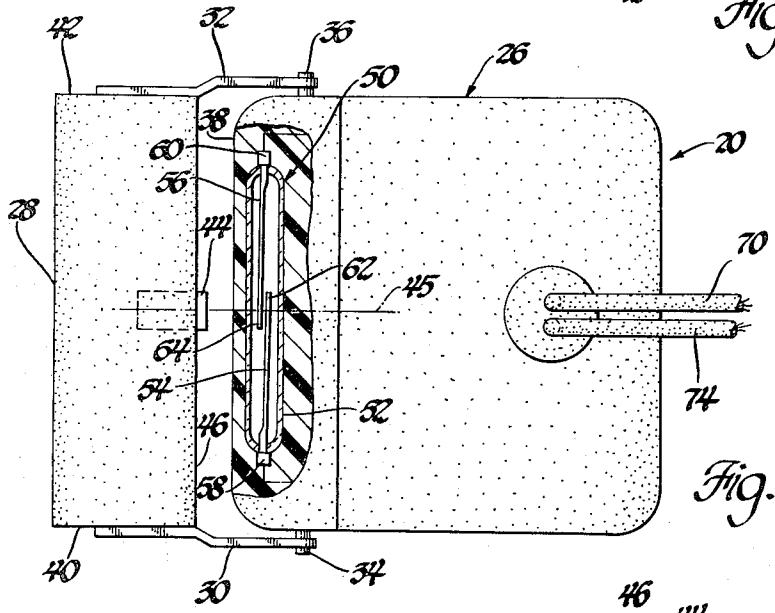


Fig. 2

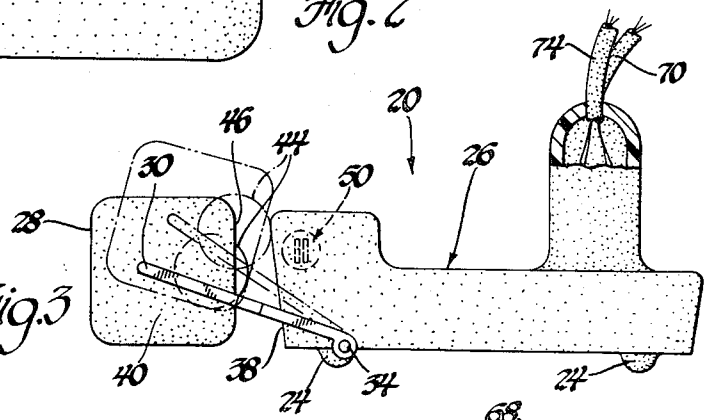


Fig. 3

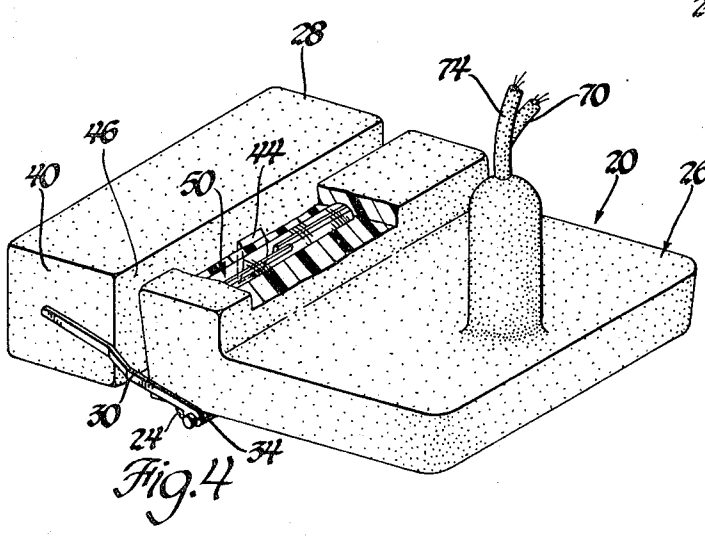


Fig. 4

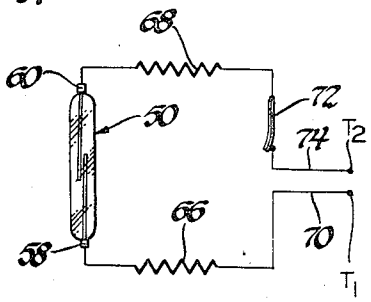


Fig. 5

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FLOAT ACTUATED EVAPORATOR HEATER

This invention relates to moisture vaporizing apparatus and more particularly to an apparatus for automatically disposing of condensate from the receiving pan of a domestic refrigerator.

In frost free refrigerators it is necessary to periodically remove and dispose of frost accumulation on the heat exchanger or evaporator coils. To accomplish this it is common practice to raise the temperature of the heat exchanger above the freezing point of water and to dispose of the melted frost by means of including a drain or receiving pan having a suitable drain line for carrying water away from the unit. Since the drain pan is normally positioned in the machine compartment of the refrigerator the heat generated therein may be sufficient to vaporize the condensate. In cases where the temperature of the machine compartment is not sufficient to vaporize the condensate in the drain pan electrical heating means, such as an electrical heater element, may be located in the pan for vaporizing the condensate as it accumulates. It has been standard practice to incorporate a protective thermostat in the circuit of the heating means such that when the heater raises to a certain temperature it will actuate the thermostat and open circuit the electrical heater to prevent overheating of the drain pan together with the machine compartment of the floor surface beneath the refrigerator. It has been found that the temperature buildup of the heater may be such that, before the thermostat can be actuated, the temperature of the drain pan and the adjacent floor area will be subjected to a higher temperature than is desirable with resultant damage thereto.

It is therefore an object of the present invention to provide an improved float-type evaporator arrangement for vaporizing the water collected within the drain pan of a refrigerator which prevents overheating of the drain pan.

It is a further object of the invention to provide an improved float type evaporator unit for use with a condensate receiver which includes an improved electric heater energized by a float actuated magnetic switch which automatically deenergizes the heater when the condensate level in the receiver falls to a level such that the pan would be subjected to excessive heat.

Further objects and advantages of the present invention will be apparent from the following description, references being had to the accompanying drawing wherein a preferred form of the invention is clearly shown.

In the Drawings:

FIG. 1 is a side elevational view, partly in section, of a float actuated evaporator apparatus according to one form of the invention;

FIG. 2 is a top elevational view, partly in section, of the evaporator assembly;

FIG. 3 is a side elevational view of the evaporator of FIG. 2;

FIG. 4 is a perspective view of the evaporator device of FIG. 3;

FIG. 5 is a schematic diagram of the heater circuit and switch.

As is shown in FIG. 1, a relatively large pan designated generally as **10** is adapted to receive condensate liquid flowing from a suitable drain trap device of a domestic refrigerator. Drain pans of this type are usually formed of plastic material comprising a bottom wall **12** and vertical side walls **14** and end walls **16**. A typical condensate drain tube and receiving pan arrangement is shown in U.S. Pat. No. 3,287,930 issued Nov. 29, 1966 by J. J. O'Connell et al. The details of the drain tube and pan arrangement are unimportant to the present invention and while the preferred embodiment of the invention is disclosed in combination with a refrigerator persons skilled in the art will appreciate that it may be used in other related applications.

The pan **10** has located therein a vaporizing heater assembly **20** having four dimple-like legs **24** for supporting the heater assembly above the bottom surface of wall **12**. The assembly **20** includes an immersion type heater **26** of known commercial type having a float **28** secured thereon by means of a pair

of float arms **30** and **32** pivotally attached to the heater **26** by suitable means such as pins **34** and **36**. The float **28** is formed of suitable material such as a plastic foam or the like and is generally rectangular in cross section and extends in a transverse direction substantially parallel to front wall **38** of the heater **26**. The arms **30** and **32** are suitably affixed to the end surfaces **40** and **42** of the float such as by an epoxy cement.

A magnet indicated at **44** which in the preferred embodiment is circular or disc shaped in configuration is embedded in the float **30** substantially at the midpoint of its longitudinal axis so that it is symmetrically located in the vertical plane defined by the center line **45**. It will be noted that a portion of the disc-shaped magnet extends outwardly or protrudes from the inner wall **46** of the float such that when the float rotates about the horizontal pivotal axis of pins **34, 36** upwardly on its float arms the exposed arcuate portion of the magnet will contact the front wall **38** of the heater **26** adjacent the upper edge thereof and is stopped thereby. By this arrangement the float arms **30, 32** attain a maximum angle of inclination from the horizontal of approximately 35° such that the magnet **44** will travel in an arcuate path of the order of 15° toward the upper edge of wall **38**.

In the preferred form a standard dry or reed switch **50** of known commercial type is sealed or encapsulated in a glass tube **52** having two elongated electrically conductive reed members **54, 56** that are sealed, one at each end of tube **52**, by mounting portions **58** and **60**, respectively. The free contacting portions **62** and **64** of the reed members **54, 56** overlap at the center of the tube and are normally open or spaced by a short gap, as shown in FIG. **2**, while dry nitrogen gas is forced into the tube **52** during the sealing operation creating an inert atmosphere for the contacts **62, 64**. When the switch of this type is introduced into a magnetic field, the reeds **54, 56** become flux carriers, and the overlapping ends become opposite magnetic poles which attract each other. If the magnetic attraction between the reed contacts **62, 64** becomes strong enough to overcome the stiffness of the reeds, they move together and touch, completing the magnetic circuit and making electrical contact.

As seen in the schematic diagram of FIG. **5** the mounting portions **58, 60** of the reeds are electrically connected to resistance heaters **66, 68** respectively. The heater **66** may be connected by conductor **70** to a terminal T_1 while the heater **68** connected through a thermostatic overheat-protective switch **72** and thence by conductor **74** to terminal T_2 which terminals may be connected to a standard household 118 volt power source.

The evaporator unit according to the invention operates in the following manner. Typically, the conditions illustrated in FIG. **1** would represent the high water level **76** state of the condensate in the pan **10** so that as a consequence the float **28** and float arms **30, 32** move upward around the pivot pins **34, 36**, consequently swinging the magnetic disc **44** upward in a clockwise direction, thereby contacting the wall **38** of the immersion heater. As a result the reed contacts **62, 64** are closed and the heater elements **66, 68** are energized causing a vaporization of the water within the pan with the attendant fall in level of the condensate and float **28** resulting in opening of the contacts **62, 64** of the reed switch. This action swings the float **28** in a counterclockwise direction moving the magnet **44** outwardly and downwardly from the contacts **62, 64** and immediately opening the circuit and deenergizing the elements **66** and **68** again permitting the water level to rise to a point where the float **28** will again rise and close the contacts **62, 64**. Because of the small swinging movement required to energize and deenergize the reed switch the level **76** of the condensate is maintained at an elevation to provide substantial cooling of the heater **26** by the water to prevent overheating of the pan **10** and possible damage to the refrigerator components or adjacent floor area.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is:

1. A float actuated heater apparatus for regulating the level of defrost water in a condensation collecting receiver pan of a domestic refrigerator comprising an immersion electric heater body having resistance heaters embedded therein including an electrical heating circuit for energizing said resistance heaters, a pair of spaced flat support arms pivotally mounted on said heater body about a horizontal axis, a float on said float arms responsive to a rise or fall of water level in the collecting pan, said heat body including a normally open reed switch located thereon operative to open and close the circuit of said resistance heaters, said reed switch having a pair of reeds sealed in a glass tube each having a mounting portion and a contacting portion spaced longitudinally on the reed, said reeds having their contacting portions in overlying relationship with one another, the longitudinal axis of said reed switch located parallel to the horizontal pivotal axis of said float arms, a magnet incorporated with said float so as to be movable in an arcuate path in accordance with the float elevation toward and away from said reed switch, the path of said magnet defining a vertical plane substantially bisecting said reed switch contacting portions whereby said reed switch is sensitive to a relatively small rise of the water level in the pan to cause said magnet to close said reed switch contacts and energize said heater elements, and whereby a relatively small decrease in the water level pivots said magnet away from said reed switch contacts allowing them to open thereby deenergizing said resistance heaters and maintaining in said pan a minimum volume of water at a level sufficient to maintain said heating assembly partially submerged in the water.

2. A float actuated heater apparatus for regulating the level of defrost water in a condensation collecting receiver pan of a domestic refrigerator comprising a rectangular shape in plan immersion electric heater body having resistance heaters embedded therein including an electrical heating circuit for energizing said resistance heaters, a pair of spaced float arms pivotally mounted on a horizontal axis at points on said heater body side walls adjacent the forward lower edge of said heater body, a float on said float arms and extending therebetween

substantially coextensive with the front wall of said heater body, said heater body including a normally open reed switch embedded therein at a point adjacent the front wall upper edge of said heater body operative to open and close the circuit of said resistance heaters, said reed switch having its longitudinal axis parallel to said float arm pivotal axis and including a pair of reeds sealed in a glass tube each reed having a mounting portion and a contacting portion spaced longitudinally thereon, said reeds having their contacting portions in overlying relationship with one another, the longitudinal axis of said reed switch located parallel to the horizontal pivotal axis of said float arms, a magnet incorporated with said float so as to be movable in an arcuate path in accordance with the float movement toward and away from said reed switch, said float operative to swing in an upward direction from a substantially horizontal plane to contact said heater body adjacent said front wall upper edge to limit the uppermost extent of its pivotal rising motion when said magnet is disposed adjacent the upper edge of said heater body, the path of said magnet defining a vertical plane substantially bisecting said reed switch contacting portions whereby said reed switch is sensitive to a relatively small rise of the water level in the pan to cause said magnet to close said reed switch contacts and energize said heater element, and whereby a relatively small decrease in the water level pivots said magnet away from said reed switch contacts allowing them to open thereby deenergizing said resistance elements and maintaining in said pan a minimum volume of water at a level sufficient to maintain said heater body partially submerged in the water.

3. The float actuated heater apparatus as defined in claim 2 wherein said float is rectangular in cross section and said magnet is in the form of a disc embedded in said float such that an arcuate section of said disc extends outwardly from a side wall of said float towards said heater body front wall, said arcuate section operative to contact said heater body front wall to limit the uppermost extent of the pivotal rising motion of said float.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,679,867 Dated July 25, 1972

Inventor(s) James A. Canter

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

:

Column 3, line 6, (Claim 1) "flat" should read -- float --.

Signed and sealed this 10th day of April 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

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Commissioner of Patents

PO-1050
(5/69)

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