Nov. 28, 1939. D. G. SMELLIE 2,181,590

ICE TRAY

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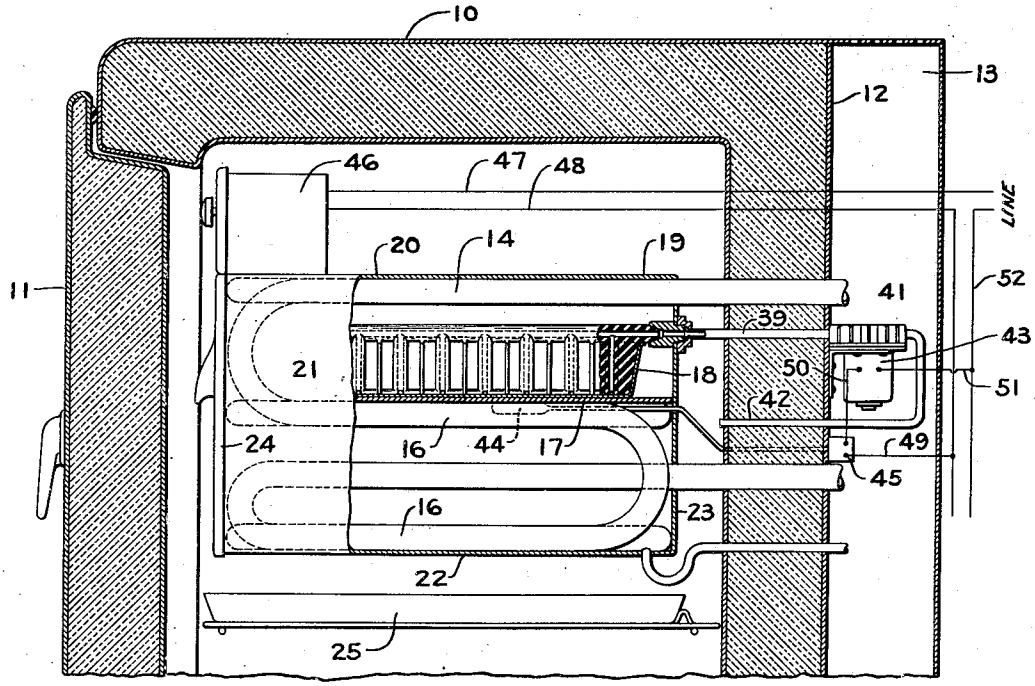


Fig.1

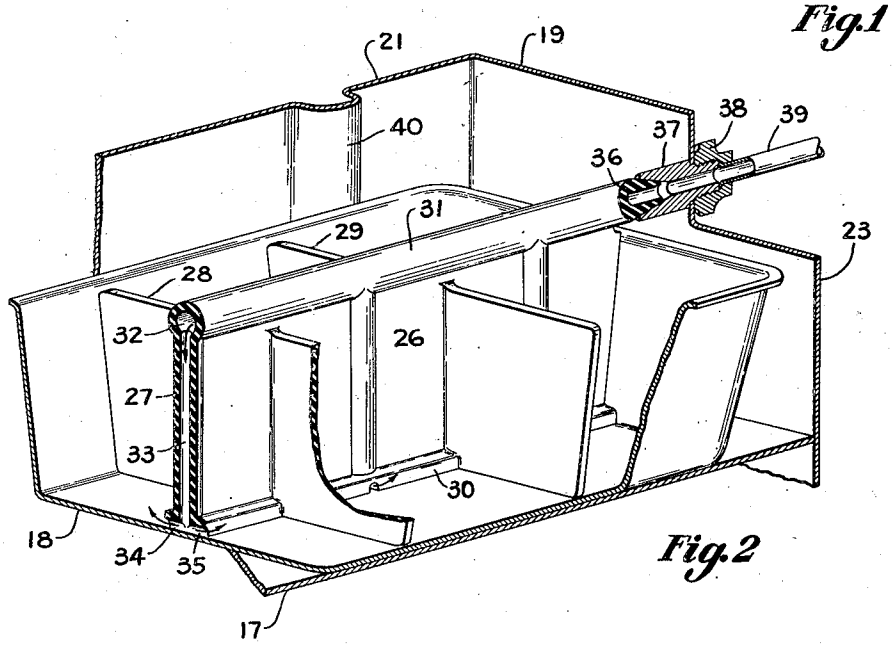


Fig.2

INVENTOR

Donald G. Smellie

BY

Harry S. Dwarris

ATTORNEY

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ICE TRAY

Donald G. Smellie, Canton, Ohio, assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

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13 Claims. (Cl. 62—108.5)

This application relates to domestic refrigerators and more particularly to apparatus for making clear ice.

In an application for Letters Patent by Alfred G. Gross, Serial #188,412 filed February 3, 1938, there is disclosed an apparatus applied to a domestic refrigerator in which air is caused to pass upwardly through the freezing water to free it of suspended gases and thereby produce clear ice cubes.

In the apparatus disclosed in the aforementioned application, it was necessary to design a special ice tray to lead the air to the freezing water and it is accordingly an object of this invention to provide a flexible grid structure adapted to be applied to a standard ice tray and having conduit means associated therewith leading to the various freezing compartments whereby a fluid, such as air, may be passed through the water in the freezing compartment to free it of suspended gases and thereby produce clear ice.

Another object of the invention is to provide a grid structure and that is adapted to be applied to a standard ice tray which is made of rubber or other similar material so that frozen ice cubes can be readily removed therefrom.

Other objects and advantages of the invention will become apparent from the specification and drawing in which:

Figure 1 shows the invention applied to a domestic refrigerator;

Figure 2 shows an embodiment of the invention partly in section together with a portion of the freezing chamber walls of a domestic refrigerator.

In the drawing is shown a domestic refrigerator cabinet having a top wall **10**, a door **11**, a back wall **12**, and a flue **13**, for the circulation of cooling air over the heat radiating part of any suitable refrigerating system. Suitably mounted in the cabinet is an evaporator, generally indicated at **14**, formed from a continuous coil of tubing to provide a plurality of horizontally spaced apart pipe portions **16** on which are mounted shelves **17**, for the reception of ice making trays **18**. The evaporator **14** is enclosed in a housing **19**, having a top wall **20**, side walls **21**, a bottom wall **22**, a rear wall **23**, and a door **24**. Suitably supported beneath the evaporator is a drip pan **25**.

As shown in Figure 2, the grid structure generally indicated at **26**, comprises a longitudinal partition **27**, and lateral partitions **28** and **29** extending on each side of the longitudinal partition to form individual cube compartments. This grid structure is made of flexible material, preferably rubber, and is shaped to fit inside a standard ice freezing tray as shown. Ice does not freeze as tightly to rubber as it does to metal and the making of the grid structure of rubber provides for the easy removal of the ice cubes after they have become frozen. The rubber is also easily flexed so that frozen ice cubes can be readily removed. To make sure that the ice cubes will be lifted from the freezing tray when the grid structure is raised, the longitudinal partition is provided with extension **30**, extending out into the cube compartments on either side of the central partition. The grid structure need not be made of rubber or other non-metallic material but could obviously be made of metal if desired.

To provide for the introduction of air beneath the surface of water to be frozen, the longitudinal partition **27** is enlarged at its top as shown at **31** and is provided with a duct **32**, having extensions **33** leading downwardly through the central partition **27**, to apertures **34** and **35** opening into each of the cube compartments. As will be noted, these apertures **34** and **35** open into the cube compartment at their very bottom so that air flowing through the duct will enter at the bottom of the compartment and agitate all of the water therein so as to remove all of the gases suspended in the water and thereby produce clear ice cubes.

The conduit means need not be made integral with the grid structure but can be made to be separately attached thereto with branch conduits extending to the bottom of each freezing compartment.

The enlarged portion **31** of the longitudinal partition **27**, is extended beyond the edge of the tray as shown at **36** to form a joint member cooperating with a second joint member **37**, supported in the end wall **23** of the housing **19**, by a nut **38**. The nut **38** also holds an incoming conduit member **39** in cooperative relationship with the end of member **37** to form a fluid tight joint.

As shown, the joint member **36** is tapered and the joint member **37** has a corresponding female taper so that when the tray is placed in the freezing chamber it will be certain that the joints will be aligned in cooperative relationship. The grid structure need not be made with a single longitudinal partition **27** but two or more may be provided with a corresponding number of joints in the evaporator housing.

The side walls **21** of the housing **19** are pro-

vided with ribs 40, which contact with the edges of the tray 18 to make certain that the joint members 36 and 37 are in cooperative relationship as the tray is inserted into the freezing chamber.

In order to supply air to the conduit formed in the grid structure, the pipe 39 is connected to the discharge side of a suitable pump 41, which preferably has its inlet side connected to the interior of the refrigerator cabinet by means of a pipe 42, so that the air entering the freezing water will already be cold and thereby not interfere with the freezing of the water. The pump 41 is preferably supported in the flue 13, so that cooling air flowing up the flue 13 will carry away the heat from the pump and its driving motor 43. A thermostatic bulb 44 contacts with the bottom of the shelf 17, so as to operate a control 45 so as to shut off the motor 43, and stop the flow of air through the grid structure when the water in the tray 18, resting on the shelf 17, has become frozen. If desired, other thermostatic bulbs beneath other shelves of the freezing chamber can be provided to operate in conjunction with thermostatic bulb 44 to operate the control device 45.

A control device 46 which controls the energy supplied to the refrigerator system in accordance with the temperature within the refrigerator cabinet is suitably supported on the evaporator 14 and has one side connected by conductor 47 to one side of an electric supply line. The other side of the control member 46 is connected by a conductor 48 and conductor 49 to one side of control member 45. The conductor 48 is extended and is connected to one side of the energy consuming part of the refrigerating system, which may be one operated by heat or one operated by an electric motor or both. The other side of the control 45 is connected by means of conductor 50 to the motor 43 and through its field winding and conductor 51, to a conductor 52, connecting the other side of the energy consuming part of the refrigerating system to the other side of the electrical supply line.

In operation, if the control member 46 is calling for refrigeration, the refrigerating system will be operating and if the water in the tray 18 has not yet been frozen, the control member 45 will connect the motor 43 through the control 46 to both sides of the supply line. If the control 46 is not calling for refrigeration and the refrigerating system is not operating, the motor 43 will also not be operating even though the water in the tray 18 has not been frozen. This assures that no air will be circulated through the grid structure when refrigeration is not being produced.

It can be seen from the foregoing description that a freezing tray and grid structure has been provided which is simple in construction, easy to manufacture, and efficient in operation whereby cold air can be circulated to the freezing water in the ice tray to agitate the same and remove the suspended gas therefrom and thereby produce clear ice cubes and in which the frozen cubes can be easily removed from the tray and grid assembly.

It can also be seen that an ice tray and grid, of the character described, has been provided in which the grid is easily positioned in and removed from the tray by using the enlarged portion 31 as a hand grip in removing the grid assembly from the tray, and in separating the cubes from the grid. The fact that this portion is of non-conducting material makes it particularly suitable for this purpose since it will not freeze to the hand of the user. The tray and grid assembly can also be easily positioned in the freezing compartment of a domestic refrigerator to cooperate with the joint member there in forming a connection for the supply of air thereto.

While I have illustrated and described only one embodiment of my invention, it is to be understood that this embodiment is to be taken as illustrative only and not in a limiting sense. I do not wish to be limited to the structure shown but to include all equivalent variations thereof, except as limited by the scope of the appended claims.

I claim:

1. In combination, an evaporator of a domestic refrigerator having a freezing chamber, a removable tray positioned in said chamber, a grid structure positioned with said grid structure, conduit means associated with said chamber, and a separable joint member on each of said conduit means, said chamber having means for positioning the tray therein whereby the joint members are positioned in cooperative relationship.

2. In combination, an ice tray for a domestic refrigerator, a grid structure positioned therein to form freezing compartments, said grid being so constructed that fluid may be led to the compartments to agitate the contents thereof.

3. In combination, an ice tray for a domestic refrigerator, a grid structure positioned therein to form freezing compartments and conduit means associated with said grid structure and leading to each of said compartments.

4. In combination, an ice tray for a domestic refrigerator, a grid structure removably positioned therein to form freezing compartments, and conduit means associated with said grid and leading to each of said compartments, said grid structure being formed of flexible non-metallic material.

5. An ice tray grid structure of flexible non-metallic material, comprising longitudinal and lateral grid members to form walls of freezing compartments, and conduit means formed on said longitudinal grid member and having portions opening through said walls at the bottom thereof.

6. An ice tray grid structure of flexible material comprising, longitudinal and lateral partitions adapted to cooperate with a freezing tray to form freezing compartments, conduit means formed integral with a longitudinal partition and having extensions extending to the bottom of said partition and opening into each freezing compartment, said conduit means extending beyond the end of said longitudinal partition and being shaped to form a joint member.

7. An ice tray grid structure of flexible material comprising, longitudinal and lateral partitions adapted to cooperate with a freezing tray to form freezing compartments, conduit means associated with a longitudinal partition and having extensions extending to the bottom of and opening into said compartments, said conduit means extending beyond the end of said longitudinal partition and being shaped to form a joint member.

8. An ice tray grid structure of flexible material and adapted to cooperate with an ice tray to form freezing compartments, conduit means extending longitudinally of said grid structure and

having extensions extending to and opening into said compartments, said conduit means extending beyond the end of said grid structure and being shaped to form a joint member.

9. In combination, a domestic refrigerator cabinet, an evaporator having a freezing chamber positioned therein, a tray positioned in said freezing chamber, a grid structure positioned in said tray, conduit means associated with the evaporator, grid structure and cabinet, said conduit means leading from the interior of the cabinet to adjacent the bottom of the tray and power means in said conduit means for pumping air from the cabinet to the tray to agitate the contents thereof.

10. The combination as set forth in claim 9 in which the power means is positioned outside said cabinet.

11. The combination as set forth in claim 9 in which control means is provided for said power means operable when the contents of said tray is frozen to de-energize said power means.

12. In combination, a domestic refrigerator cabinet, an evaporator having a freezing chamber positioned therein, a tray positioned in said freezing chamber, a grid structure positioned in said tray, conduit means associated with the evaporator, grid structure and cabinet, said conduit means leading from the interior of the cabinet to adjacent the bottom of the tray, power means in said conduit means for pumping air from the interior of the cabinet to the tray to agitate the contents thereof, control means for said power means operable when the contents of the freezing tray is frozen to de-energize said power means and temperature responsive means in said cabinet operable to control said control means in accordance with the cabinet temperature.

13. An ice tray grid structure of flexible non-metallic material comprising longitudinal and lateral grid members to form walls of freezing compartments, conduit means formed on said longitudinal grid member and having portions opening through said walls at the bottom thereof, said longitudinal grid member being enlarged adjacent said conduit means to form a hand grip for use in removing said grid structure from a freezing tray and for removing ice cubes from said grid structure.

DONALD G. SMELLIE.