CONTROL SYSTEM FOR REFRIGERATOR WITH AUTOMATIC ICEMAKER AND DEFROSTING MEANS

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4 Claims

ABSTRACT OF THE DISCLOSURE

In the preferred form, a household refrigerator having a below freezing frost-free storage compartment and a separate above freezing storage compartment is provided with an icemaker in which the timed freezing and ice separating periods are controlled by a multiple lobed cam driven by a timer motor which has an additional cam providing a defrost period which is synchronized with one of the ice separating periods of the icemaker.

Icemakers are now being incorporated in increasing quantities in household refrigerators in which the freezing compartment is of the frostproof type. Since controls are required for both the icemaker and the defrosting of the evaporator for the frostproof compartment, it is an object of this invention to provide a simple timer control system which will control the icemaker and the defrosting and will also coordinate the defrosting periods of the evaporator so as to insure that the defrosting does not adversely affect the icemaking cycles.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein preferred embodiments of the present invention are clearly shown.

In the drawings:
FIG. 1 is a vertical sectional view, partly diagrammatic, of a two compartment household refrigerator embodying one form of icemaker; and
FIG. 2 is a wiring diagram illustrating a control system for the refrigerator and icemaker embodying one form of my invention.

Referring now more particularly to FIG. 1, there is illustrated an insulated household refrigerator cabinet 20 provided with a lower insulated above freezing compartment 22 and an upper below freezing frost free compartment 24. These compartments are separated by a horizontal insulated wall 26. The lower compartment 22 is closed by a lower door 28 while the upper compartment 24 is closed by an upper door 30.

Illustrated diagrammatically is a refrigerating system which includes a compressor 32 driven by an electric motor 34 which pumps evaporated refrigerant into a condenser 36 where the refrigerant is liquefied and forwarded through a restrictor conduit 38 to a horizontally finned evaporator 40 located between the upper and lower walls 42 and 44 of a duct which is located in or adjacent the below freezing compartment 24. A fan 46 driven by an electric motor 48 draws air from the compartment 24 and discharges the air through the finned evaporator 40 causing the refrigerant in the evaporator to evaporate and the air to be cooled below water freezing temperatures. The outlet of the evaporator connects to the refrigerant conduit 50 extending to the above freezing compartment 22 where it has an air cooling portion 54 for cooling the compartment 22. The cooling portion 54 is connected to the inlet of the compressor 32.

In addition to serving as a storage compartment for frozen foods, the upper compartment 24 also houses an icemaking and ice storage apparatus. At the rear of the evaporator 40 there is provided one or more ice freezing tubes 56. This tube is surrounded by horizontal fins 58. After the air is passed through the evaporator 40, the walls of the duct 42 and 44 are arranged to direct the air into the spaces between the fins 58 around the ice freezing tube 56 after which the air is returned to the open spaces of the compartment 24. Preferably, the icemaker is of a type designed to produce clear ice. It includes a water supply pipe 60 extending through the insulated rear wall of the cabinet to a float control 62 which keeps filled an insulated water reservoir 64 provided with an insulated wall 66. In the lower portion of the reservoir 64 is an electric water circulating pump 68 which pumps water through a supply pipe 70 to an annular insulating trough 72 from which the water flows through the tube 56 and is gradually frozen therein. Beneath the tube 56 are a series of inclined bars 74 which allow the unfrozen water residue to return to the water supply reservoir 64.

As shown in the diagram FIG. 2, the electric pump 68 is controlled by a double throw switch 76 which in its upper position connects through an upper contact 78 with the electric pump 68 and which in its lower position connects with a lower contact 80 which connects to an electric water circulating heater 82 which is wrapped around the tube 56 between the fins for heating the tube to separate the ice therefrom at the conclusion of the freezing period. When the ice is melted free from the tube 56 it will fall onto the bars 74 and be guided into the ice receptacle 84 which is pivotally mounted on the pivot 86 at the rear and supported at the front by a supporting spring 88. The ice receptacle 84 when substantially filled is adapted to open the bin switch 90 to stop icemaking operations. For this purpose the bin switch 90 is connected in series with the double throw switch 76. Also connected in series with the double throw switch 76 is a thermostat switch 92 which may be located at some suitable position in the compartment 24 to prevent operation of the icemaker in the event that the temperature in the compartment has not been cooled sufficiently for the icemaking operation.

The double throw switch 76 is operated by a cam follower 94 which is operated by an eight lobed rotary cam 96 having eight lobes 98 which provide eight freezing periods per revolution and eight notches 121 which provide a thawing period between each of the freezing periods in which the double throw switch 76 is in its lower position energizing the ice separating heater 82 when the cam follower 94 is in one of the notches 121. When the cam follower 94 is supported by any one of the eight lobes 98 it holds the double throw switch in its upper position to cause the operation of electric pump 68. The icemaking circuit includes the bin switch 90, the electric pump 68 and the ice separating heater 82 which are connected across the supply conductors 123 and 135.

The compressor motor 34 is controlled by a second double throw switch 127 having its upper contact 129 connected to the motor 34 and its lower contact 131 connected to the supply conductor 125. The double throw switch 127 connects through a thermostat switch 131 to the supply conductor 123. This thermostat switch 131 normally controls the operation of the refrigerating system to keep the air cooling evaporator 54 at the desirable temperature for maintaining desirably low freezing temperatures in the above freezing compartment 22. This also causes the maintenance of below freezing temperatures in the evaporator 50 sufficiently low for ice freezing purposes and storage of frozen foods in the below freezing compartment 24. The double throw switch 127 is normally held in its upper position by the cam follower 133 and the above freezing compartment 24.

The rotary cam 135. The cam 135 has a single defrosting notch 137 for moving the double throw switch 127 to its lower position in contact with the lower contact
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139 for energizing the defrost heater 141. This defrost heater 141 may be of any suitable type and is illustrated diagrammatically as a heater wire extending through the evaporator 40 adjacent the refrigerant conduits. The notch 137 on the cam 135 is oriented with a notch 143 of the cam 96. Both cams 96 and 135 are connected to the drive shaft 145 of the timer motor 147 which is connected across the supply conductors 123 and 125 and operated continuously at a timed rate. The notch 143 is arranged to lower the cam follower 94 and to lower the double throw switch 76 into contact with its lower contact 80 to energize the ice separating heater 82 and to again lift the cam follower 94 to move the double throw switch 76 to its upper position during the time that the cam follower 133 remains in the notch 137 of the cam 135 to energize the defrost heater 141.

By this coordinating arrangement, the defrosting of the evaporator and the separation of the ice are more rapidly accomplished with less effect upon temperatures maintained in both storage compartments. The control system is thereby made more reliable and less expensive since a single timer motor can serve to control both the defrosting and the icemaking system.

While the embodiments of the invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

I claim:

1. A household refrigerator including an insulated cabinet containing a compartment to be kept cool, a freezing machine for freezing pellets within said cabinet comprising a mold and means for delivering liquid to be frozen to said mold and heating means associated with said mold for separating the frozen liquid from said mold, a refrigerating system associated with said cabinet having evaporating means for cooling said compartment and for freezing liquid in contact with the surface of said mold and having refrigerant liquefying means operatively connected to the evaporating means, said evaporating means being subject to the accumulation of frost thereon, said system being provided with heat defrosting means for heating said evaporating means wherein the improvement comprises a single timer control means having means for starting and stopping the liquid delivering means and the heating means for separating the frozen liquid from the mold and said defrosting means, said control means having co-ordinating means for associating the starting of said heat defrosting means with a starting of said heating means for separating the frozen liquid from the mold.

2. A household refrigerator including an insulated cabinet containing a compartment to be kept cool, a freezing machine for freezing pellets within said cabinet comprising a mold and means for delivering liquid to be frozen to said mold and heating means associated with said mold for separating the frozen liquid from said mold, a refrigerating system associated with said cabinet having evaporating means for cooling said compartment and for freezing liquid in contact with the surface of said mold and having refrigerant liquefying means operatively connected to the evaporating means, said evaporating means being subject to the accumulation of frost thereon, said system being provided with heat defrosting means associated with said evaporating means and a defrosting switch for rendering effective said defrosting means to heat and defrost said evaporating means, cycling switch means for cyclically controlling said liquid delivering means and said heating separating means, wherein the improvement comprises, a timing means having means for periodically operating said defrosting switch to heat and defrost said evaporating means, said timing means also having means for operating said cycling switch means a plurality of times to provide a plurality of operations of said liquid delivery means and a plurality of operations of said heating separating means between successive operations of said defrosting switch, the operation of said heating separating means intervening between successive operations of said liquid delivery means, said timing means having means for co-ordinating the operation of said cycling switch means and said defrosting switch to cause one of the operations of the heating separating means during each operation of the defrosting switch.

References Cited

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