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ICE MAKER

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This invention relates to ice makers and in particular to an ice body maker for use in a refrigeration apparatus providing air at a freezing temperature.

Several methods have heretofore been employed for cooling the mold of ice body makers provided in refrigeration apparatus. Where the freezing temperature air of the refrigerating apparatus is static, it has been necessary to transfer heat from the mold conductively, as by direct contact therewith of an evaporator tube or a refrigerated shelf. This method of cooling the mold has the serious disadvantage of frost build-up on the mold and associated parts as a result of the low temperature thereof. In refrigerating apparatus having means for force circulating the freezing temperature air therethrough, the cooling of the ice body maker mold may be effected by placing the mold directly in front of the air duct. While this arrangement permits the elimination of the conductive heat transfer elements, it has the serious disadvantage of requiring the arrangement of the ice body maker for mounting in the locality of the duct.

The present invention comprehends an ice body maker structure which eliminates the above-discussed problems in a simple and economical manner, providing substantially unlimited freedom in the placement of the ice body maker in the refrigeration apparatus.

The principal feature of the present invention is, therefore, the provision of a new and improved ice body maker, for use in a refrigeration apparatus providing air at a freezing temperature.

Another feature of the invention is the provision of such an ice body maker comprising a unitary assembly providing substantially improved freedom of placement in the refrigeration apparatus.

A further feature of the invention is the provision of such an ice body maker including an air moving means as an element of the unitary assembly.

Still another feature of the invention is the provision of such an ice body maker including an air moving means driven by the force providing mechanism of an associated ice body ejecting means, for moving the freezing temperature air in heat transfer relationship with the ice body mold.

A still further feature of the invention is the provision of such an ice body maker including a finned mold for freezing an ice body therein, means for ejecting ice bodies from the mold including a motor, a duct for separating a portion of the air from the remainder of the air in the refrigeration apparatus, and a fan driven for moving the freezing temperature air from the duct in heat transfer relationship with the mold.

Still another feature of the invention is the provision of such an ice body maker further including a temperature responsive device sensing the temperature of the air adjacent the duct for controlling the motor to operate only when the air is below a preselected freezing temperature.

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIGURE 1 is a fragmentary view of a refrigeration apparatus provided with an ice body maker embodying the invention.

FIGURE 2 is a schematic wiring diagram illustrating the control circuit of the motor.

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In the exemplary embodiment of the invention as disclosed in the drawing, a refrigeration apparatus generally designated 10 comprises an ice body maker arranged to be installed as a unit in a portion of a conventional or a frost-free freezer type refrigerator which provides a body of air at a freezing temperature, such as 10° F. Herein the refrigerator provides air at such a freezing temperature to a space generally designated 11 defined in part by an insulated wall 12 as shown in FIGURE 1 of the drawing.

Refrigeration apparatus 10, as shown in FIGURE 1, comprises a unitary assembly carried on a block 13 of material such as rigid foamed insulation bonded to a front plate 14 and a rear plate 15 and secured to wall 12 in an opening 16 therein. A mold 17 having an upwardly opening cavity 18 in which the ice bodies 19 are formed is secured to front plate 14. The ice bodies are formed in mold 17 serially one at a time and are ejected therefrom by an ejector mechanism generally designated 20 which may be generally of the type disclosed in copending Linstromberg application Serial No. 790,557, filed February 2, 1959, and owned by the common assignee. Broadly, the ejecting mechanism includes a timer motor 21 driving a shaft 22 through a gear train 23. A cam 24 is fixed to the end of shaft 22 and bears against a cam follower 25 fixed to a striker 26. At a preselected point in the movement of cam 24, the striker is released to strike the projecting lower end 27 of an ejector pin 28 having its upper end 29 disposed within the lower end of cavity 18. The impact force delivered through the ejector pin to the bottom of the ice body 19 in cavity 18 causes it to break free of the mold wall and be ejected upwardly from the mold. Also controlled by shaft 22 is a water valve 30 which controls the flow of water, as in the above-indicated Linstromberg application, to deliver replacement water to mold cavity 18 subsequent to the ejection of the previous ice body.

Motor 21 which comprises the force providing mechanism of the ice body maker is further provided with an axial shaft 31 which extends from the motor through the block 13 to terminate in a recess 32 in the wall. Recess 32 defines a vertical duct which is open to space 11 through an inlet 33 through front plate 14 below the ejecting means 20, and through an outlet 34 through plate 14 horizontally of mold 17. The invention comprehends the provision in refrigerator apparatus 10 of an air moving means for directing a stream of the freezing temperature air into heat transfer relationship with mold 17. The air moving means comprises a propeller type fan 35 driven by a motor other than that of the refrigerator, the fan being secured to the end of shaft 31 in duct 32 at outlet 34 to be driven by motor 21 to draw the freezing temperature air from space 11 upwardly through the duct and discharge it directly against mold 17. To facilitate the heat transfer between the air and the mold, the mold may be provided with a plurality of fins 36.

Motor 21 is arranged to operate at all times except when the temperature of the air in space 11 rises above 10° F. As best seen in FIGURE 2, motor 21 is energized from a suitable power supply source 37, such as 115 volt, 60 cycle supply, and is controlled by a switch 38 operated by an actuator 39 controlled by a sensing element 40 disposed in the duct 32. Thus, when the temperature of the air in duct 32 exceeds 10° F., the actuator 39 opens the switch 38 and prevents further operation of the motor 21 and fan 35 until such time as the temperature of the air in space 11 is restored to 10° F.

As fan 35 moves the freezing temperature air in heat transfer relationship with the mold 17 independently of movement of the air in space 11, the ice body maker of the present invention functions equally well whether the

air in space 11 is force circulated or is static therein. Timer motor 21 operates independently of the other refrigerator apparatus such as the compressor of the refrigerator and, thus, the ice bodies may be formed whenever space 11 is at the desired freezing temperature. As it is unnecessary to provide a refrigerant carrying coil to the mold and as the apparatus 10 comprises a unitary assembly which may be installed anywhere in space 11, the mold structure and the installation of the ice body maker are substantially simplified. By moving the air directly over the mold 17, the ice bodies may be formed in mold cavity 18 at a substantially increased rate.

Having described our invention as related to the embodiment shown in the accompanying drawing, it is our intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

The embodiment of the invention in which an exclusive property or privilege is claimed is defined as follows:

1. An ice body maker for use in a refrigeration apparatus having an enclosure provided with air at a freezing temperature, comprising: means defining an opening in the enclosure; a mold for freezing an ice body therein; means for removing ice bodies from said mold; means for delivering water to said mold after removal of ice bodies from said mold; air moving means for directing a stream of the air at freezing temperature into heat transfer relationship with said mold; and support means carried in said opening and associating said air moving means, said mold, said ice body removal means and said water delivery means to form a unitary assembly capable of being removed as a unit from the enclosure.

2. An ice body maker for use in a refrigeration apparatus having an enclosure provided with air at a freezing temperature, comprising: means defining an opening in the enclosure; a mold for freezing an ice body therein; means for removing ice bodies from said mold; means for delivering water to said mold after removal of ice bodies from said mold; air moving means; duct means cooperating with said air moving means for directing a stream of the air at freezing temperature into heat transfer relationship with said mold; and support means carried in said opening and associating said air moving means, said mold, said ice body removal means, said water delivery means and said duct means to form a unitary assembly capable of being removed as a unit from the enclosure.

3. An ice body maker for use in a refrigeration apparatus having an enclosure provided with air at a freezing temperature, comprising: a mold for freezing an ice body therein; means for removing ice bodies from said mold; means for delivering water to said mold after removal of ice bodies from said mold; air moving means; duct means included in said assembly cooperating with said air moving means for directing a stream of the air at freezing temperature into heat transfer relationship with said mold; a temperature responsive device sensing the temperature of the air adjacent said duct means for controlling said air moving means and said ice body re-

moval means to operate only when the air is below a preselected freezing temperature; and means associating said mold, said ice body removing means, said water delivering means, said air moving means, said duct means and said temperature responsive device to form a unitary assembly.

4. An ice body maker for use in a refrigeration apparatus providing air at a freezing temperature, comprising: a mold for freezing an ice body therein; means for ejecting ice bodies from said mold, including a force providing mechanism; and an air moving means driven by said force providing mechanism for moving the freezing temperature air in heat transfer relationship with said mold.

5. An ice body maker for use in a refrigeration apparatus providing air at a freezing temperature, comprising: a mold for freezing an ice body therein; means for ejecting ice bodies from said mold, including a force providing mechanism; means causing operation of said mechanism at all times during provision of air below a preselected freezing temperature by the refrigeration apparatus; and an air moving means driven by said force providing mechanism for moving the freezing temperature air in heat transfer relationship with said mold.

6. An ice body maker for use in a refrigeration apparatus providing air at a freezing temperature, comprising: a finned mold for freezing an ice body therein; means for ejecting ice bodies from said mold, including a motor; a duct for separating a portion of the air from the remainder thereof in the refrigeration apparatus; and a fan driven by said motor for moving the freezing temperature air from said duct in heat transfer relationship with said mold.

7. The ice body maker of claim 6 including a temperature responsive device sensing the temperature of the air adjacent said duct for controlling the motor to operate only when the air is below a preselected freezing temperature.

8. An ice body maker for use in a refrigeration apparatus having an enclosure provided with air at a freezing temperature, comprising: a mold for freezing an ice body therein; means for removing ice bodies from said mold; means for delivering water to said mold after removal of ice bodies from said mold; air moving means; duct means included in said assembly cooperating with said air moving means for directing a stream of the air at freezing temperature into heat transfer relationship with said mold; and means associating said mold, said ice body removing means, said water delivering means, said air moving means and said duct means to form a unitary removable assembly.

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