

Jan. 13, 1959

D. E. MacLEOD ET AL

2,867,987

CONTROL DEVICE FOR ICE MAKING MACHINES

Filed July 26, 1956

2 Sheets-Sheet 1

FIG. 1.

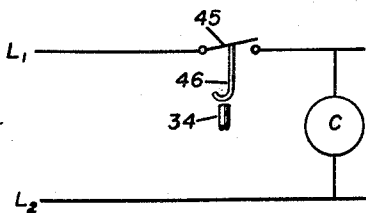
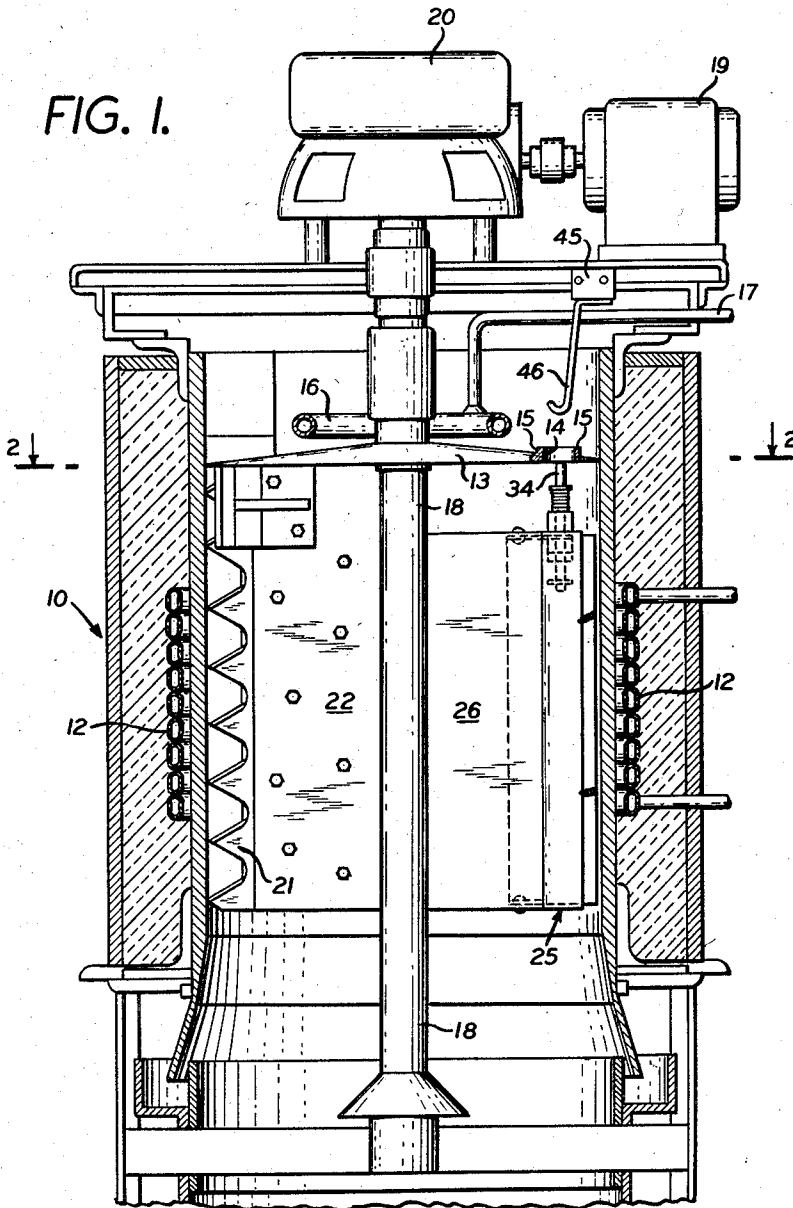


FIG. 6.

INVENTORS.
DAVID EARLE MACLEOD.
ENOCH J. KARB.

BY *Herman Seid*
ATTORNEY.

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D. E. MacLEOD ET AL

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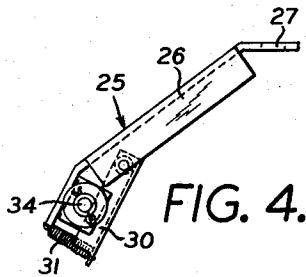


FIG. 4.

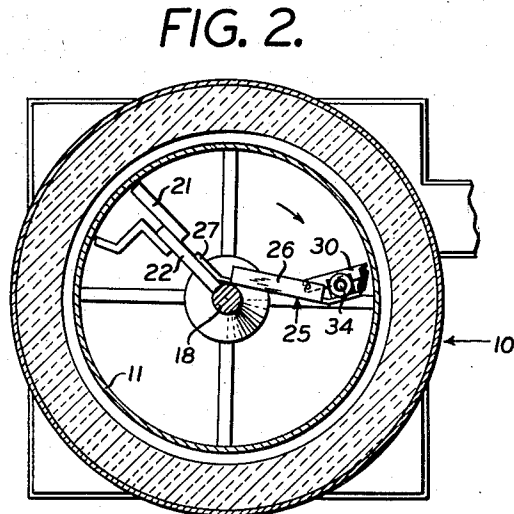


FIG. 2.

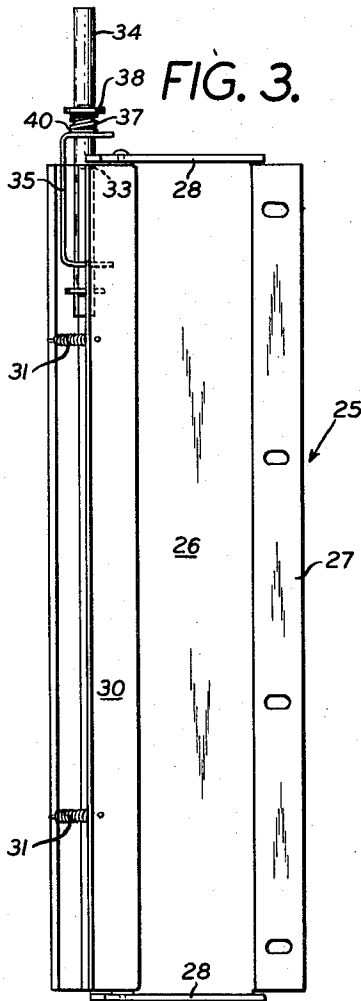


FIG. 3.

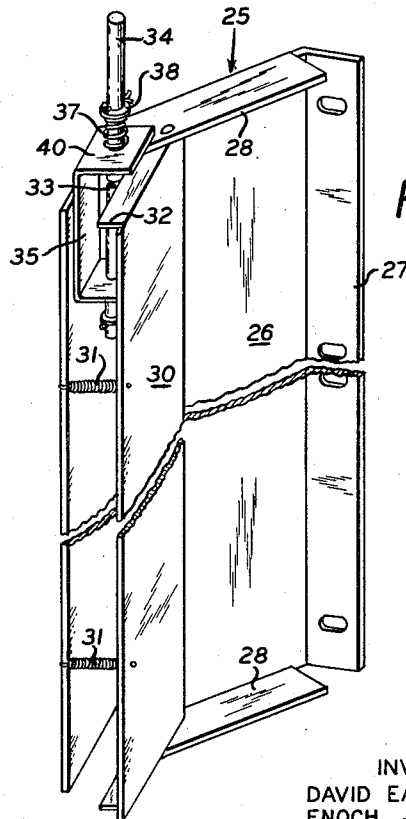


FIG. 5.

INVENTORS.
DAVID EARLE MACLEOD.
ENOCH J. KARB.

BY *Herman Seid*
ATTORNEY.

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CONTROL DEVICE FOR ICE MAKING MACHINES

David Earle MacLeod and Enoch J. Karb, Syracuse, N. Y., assignors to Carrier Corporation, Syracuse, N. Y., a corporation of Delaware

Application July 26, 1956, Serial No. 600,214

11 Claims. (Cl. 62—71)

This invention relates to a control for ice making machinery, more particularly to a control device for regulating the operation of ice flake making machinery in response to a predetermined accumulation of ice formed by said machinery.

A variety of equipment has been evolved for producing ice of various thickness and shape. Recent developments have given rise to machinery producing ice flakes which comprise relatively small, thin, translucent bits of ice. These ice flakes which present a relatively large surface area for any given ice volume have been found desirable for use in cooling various drinks, or the like food which is served with the ice to the consumer. The ice flakes produced are also used in packing foods such as vegetables to be transported a substantial distance to a market. Ice of the form described is less harmful to the food than crushed ice formations which presents a plurality of sharp points capable of penetrating the food.

So-called "Flake Ice Machines" such as described in co-pending application S. N. 538,204, filed October 3, 1955, in the name of E. MacLeod et al., generally comprise a cylindrical drum arranged adjacent the evaporator coils of a refrigeration system, with the result that the drum surface is relatively cooled. Passing water over the drum surface results in the formation of a coating of ice on said surface. Blades of a given design are then employed for breaking the ice layer away from the surface of the drum. As is apparent, the functioning of the ice removing blades is obviously dependent on the thickness of the ice layer deposited on the drum surface, since the amount of force which must be exerted by the blades is a function of ice thickness. It is thus desirable to provide some means for limiting the thickness of the ice layer formed on the drum surface, in order to limit the maximum force needed for ice-removal. Though generally the ice forms on the drum surface in a layer of uniform thickness, occasional portions of excess thickness do occur. The problems arising from the formation of an excess ice thickness on the side walls of the drum are manifold. In addition to resulting in production of an ice flake of undesirable thickness, economically inexpedient power drives are required for moving the blade. From a maintenance point of view, notwithstanding the provision of a heavy duty power drive, binding of the machinery still results, as well as breakage of the blades and the gear teeth and excessive wear of bearings employed in the drive mechanisms.

It is with the above problems in mind that the present means have been evolved, means regulating the operation of ice making equipment in accordance with the thickness of the ice formed by said equipment. The novel means here provided function to prevent mechanism breakdown, and to limit the ice thickness.

It is accordingly a primary object of this invention to provide control means regulating the operation of an ice forming machine, as a function of the thickness of the formed ice.

An additional object of this invention is to provide a

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control assembly for ice making machines, for preventing mechanism breakdown due to excess thickness of ice formation.

Another object of this invention is to provide means on an ice flake machine for protecting the mechanical components of said machine from damage which may occur due to unusual ice accumulations on the ice forming surfaces of the machines.

It is also an object of this invention to provide an improved control assembly which may be incorporated on existing ice forming machines in a relatively inexpensive manner to limit the ice thickness, and protect the mechanism of this machine.

These and other objects of the invention which will become apparent from the following disclosure and claims are achieved by provision of a switch control assembly mounted adjacent the drum of the aforementioned ice flake machine. This control assembly is arranged to actuate a micro switch positioned in the circuit of the motor employed for driving the moving parts of the ice flake forming machine. As applied to this ice flake machine, the micro switch is provided in the motor circuit employed for rotating the shaft on which the ice removing blades are supported. The micro switch is actuated by a switch arm. Said switch arm is positioned to be contacted by a switch actuating pin which is normally spring biased into an upward switch actuating position. The pin is retained in a downward position against the biasing of the spring, and out of switch actuating position by means of a detector blade which moves at a fixed distance from the ice formation surface of the ice flake machine. When said blade contacts an unusual ice accumulation, due either to an excess ice formation at a given point, or a general excess ice formation, then the blade is moved with respect to the pin to release same, causing the switch arm to actuate the switch to stop the drive motor of the machine.

A primary feature of this invention is that the control assembly functions to eliminate damage to the gears of the drive mechanism which conventionally results when the ice removing blades are forced through ice of excessive thickness.

Another feature of the novel control structure here provided resides in the fact that blade damage resulting from excess ice accumulations, is substantially eliminated.

The specific constructional features of a structure embodying this invention, and their mode of operation, will be made most manifest and particularly pointed out in the following description taken in conjunction with the accompanying drawings, wherein:

Figure 1 represents a fragmentary cross-sectional, partially diagrammatic view through a typical ice flake forming machine, showing the novel control mechanism in operative position; and

Figure 2 is a cross-sectional view taken on line 2—2 of Figure 1; and

Figure 3 is an elevational view of the novel control assembly; and

Figure 4 is a top plan view of the novel control assembly; and

Figure 5 is a perspective view of the control assembly; and

Figure 6 is a partial view of the schematic control circuit, showing the position of the control switch.

Referring now more particularly to the drawings, like numerals in the various figures will be taken to designate like parts.

The invention here disclosed is most effectively embodied in an ice flake forming machine of the type previously referred to. It is however apparent that the broad concept of employing a control mechanism embodying

the features of this invention may have applicability to a great variety of situations where it is desired to regulate the operation of a mechanism depositing a layer of material on a given surface, in response to the thickness of the deposited layer of material.

As best seen in Figure 1, the embodiment in which the invention is found to have maximum utility relates to an ice flake forming machine. This machine 10 of the type more fully described in co-pending application S. N. 538,204, comprises a cylindrical surface 11 having the evaporator coils 12 of a refrigeration system (not shown) arranged to refrigerate said surface 11. A water distributor plate 13 of a conical configuration is arranged to direct water along the interior surface of said refrigerated cylinder whereby a gradual thickness of ice will be deposited on said surface 11. Distributor plate 13 is formed with an aperture 14 having upwardly extending peripheral lip 15 about the boundary thereof. Lip 15 functions to prevent water from passing through aperture 14, as will become hereinafter more apparent. Water is supplied to plate 13 from perforate torus shaped tube 16 connected to water supply line 17. A shaft 18 is coaxially positioned with respect to surface 11 to rotatably support the water distributor plate 13. The motor 19 drives the shaft 18 through gear box 20 which, in addition to the water distributor plate 13, also supports the cutter blade 21 through supporting plate 22 secured to the shaft by any suitable fastening means.

Mounted on shaft 18 at a spaced circumferential distance in advance of the cutter blade is a control assembly 25 arranged beneath aperture 14 in plate 13. The control assembly 25 comprises a mounting bracket 26 having an offset ear 27 (see Figures 4 and 5) adapted for securement to the supporting plate 22 for rotation with the shaft 18. Ear 27 is secured by any suitable fastening means to supporting plate 22.

Mounting bracket 26 is formed with perpendicular end flanges 28 as best seen in Figure 5. At the end of these end flanges, remote from ear 27, detector blade 30 is pivotally supported. Springs 31 between the free end of blade 30 and the free end of bracket 26 bias blade 30 to a normal operative position as illustrated. The upper portion of detector blade 30 is formed with a flange 32 which in operative position, engages in notch 33 of pin 34 which is mounted for vertical reciprocation in pin bracket 35 suitably secured on mounting bracket 26. Spring 37 is mounted in compression about pin 34 between plate washer 38, secured on pin 34, and the upper flange 40 of pin bracket 35. This spring biases pin 34 to an upward position. As best seen in Figure 1, pin 34 extends up through aperture 14 in plate 13. Peripheral lip 15 prevents water on plate 13 from dripping onto the control assembly.

Micro switch 45 is positioned in the circuit of motor 19 driving shaft 18. Switch arm 46 actuating the micro switch is positioned as best seen in Figure 1 so that upon release of pin 34, to its upwardly biased position, the micro switch will be actuated to stop the drive motor.

Operation

The above described structure reveals how the invention may best be applied to prevent excess accumulation of ice as formed by an ice flake machine from interfering with the proper functioning of said machine. The necessity of this thickness control is apparent when it is considered that satisfactory functioning of the machine is dependent on the forces that the ice removing blades must exert to free the ice flakes from the refrigerated surface. Excess ice thickness may damage the blades, break the gear teeth or cause excessive bearing wear.

The control assembly here provided is secured on shaft 18 for continuous movement over the surface of ice deposit. When a given ice thickness has been built up on refrigerated surface 11, detector blade 30 contacts the ice surface pivoting the blade 30 about bracket 26 against

the spring biasing effect of spring 31. Upon movement of blade 30 away from bracket 26, flange 32 is forced out of slot 33 in pin 34, thus permitting pin 34 to be upwardly biased by spring 37 so as to move switcharm 46 causing micro switch 47 to stop the drive motor 19 and deactivate the machine.

It is thus seen that blade 30 will be actuated either by an unusual ice accumulation at one point on the ice forming surface, or by a general excess ice build up. In either event the machine will be stopped, preventing damage to the drive gears, blades or bearings.

Obviously, switch 45 may control a variety of the drive mechanisms of the flake ice machine so as to stop the refrigerant compressor, or any of the component pump motors, or the like.

After the ice accumulation, causing the action referred to above, has been removed, the element 34 is manually forced in a downward direction until seat 33 engages flange 32.

The above disclosure has been given by way of illustration and elucidation, and not by way of limitation and it is desired to protect all embodiments of the herein disclosed inventive concept within the scope of the appended claims.

We claim:

1. Means for making ice, said means comprising: refrigerating means; means distributing water over said refrigerating means; means removing the formed ice from said refrigerating means; and means gauging the thickness of ice to detect any excess ice thickness, said gauging means deactivating the ice removing means.

2. A method for making ice comprising the steps of: flowing a thin film of water over a refrigerated surface to form a thin sheet of ice thereon; gauging the thickness of the sheet of ice; exerting a compressive force on the ice sheet to sever the bond between the ice and the surface, whereby ice of a given thickness is formed and stopping the severing of said bonds in the event that an excess thickness of ice is gauged.

3. A method for making ice comprising the steps of: flowing a thin film of water over a refrigerated surface to form a thin sheet of ice thereon; gauging the thickness of the sheet of ice to detect any excess ice thickness; exerting a compressive force on the ice sheet to remove same from the refrigerated surface; and preventing the exertion of compression forces on the ice sheet when an excess ice thickness has been detected.

4. In a machine for making ice, the combination of: an ice accumulating surface; means to refrigerate said surface; means for distributing water over the surface to form ice thereon; means removing the formed ice from said surface; and means operatively associated with said removing means for detecting any excess ice thickness to deactivate said removing means.

5. In a machine for making ice, the combination of: a cylindrical surface; means to refrigerate said surface; means for distributing water over the surface to form ice thereon; an ice removing blade passing over said cylindrical surface to remove the ice formed thereon; and a detector member controlling the movement of said blade, said detector member continuously measuring the maximum allowable thickness of ice formed on said surface.

6. Apparatus as in claim 5 in which the ice removing blade exerts a compressive force on the ice.

7. Apparatus as in claim 6 in which the detector member moves with said blade.

8. In a machine for making ice flakes the combination of: a cylindrical ice accumulating surface; means for distributing water over the surface to form ice thereon; an ice removing blade arranged to move over said surface to remove the formed ice therefrom; and a detector member mounted to move with said ice removing blade, said detector member moving at a fixed distance from said surface whereby an excess thickness of ice on

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said surface will cause the detector member to be deflected causing said removing blade to stop.

9. In an ice flake forming machine having an ice forming surface and means for removing the ice from said surface in a flake form, apparatus for regulating the operation of said machine, said apparatus comprising: a detector member mounted to move at a fixed distance from the ice forming surface; a support for said detector member; a pivot connection between said detector member and said support; a switch actuating member on said support engaged by said detector member when said detector member is in operative position; and a switch in an electrical circuit supplying power to the machine, said switch being actuatable by said switch actuating member, whereby upon release of said member from engagement with said detector member, the machine is stopped.

10. Apparatus as in claim 9 in which said switch actuating member comprises a pin spring biased into switch activating position.

11. Apparatus as in claim 10 in which said pin is notched, and said detector member has a portion en-

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gaging said notch to retain the pin against the biasing action of the spring.

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