United States Patent

Linstromberg

[15] **3,648,476**

[45] **Mar. 14, 1972**

[54] CLUTCH FOR DOMESTIC ICE MAKER WITH DEFROST TIMER DRIVE MOTOR

[72] Inventor: **William J. Linstromberg,** Evansville, Ind.

[73] Assignee: **Whirlpool Corporation**

[22] Filed: **June 18, 1970**

[21] Appl. No.: **47,518**

[52] **U.S. Cl.** **62/137,** 62/234, 192/56

[51] **Int. Cl.** **F25d 21/00**

[58] **Field of Search** .....62/137, 233, 234; 222/56; 221/10, 13; 192/56 X; 64/30 R

[56] **References Cited**

UNITED STATES PATENTS

3,541,806	3/1970	Jacobs	62/233
3,529,430	9/1970	Bauerlein	62/137
3,315,483	4/1967	Donahue, Jr.	62/137
3,449,919	6/1969	Fox	62/233 X
3,446,923	5/1969	Voland et al.	62/233 X

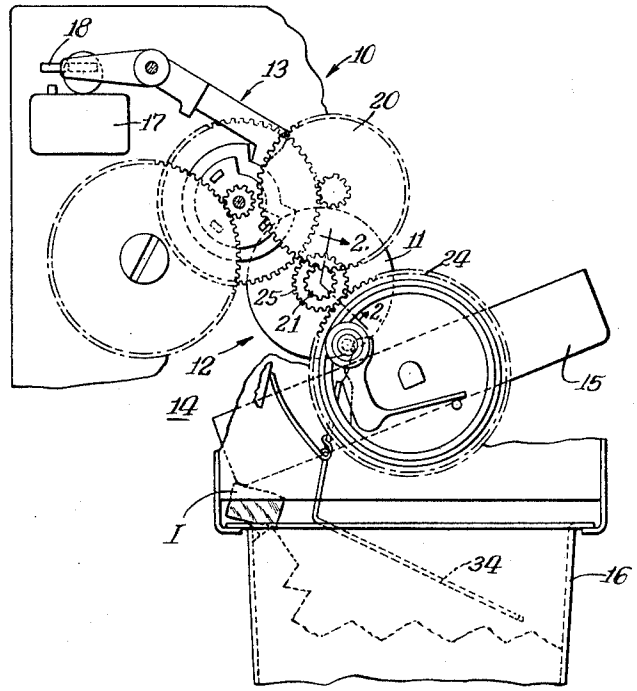
Primary Examiner—William E. Wayner

Attorney—James S. Nettleton, Thomas E. Turcotte, Burton H. Baker, Gene A. Heth, Franklin C. Harter, Anthony Niewyk, Robert L. Judd and Hofgren, Wegner, Allen, Stellman & McCord

[57] **ABSTRACT**

A control means for use in a refrigeration apparatus permitting the use of a single motor for driving both a defrost control mechanism and an ice maker control mechanism. The control means includes a slip clutch permitting the motor to continue to drive the defrost timer mechanism notwithstanding a stoppage of the ice maker mechanism, such as by jamming thereof.

7 Claims, 3 Drawing Figures



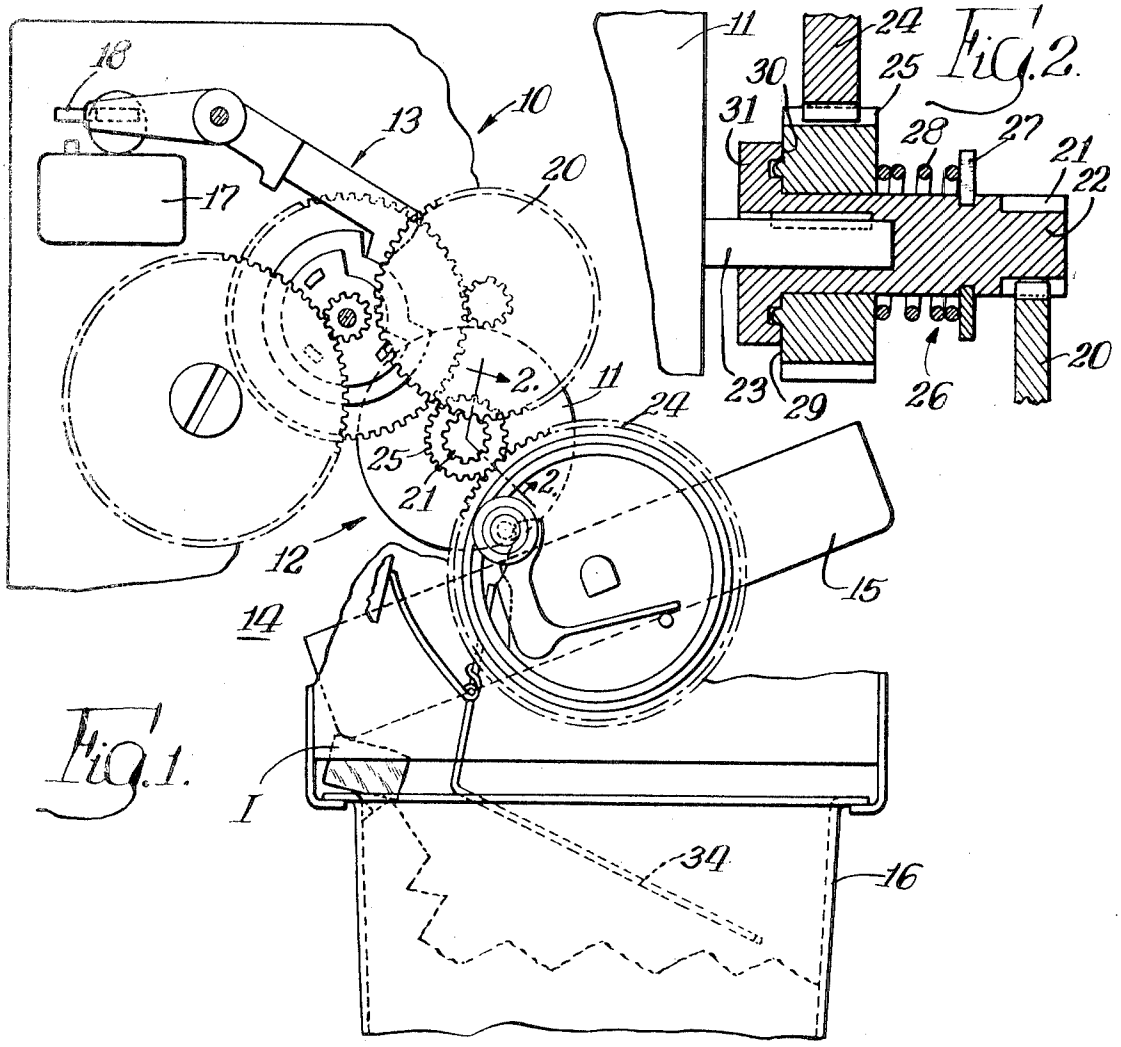


Fig. 1.

Fig. 2.

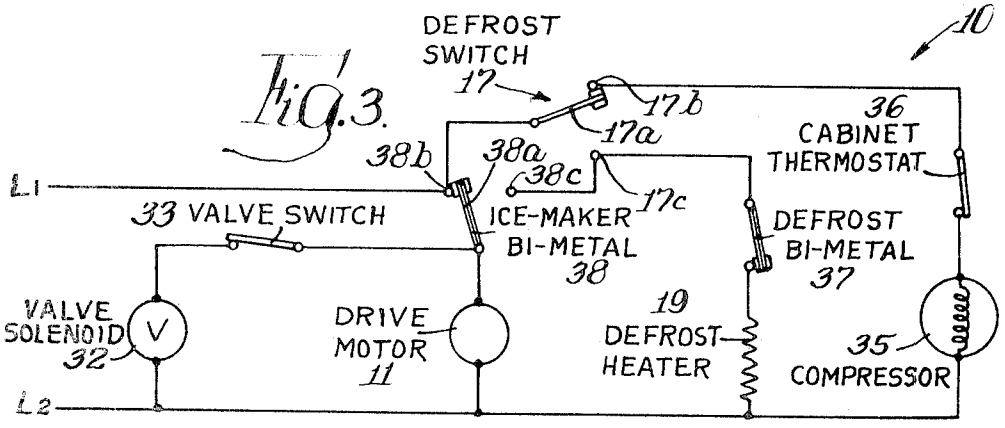


Fig. 3.

Inventor:-
William J. Linstromberg.
By Hofgren, Wegner, Allen, Stellman & McCord Attys.

CLUTCH FOR DOMESTIC ICE MAKER WITH DEFROST TIMER DRIVE MOTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to refrigeration apparatus and in particular to control means for use therein utilizing a single motor both as a defrost control timer and an ice maker drive means.

2. Description of the Prior Art

In conventional refrigeration apparatus such as frostless type refrigerators provided with means for making and harvesting ice bodies, a synchronous timing motor is provided to control the ice body forming and harvesting operations. Conventionally additional means are provided for cyclically defrosting the refrigeration apparatus. Such defrost control means conventionally include a second timer motor. Such provision of both the ice body maker motor and separate defrost timer motor is relatively expensive.

It has been proposed to provide a single drive motor for controlling both the ice body making and harvesting operation and the defrost timing operation. A problem arises, however, in the use of such a single drive motor in that at times the ice making mechanism may become jammed such as by an ice body becoming lodged between parts of the mechanism. Such a jammed condition would undesirably stop the drive motor so as to prevent proper operation of the defrost mechanism which requires a substantially continuous drive to function as a timer for effecting preselected cyclical defrosting operations.

SUMMARY OF THE INVENTION

The present invention comprehends an improved refrigeration apparatus control utilizing a single drive motor for controlling both the ice body making and harvesting operation and the defrost timing operation.

The control includes means for permitting continued operation of the drive motor notwithstanding a jamming or other stoppage of the ice making mechanism which would otherwise tend to stall the motor. More specifically, the invention comprehends providing a suitable clutch in the means for driving the ice making and harvesting mechanism from the drive motor to break the driving connection from the drive motor in the event of such stoppage.

The control is extremely simple and economical of construction while yet providing the highly desirable features discussed above.

BRIEF DESCRIPTION OF THE DRAWING

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

FIG. 1 is a fragmentary front elevation of a refrigeration apparatus control mechanism embodying the invention;

FIG. 2 is a fragmentary enlarged section substantially along the line 2—2 of FIG. 1; and

FIG. 3 is a schematic wiring diagram of the electrical circuitry of the control mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, a refrigeration apparatus generally designated **10** is shown to comprise a drive motor **11**, a first control mechanism generally designated **12** for cyclically controlling the making and harvesting of ice bodies, and a second control mechanism generally designated **13** for periodically effecting defrosting of the refrigeration apparatus **10**. Apparatus **10** may be mounted within a space generally designated **14** such as a freezing compartment of a combination frost-free type refrigerator-freezer apparatus. The ice bodies generally designated I are conventionally formed in a suitable mold **15** which is suitably acted upon and manipulated to effect a harvesting of the ice bodies therefrom into a subjacent collecting bin **16**, as shown in FIG. 1 of the drawing. An excellent example of such a mechanism **12** is disclosed in Frohbieter U.S. Letters Pat. No. 3,382,682 owned by the assignee hereof, to which patent reference may be had for a detailed description of the ice body making and harvesting mechanism.

Defrost control mechanism **13** is schematically shown in FIG. 1 to include a control switch **17** adapted to be periodically operated by a suitable actuator **18** of mechanism **13** to energize an electric defrost heater **19** for effecting the desired defrosting of apparatus **10**. Such a defrost timer control mechanism is disclosed in detail in copending application of Linstromberg et al., Ser. No. 46,921, **filed June** 17, 1970, owned by the assignee hereof, and to which patent application reference may be had for a detailed description of mechanism **13**.

For purposes of understanding of the present invention, it need merely be understood that defrost mechanism **13** includes an input drive gear **20** meshing with a pinion **21** of a shaft extension **22** fixed to the output shaft **23** of the drive motor **11** whereby control mechanism **12** is directly driven by motor **11**. Ice making and harvesting mechanism **12** includes an input drive gear **24** meshing with a pinion **25** rotatably coaxially mounted on shaft extension **22**. Pinion **25** is driven directly with shaft extension **22** under normal circumstances by means of a slip clutch **26** including a backup ring **27** fixed on the shaft extension **22** forwardly of pinion **25**, and a coil spring **28** extending coaxially between pinion **25** and backup ring **27**, as shown in FIG. 2. Spring **28** urges a rear face **29** of pinion **25** against a forwardly facing shoulder **30** of an annular enlargement **31** at the rear end of shaft extension **22** to provide a frictionally locked connection of the pinion **25** to shaft extension **22**.

In normal operation ice making and harvesting mechanism **12** controls apparatus **10** to form ice bodies in mold **15** as by the delivery of water thereto for freezing therein within refrigerated chamber **14**. Thus, control mechanism **11** includes a suitable water valve operated by electric solenoid **32** (FIG. 3) controlled by a water fill valve switch **33**. Control mechanism **12** further includes means for sensing the level of ice bodies collected in bin **16**, illustratively comprising a sensing arm **34** which periodically sweeps through collecting bin **16**. In the event that the level of collected ice bodies is below a preselected full level, control mechanism **12** continues to operate under the driving force of motor **11** to deliver ice bodies from mold **15** and to form a subsequent batch of ice bodies in mold **15** upon suitable water delivery through the water valve. In the event that the level is at the preselected full level, sensing arm **34** operates control mechanism **12** to prevent further making and harvesting of ice bodies by breaking the driving connection between gear **24** and ice mold **15**. Drive motor **11** continues to drive gear **20** for timing the defrost operation.

However, should the operation of control mechanism **12** be stopped because of other reasons such as jamming of mold **15** (as by ice body I illustrated in FIG. 1), the drive from gear **24** is not so broken and, thus, if it were not for the slip clutch **26** the stopping of mechanism **12** would stall motor **11** thereby preventing continued driving of gear **20** and mechanism **13**. Slip clutch **26** is arranged to permit gear **24** and pinion **25** to be stalled while yet motor **11** may continue to drive gear **20** thereby maintaining the timing functioning of drive motor **11** relative to defrost mechanism **13**.

As shown in FIG. 3, refrigeration apparatus **10** includes a conventional compressor motor **35** controlled by conventional cabinet thermostat **36** in series with defrost switch **17** for refrigerating space **14** to a preselected low freezing temperature. Defrost switch **17** may comprise a single pole, double throw switch having a moving contact **17*a*** selectively engageable with a first fixed contact **17*b*** connected to cabinet thermostat **36**, and a second fixed contact **17*c*** connected to a single pole defrost bimetallic switch **37** in series with defrost heater **19**. Moving contact **17*a*** may be connected to one power supply lead L1 and the other side of defrost heater **19**

and compressor **35** may be connected to the other power supply lead L2. A bimetallic ice maker switch generally designated **38** may include a moving contact **38***a* connected to drive motor **11**, a first fixed contact **38***b* connected to power supply lead L1 and a second fixed contact **38***c* connected to contact **17***c* of switch **17**.

Drive motor **11** runs substantially continuously as discussed above to provide a desired timing functioning in controlling defrost mechanism **13**. When switch **17** is thrown from the position of FIG. **3** to engage moving contact **17***a* with fixed contact **17***c* thereby deenergizing compressor motor **35** and energizing defrost heater **19**, drive motor **11** continues to be energized through switch **38**. In the event that the temperature within space **14** rises above a preselected high temperature, switch **38** is thrown to engage moving contact **38***a* with fixed contact **38***c*. Under such high temperature conditions which would prevent forming of ice bodies in mold **15**, frosting of the apparatus normally does not occur and, thus, need for continuous timed defrost sequence at this time is obviated.

Thus, under normal cycling conditions of mechanism **12**, operation of water fill valve switch **33** is prevented when the level of ice bodies in the bin **16** reaches the full level without requiring the stoppage of drive motor **11**. Under such circumstances, clutch **26** is not brought into play as gear **25** may rotate with shaft extension **22**. However, when gear **25** is stopped as by a jamming of mechanism **12**, clutch **26** permits the continued driving of gear **20** in the novel and simple manner discussed above.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

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

1. In a refrigeration apparatus having means for making and harvesting ice bodies, control mechanism comprising: first control means for cyclically controlling the making and harvesting means to effect making and harvesting of ice bodies; a drive motor; second control means for periodically effecting defrosting of said apparatus; means connected to said drive motor for positively driving said second control means; and safety means for yieldingly driving said first control means from said drive motor to permit continued timing of the defrosting cycles notwithstanding a stoppage of said first control means.

2. The refrigeration apparatus control mechanism of claim **1** wherein said last named means includes a spring biased clutch intermediate said drive motor and said first control means.

3. The refrigeration apparatus control mechanism of claim **1** including an output pinion driven by said motor, said pinion directly driving said second control means and driving said first control means through a slip clutch.

4. The refrigeration apparatus control mechanism of claim **1** wherein said drive motor is provided with an output shaft; a first pinion fixedly carried by said shaft for driving said second control means, a second pinion carried by said shaft for driving said first control means, and said safely means comprises a slip clutch releasably driving said second pinion with said shaft.

5. In a refrigeration apparatus having a water fill valve and a defrost heater, control means comprising:

a continuously operating drive motor;

first means operated by said motor for operating said heater periodically to defrost said apparatus;

second means operated by said motor for periodically opening said valve, slip clutch means for permitting said motor to continue to drive said first means notwithstanding a stoppage of said second means.

6. The refrigeration apparatus control means of claim **5** wherein said heater comprises an electric heater and said first means includes a switch for controlling electrical energization of said heater.

7. The refrigeration apparatus control means of claim **5** wherein said valve includes an electric solenoid operator and said second means includes a switch for controlling electrical energization of said solenoid.

* * * * *