June 13, 1933. L. H. VOLD 1,914,055

AUTOMATIC CUT-OUT FOR DEFROSTING DEVICES

Filed March 1, 1932 2 Sheets-Sheet 1

FIG. 1.

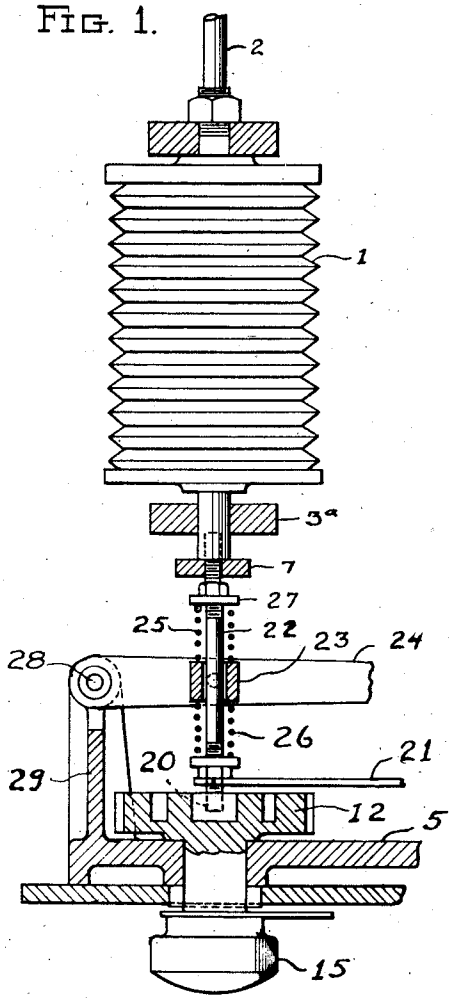


FIG. 2.

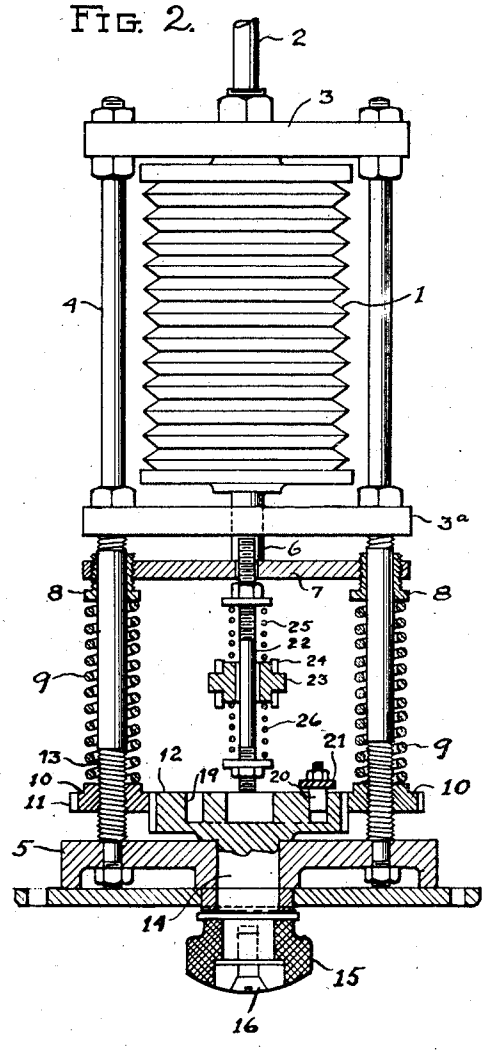


FIG. 3.

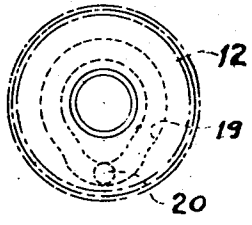
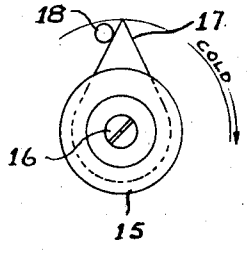


FIG. 4.



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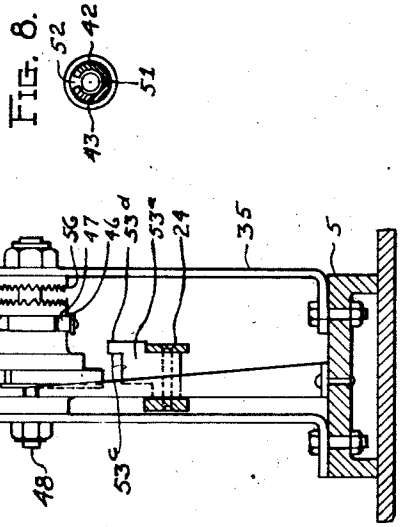


FIG. 7.

FIG. 8.

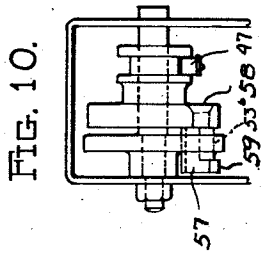


FIG. 10.

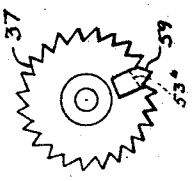


FIG. 9.

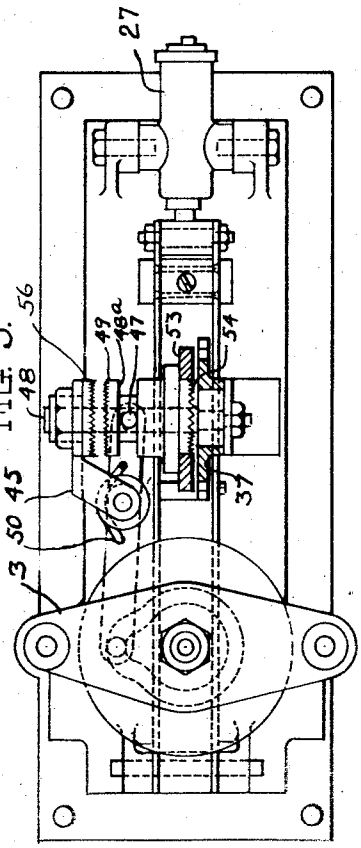


FIG. 5.

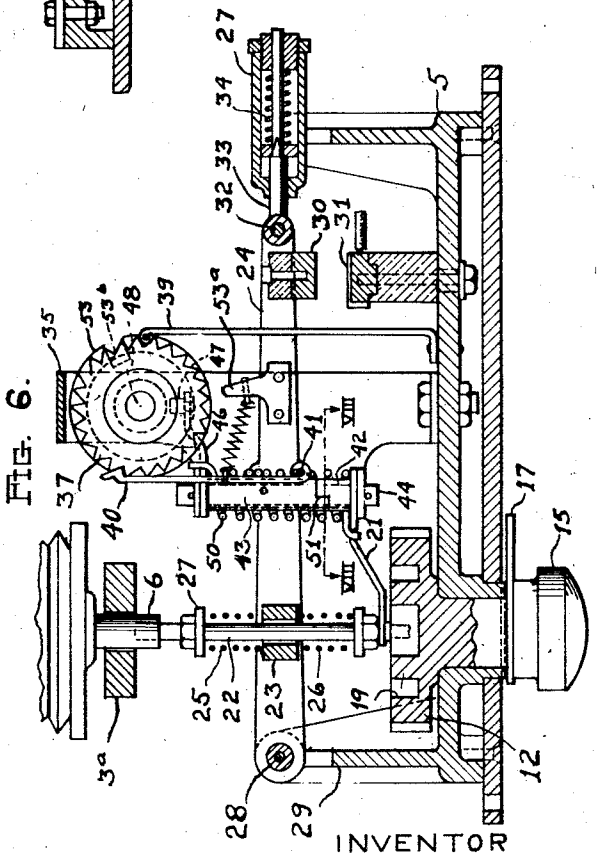


FIG. 6.

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AUTOMATIC CUT-OUT FOR DEFROSTING DEVICES

Application filed March 1, 1932. Serial No. 595,995.

This invention relates to control systems for household refrigeration and more particularly to mechanism controlling the automatic defrosting of the freezing chamber at periodic intervals, and it is among the objects of the invention to provide control mechanism of the above designated character which shall function to automatically prevent defrosting during periods of abnormally cold settings of the control dial and again render defrosting effective when the control is reset to normal.

A further object of the invention is the provision of simple and reliable mechanism which shall be adapted to automatically coordinate the function of the defrosting cycle with the control for varying the low temperature setting of the freezing unit in such manner that the defrosting mechanism is temporarily rendered inoperative until the setting is again brought to normal.

In my Patent No. 1,833,544, granted November 24, 1931, I have disclosed a defrosting mechanism which functions periodically to automatically interrupt the freezing unit for a period to allow for the defrosting of the freezing element and the present invention embodies substantially the same mechanism as described in my patent modified in structure to render it operative for the purpose hereinbefore stated.

Modern refrigerating units for household use are equipped with control for varying the freezing capacity of the refrigerator unit from normal to abnormal settings whereby the temperature may be temporarily lowered to an abnormal condition for rapid freezing of foods such as frozen puddings or the like, and after such abnormal freezing operation the control member is again set to normal operating temperature. Many modern household refrigeration units are also equipped with defrosting mechanisms which automatically operate at predetermined intervals.

To prevent the operation of the defrosting mechanism during a period at which the control mechanism is set for abnormal freezing, it is necessary to so coordinate the defrosting mechanism with the abnormal temperature control setting that the former will be rendered inoperative during such abnormal setting and to this end I provide the method of control rendered effective through the apparatus disclosed in the accompanying drawing constituting a part hereof, in which like reference characters designate like parts and in which Figure 1 is a side elevational view partly in section of an expanding bellows and control dial embodying the principles of this invention; Figure 2 an end elevational view thereof partially in section; Figure 3 a front elevational view of a gear wheel embodying a cam which is actuated by the dial shown in front elevation in Figure 4 of the drawing; Figure 5 a top plan view of the defrosting switch and control mechanism; Figure 6 a side elevational view thereof; Figure 7 an end elevation of the structure shown in Figure 5; Figure 8 a cross sectional view of a clutching mechanism shown in Figures 5 and 6; Figure 9 a front elevational view of a notched ratchet wheel; and Figure 10 a side elevational view of a modified form of clutch employing the ratchet wheel of Figure 9.

With reference to Figures 1 to 4 inclusive of the drawing, the structure therein illustrated comprises a bellows 1 which is subjected to the pressure of the gases in the freezing coils of the refrigerator unit to which it is connected by pipe 2 in the usual manner, the bellows being secured in yokes 3 and 3a which are rigidly held by tie bolts 4 to a base plate 5.

The bottom of bellows 1 is provided with a stem that rests against a movable abutment 7 which is supported by adjusting nuts 8 on the tie rods 4 having screw threaded engagement with member 7. Coil springs 9 are disposed between the adjusting nuts 8 and pinions 10 the teeth 11 of which interact with the teeth of a gear wheel 12, the pinions 10 being in screw thread engagement with the threads 13 of the tie rods 4.

The gear wheel 12 has a shank 14 extending through the base member 5 on the end of which is secured an adjusting dial 15, the dial being fastened by a counter-sunk screw 16 and being provided with an indicator 17.

The dial indicator 17 abuts against a stop pin 18 which is its normal position as shown in Figure 4 of the drawing, and it is rotatable through an angle of substantially 360° to vary the abnormal setting of the freezing unit in a manner to be hereinafter explained.

The gear wheel 12 when subjected to angular movement by the dial 15, rotates pinions 10 and causes them to move axially on the tie rods 4 by virtue of their threaded connections with the screw elements 13 thereby varying the degree of compression of coil springs 9 and effecting a corresponding decreased pressure on the bellows when dialing in the direction for cold setting on dial 15.

Gear wheel 12 is provided with a cam groove 19 in which a pin or follower 20 is operatively disposed, the pin being secured to a lever 21.

The stem 6 abutting on 7 is threaded to stem 22 around which is disposed a trunnion member 23, the trunnions of which are engaged by a lever 24, this lever being a switch lever operating an electric contact to start the motor at the high pressures in the cooling coil, and the switch lever 24 is rendered operative when the pressure of springs 9 is overcome by the pressure in the bellows through member 7.

Springs 25 and 26 serve to store energy to snap lever 24 when bellows 1 expands under high pressure to overcome the restraining effect of a spring box 27, Figures 5 and 6, in the high or low position of lever 24. Lever 24 is pivotally supported at 28 to an upright 29 which may constitute an integral part of the base member 5.

With reference to Figures 5 to 10 inclusive of the drawing, lever 24 is shown as provided with an electrical contact 30 that is in alinement with a stationary contact 31. The contacts 30 and 31 constitute the terminals of an electrical motor circuit which when closed energizes the circuit to operate the motor of the freezing unit. The end of lever 24 is pivoted at 32 to a plunger 33 around which is disposed a coil spring 34 which is contained in the spring box 27 to store up energy to prevent tripping of lever 24 for minor variations of pressure in the bellows 1, thus rendering the switch mechanism operative within predetermined limits of pressure in the bellows.

Mounted on the base 5 is an upright 35 carrying a stud shaft 48 on which is mounted a ratchet wheel 37. A spring arm 39 is fastened to the base 5 and constitutes a fixer for the ratchet wheel 37, and a spring arm or pawl 40 is carried by switch lever 24 to engage the teeth of the ratchet wheel, it being pivoted at 41 to the switch lever 24 and is adapted to engage the teeth of the ratchet wheel to rotate it in response to movement of the switch lever.

Lever 21 is provided with a clutch 42 which engages a clutch 43, both clutches being centered on a pin 44 carried by a bracket 45, Figure 5. Clutch 43 is provided with a lever 46 carrying a pin 47 loosely fitted in a groove 48*a* of a double clutch designated at 49.

Around clutches 42 and 43 is centered a torsion spring 50 which connects levers 21 and 46 under the tension of the spring to cause the jaw clutches 42 and 43 to bear on each other at 51 leaving a free space 52 as shown in Figure 8, which is a cross section through the clutch mechanism taken along the lines VIII—VIII of Figure 6.

Attached to the double tooth clutch 49 is a disc 53 constituting an abutment for a prong 53*a* of the switch lever 24 to limit the movement of the lever in the upward direction, the disc 53 being attached to the double tooth clutch 49 which engages a tooth clutch 54 of the ratchet wheel 37, Figure 5. The ratchet wheel 37 by its connection with pawl 40 is rotated, tooth by tooth, as the switch lever 24 snaps to and from the make and break positions of the electric contacts 30 and 31.

56 designates a holding clutch that engages clutch 49 when levers 21 and 46 are operated under the influence of cam 19 in the gear wheel 12 in response to adjustment of the dial 15 when it is set for abnormal freezing position. The tooth clutches 49, 54 and 56 all have the same number of teeth as the ratchet wheel 37.

The disc 53 has a notch shown in dotted lines at 53—*b* which forms an abutment for the prong 53—*a* to cause defrosting of the freezing unit, since when the prong 53—*a* is elevated to the position of notch 53—*b*, a higher pressure must be built up in the bellows 1 to depress the lever 24 against the tension of the spring box 24 to effect contact of terminals 30 and 31 which close the motor circuit.

The clutches 49, 54 and 56 are centered on the pin or shaft 48 held in the upright frame 35. The ratchet wheel 37 is journaled on shaft 48.

With reference to Figure 7 of the drawings, the prong 53—*a* is shown as provided with a projection 53—*d*, the inner face 53—*c* of which is in alinement with the face 49—*a* of the double clutch 49 so that when prong 53—*a* enters the notch 53—*b* it will prevent the disengagement of clutch 49 and clutch 54 until defrosting is completed and lever 24 is snapped down to close contacts 30 and 31.

The off-set prong 53—*c* engaging the shoulder 49—*a* of the clutch prevents defrosting during the period of cold setting of the dial when such setting occurs during the defrosting period. Should notch 53—*b* by any chance be in position for defrosting during cold setting, projection 53—*d* will seat on 49—*c*, thus preventing defrosting.

If the dial 15 is swung to abnormal cold setting during the defrosting period, lever 21 will swing over through the action of the cam slots 19 setting up torsional spring 50 causing a gap at 51 between faces of clutches 42 and 43 and closing gap at 52. When lever 24 snaps after defrosting, which in this case would not be so complete since the tension of the springs 9 is lower on account of the cold setting of the dial, the clutch 49 is free to disengage clutch 54 and snap into holding clutch 56 under tension of the torsion spring 50. The clutch 49 with abutment 53 will then remain stationary.

Figures 9 and 10 show a modified form of ratchet construction in which the notch 53—*b* is provided in a sliding block 57 and fastened to 58 instead of in a separate abutment as the disc 53 of Figure 5, and its operation is substantially the same as where the notch is provided in the disc. 59 is in the shape of a tooth in the ratchet wheel and is adapted to come in line with teeth in the ratchet wheel to form a continuous ratchet wheel when 58 is snapped over during cold setting by lever 46.

The operation of the herein described mechanism is briefly as follows:

The dial in Figure 4 is shown in position for normal refrigeration and in this position of the dial, the adjusting nuts 8 are set to effect correct tension on the coil springs 9 for the desired normal pressure in the cooling coils and bellows at which the motor will be rendered operative to maintain normal freezing temperature in the refrigerating unit. By rotating the dial 15 in the direction of the arrow, Figure 4, the gear wheel 12 will subject pinions 10 to movement about their screw threaded seats with the threads 13 and lower the pressure of springs 9 thereby rendering the bellows effective to actuate the switch lever 24 to start the motor at lower pressures in the cooling coil resulting in lower temperatures.

When the dial is adjusted to the lower temperature condition, the pin 20 in the cam slot 19 will actuate lever 21 and through spring tension of coil spring 50 will shift the double jaw clutch 49 to the position of the holding clutch 56, and in this position periodic defrostation will not take place since the member 53 is not rotated by ratchet wheel 37, clutches 49 and 54 being disconnected and extension 53—*d* seats on 49—*c*, Figure 7.

When the dial is again set to normal, clutch 49 will disengage clutch 56 and engage the clutch 54 causing 53 to rotate with the ratchet wheel 37 again bringing notch 53—*b* periodically in position for defrosting by permitting the distance of travel of the switch lever 24 which will snap the spring box 34 to a position to require a building up of pressure beyond the normal amount to again effect contact of members 30 and 31 to energiz the motor.

Similarly, if the switch lever 24 is set to the defrosting position by virtue of prong 53—*a* engaging the notch 53—*b* of disc 53, the face 53—*c* of the off-set prong will engage the shoulder 49—*a* of clutch 49 to prevent its disengagement from clutch 54 until after defrosting has been completed. The dial 15 may, however, be set for the colder abnormal temperature setting on account of the lost motion set up through the torsion spring 50 so that when defrosting is completed, clutch 49 will snap to the holding position of clutch 56 to render the switch lever 24 operative in response to lower pressure caused by the lower tension of coil springs 9 against the movement of the bellows 1.

Although one embodiment of the invention has been herein illustrated and described, it will be obvious to those skilled in the art that various modifications may be made in the details of construction without departing from the principles herein set forth.

I claim herein as my invention:

1. A cut out mechanism for refrigerator control units comprising means operative by and responsive to variation of pressures in the freezing chamber for periodically defrosting the walls of said chamber, a control mechanism for setting the operating mechanism for abnormal freezing conditions, said control mechanism being inoperative for effecting abnormal cold setting when said defrosting mechanism is in its defrosting position.

2. A cut out mechanism for preventing defrosting of refrigerator units during abnormal cold setting of such unit comprising in combination with a defrosting mechanism operative periodically in responsive to variations of pressure in the refrigerating chamber, of mechanism for effecting abnormal cold setting of the refrigerator unit, means for rendering said defrosting mechanism inoperative during cold settings of said operating mechanism, and means for maintaining the control mechanism in its operative position when set for abnormal freezing if and when said defrosting mechanism is brought to its normal defrosting position.

3. In a refrigerating unit, the combination of a bellows adapted to expand and contract in response to pressure variations in the refrigerating chamber, said bellows having a communicating connection with said chamber, of a switch mechanism actuated by said bellows in response to variations in said pressures, means for varying the pressures at which such bellows will render said switch operative, a ratchet mechanism adapted to be actuated by said switch, an abutment for said switch lever adapted to be rotated by said ratchet, a notch in said abutment which is adapted to subject the switch lever to abnor-

mal movement when in register therewith, a dial for effecting abnormal setting of the refrigerator unit, a clutch mechanism operative by said dial to bring said lever abutment into and out of alinement with said switch lever, and means for preventing rotation of said lever abutment when said dial is set for abnormal freezing position.

4. In a control mechanism for refrigerator units, the combination with a rotatable abutment for a switch lever, of means for rendering said abutment rotatable in response to movement of said lever, and means for preventing such rotation, said last named means comprising a control for effecting abnormal setting of the freezing unit.

In testimony whereof I have hereunto set my hand.

LARS H. VOLD.