Jan. 2, 1940. C. W. KUHN 2,185,814

CONTROL DEVICE

Filed Feb. 7, 1935

Fig. 1

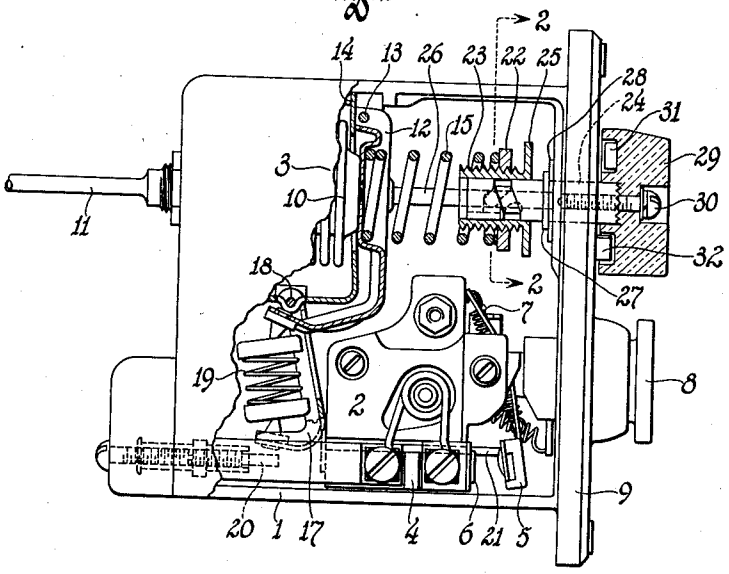


Fig. 2

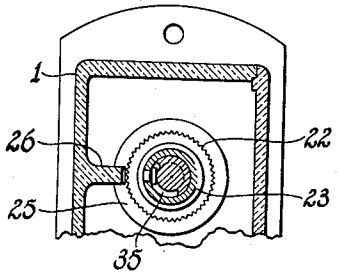


Fig. 3

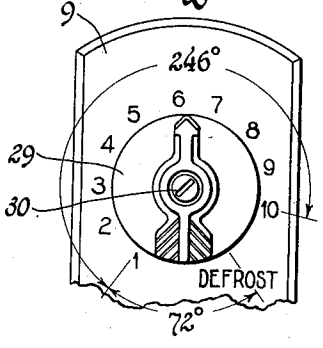


Fig. 4

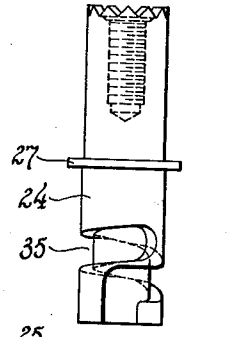


Fig. 5

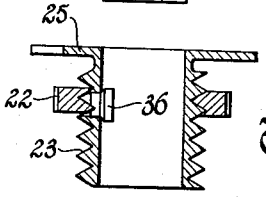
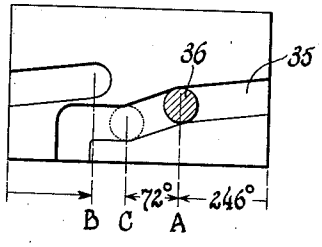


Fig. 6



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2,185,814

CONTROL DEVICE

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Application February 7 1935, Serial No. 5,364

2 Claims. (Cl. 200—83)

This invention relates to control devices for apparatus such as electric refrigerators, and more particularly to range adjusting mechanisms for such devices.

Control devices for electric refrigerators are commonly provided with a loading spring for controlling the cycles of operation of the refrigerator. The loading spring is usually shop adjusted to provide predetermined normal cycles of operation of the refrigerator and is also usually provided with a range adjusting mechanism to enable the user to effect modification of such cycles. It is desirable that the range adjusting mechanism be operable to modify the cycles of operation so as to provide for operation of the refrigerator at various refrigerating temperatures and also at temperatures which are sufficiently high to effect defrosting. Also in order to facilitate indication of the setting of the range adjusting mechanism it is desirable that the same be provided with an adjusting knob or lever which is rotatable through an angle of less than 360 degrees to effect all aforementioned temperature settings.

Heretofore it has been attempted to effect adjustment of the loading spring by means of a screw of uniform pitch, but in some instances the desired range of adjustment could not be obtained by a single revolution of the control knob without resort to a screw of objectionable pitch, whereas in other instances it is desirable to effect widely varying degrees of adjustment of the loading spring by the adjusting knob or lever upon equal degrees of movement of the latter in different parts of its range.

The present invention has among its objects to provide an improved range adjusting mechanism for control devices of the aforesaid character which provides for adjustment of the loading spring in a manner to meet the aforementioned requirements.

Another object is to provide a range adjusting mechanism of the aforesaid character which is of simple, rugged and inexpensive construction.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that the embodiment illustrated may be modified in various respects without departing from the spirit and scope of the appended claims.

In the drawing,

Figure 1 is a side view of a refrigerator control device embodying the invention, a portion of the enclosing casing being broken away and portions of the operating mechanism being shown in section;

Fig. 2 is a fragmentary sectional view taken substantially on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary front elevational view of the device shown in Fig. 1;

Figs. 4 and 5 are detail views of certain of the adjusting parts shown in Fig. 1, the parts illustrated in Fig. 5 being shown in section, and

Fig. 6 is a developed view of a cam portion on the adjusting part shown in Fig. 4.

Referring to Fig. 1, the invention is shown in connection with a refrigerator control device of the type shown in my copending application Serial No. 708,804, filed January 29, 1934, but it may be used in connection with control devices of other types.

Briefly, the refrigerator control device shown in Fig. 1 includes a box enclosing casing 1 having a switch unit 2 and a fluid condition responsive device 3 mounted therein. Said switch unit includes an insulating base 4 which carries a pivoted bridging contact element 5 and a pair of cooperating stationary contacts, one of which is illustrated at 6. Contact element 5 is movable with a snap action into and out of engagement with its cooperating stationary contacts by an over-center spring 7, said spring being operatively connected to an operating knob 8 slidably mounted within an opening in the front wall 9 of casing 1. The switch unit 2 also has a free tripping overload mechanism associated therewith which acts under overload conditions to move contact element 5 into open position through the medium of the spring 7 and which is resettable by the knob 8. However, the overload mechanism need not be considered for the purpose of this application.

The fluid condition responsive device 3 includes a bellows 10 secured to the rear wall of casing 1 and having a communicating pipe extension 11 on the rear end thereof. The pipe 11 may be connected to the low pressure side of the refrigerator to provide for operation of the bellows by pressure in that part of the apparatus, or it may contain an expansible gas and be arranged at a point contiguous to the refrigerating apparatus where the temperature and consequently the pressure within the pipe and bellows varies in accordance with operations of the refrigerator.

The front end of bellows 10 bears against a vertically arranged lever 12, pivoted at 13 upon a bracket 14 fixed within the casing 1. A coil spring 15 engages lever 12 to oppose expansive movements of the bellows 10 and said lever has a snap operating mechanism associated therewith for moving bridging contact 5 into and out of circuit closing position. Such operating mechanism includes a lever 17 pivoted at 18 upon bracket 14 and an over-center spring 19 which is held under compression between the free ends of levers 12 and 17. Movement of lever 17 is limited in one direction by insulating base 4 and in an opposite direction by an adjustable stop

20 secured to the rear wall of casing 1, and said lever is arranged to operate the movable contact element 5 through the medium of an insulating bar 21 slidably mounted within a recess in insulating base 4.

Upon a decrease in temperature bellows 10 contracts under the action of the spring 15 and for a given low temperature value determined by the setting of spring 15 lever 12 assumes a position wherein the axis of spring 19 is located to the left of pivot 18, whereupon lever 17 is adapted to move with a snap action into the position shown in Fig. 1 to effect opening of the bridging contact 5 against the action of spring 7. Upon an increase in temperature bellows 3 expands against the action of the spring 15 and for a given high temperature value also determined by the setting of spring 15, lever 12 assumes a position wherein the axis of spring 19 is located to the right of pivot 18, whereupon lever 17 moves with a snap action out of the position shown in Fig. 1 into engagement with the stop 20 to permit reclosure of the contact element 5 under the action of spring 7. As is apparent, variation of the degree of compression of spring 15 causes variation of the temperature values at which the contact element 5 is opened and closed, the temperature values at which said contact element is opened and closed being raised by increasing the degree of compression of said spring, and being lowered by decreasing the degree of compression thereof.

Spring 15 is held under compression between lever 12 and a nut 22 which is adjustably mounted upon an externally threaded sleeve 23. Sleeve 23 is slidably mounted upon a rotatable stem 24 and is held against rotation by an enlarged head 25 which is slotted as shown in Fig. 2 to receive a horizontally arranged rib projection 26 formed on casing 1. Stem 24 is rotatably mounted within an opening in the front wall 9 of casing 1 and is held against forward movement by a shoulder 27 thereon which engages a washer 28 bearing against the rear face of said wall. The front end of stem 24 has an adjusting knob 29 secured thereto by a screw 30 and the rear face of said knob is formed to provide a stop 31 which cooperates with a stop projection 32 on the front face of wall 9 to limit rotation of said knob in opposite directions.

The inner end of stem 24 is recessed to provide a cam race 35 for receiving a pin 36 fixed to sleeve 23. As shown in Fig. 6, cam race 35 is shaped to provide spiral portions of different pitch, the portion A—B of said cam race being of relatively slight pitch and extending through an angle of substantially 246 degrees, and the portion A—C being of relatively steep pitch and extending through an angle of substantially 72 degrees.

The aforedescribed range adjusting mechanism is so assembled that when knob 29 is in position 1 (Fig. 3) the angular position of stem 24 is such that pin 36 on sleeve 23 is located intermediate the cam portions A—B and A—C, as shown in full lines in Fig. 6. Nut 22 is then shop adjusted upon sleeve 23 to compress spring 15 to such a degree that the refrigerator is started and stopped at selected temperature values to provide normal cycles of operation thereof.

Upon rotation of knob 29 in a clockwise direction out of position 1 the portion A—B of cam race 35 acts through the medium of pin 36 to move sleeve 23 outwardly and thereby decrease the degree of compression of spring 15. This results in lowering of the temperature values at which the refrigerator is started and stopped, and provides for what is commonly known as cold control of the refrigerator. As is apparent, the portion A—B of the cam race 35 provides for cold control by adjustment of the knob through a relatively wide angle.

Upon rotation of knob 29 in a counterclockwise direction from position 1 into its defrost position (Fig. 3) the portion A—C of cam race 35 moves pin 36 into the dotted line position shown in Fig. 6 and sleeve 23 is thus moved inwardly to increase the degree of compression of spring 15. By increasing the degree of compression of spring 15 the temperature values at which the refrigerator is started and stopped are raised. The portion A—C of the cam race is so designed that only a relatively small angular movement of knob 29 is required to compress spring 15 to a degree which will cause operation of the refrigerator at temperatures sufficiently high to effect defrosting.

As hereinbefore stated, knob 29 has a stop 31 on the rear face thereof which cooperates with a stop projection 32 on the front wall of casing 1 and said stops are arranged to limit rotation of said knob in a counterclockwise direction beyond the defrost position shown in Fig. 3 and in a clockwise direction beyond position 10 shown in this figure.

In connection with the foregoing it should be noted that the invention may be used in connection with control devices of types other than that shown in the drawing. Also it is apparent that the cam adjusting mechanism may be modified to provide loading effects other than those hereinbefore described.

What I claim as new and desire to secure by Letters Patent is:

1. The combination with a refrigerator control device having a loading spring associated therewith, of a cam adjusting mechanism for said spring including a cam element rotatable through a given range and having an adjusting knob associated therewith, said cam element having a cam surface of relatively slight pitch which is effective upon rotation of said element through a major part of its range to adjust said spring for cold control of the refrigerator, and also having a cam surface of relatively steep pitch which is effective upon rotation of said element through the remainder of its range to adjust said spring for defrosting control of the refrigerator.

2. The combination with a refrigerator control device including a thermo-responsive switch having a control part movable in response to temperature variations, of a rotatable cam element movable between given limits, a cam follower associated with said cam, a spring associated with said control part and connected with said cam follower for modifying the action of said switch upon adjustment of said cam element, said cam element having a normal setting adjacent one of its limits and having a cam surface of relatively slight pitch which acts upon movement of said cam element towards its opposite limit to effect cold control of the refrigerator and also having a cam surface of relatively steep pitch which acts upon movement of said cam element into its former limit to effect defrosting control of the refrigerator.

CLARENCE W. KUHN.