

May 5, 1959

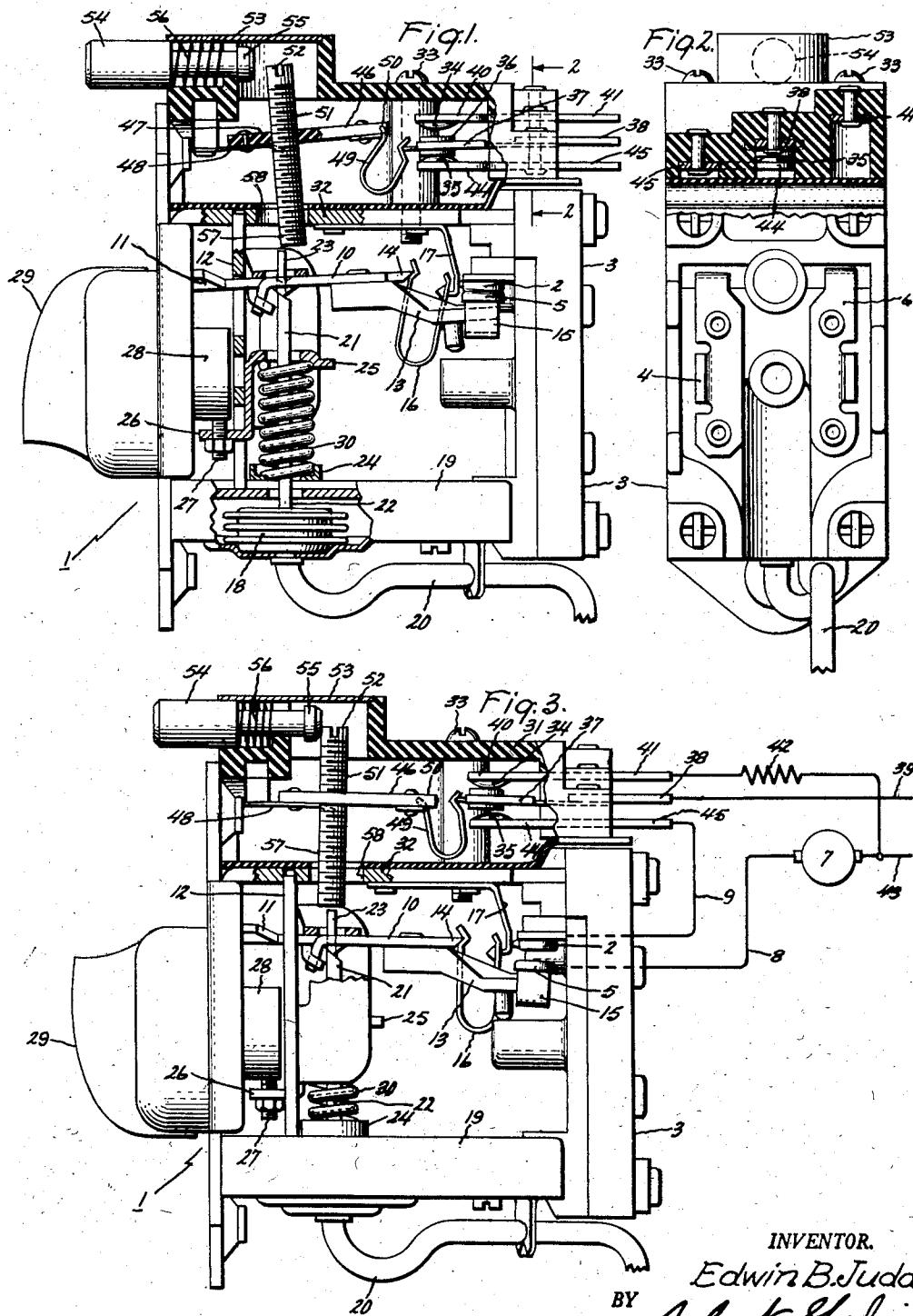
E. B. JUDD

2,885,513

CONTROL DEVICE FOR REFRIGERATION APPARATUS

Filed July 1, 1954

2 Sheets-Sheet 1



INVENTOR.

Edwin B. Judd,

BY

Robert L. Gray
His Attorney.

May 5, 1959

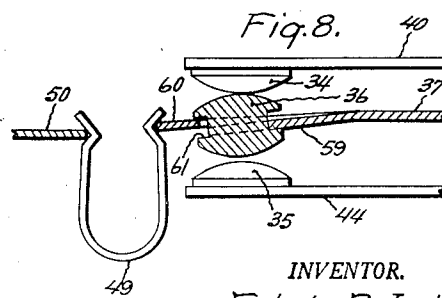
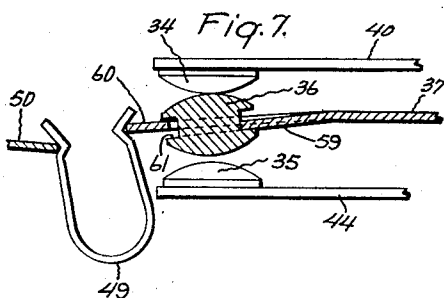
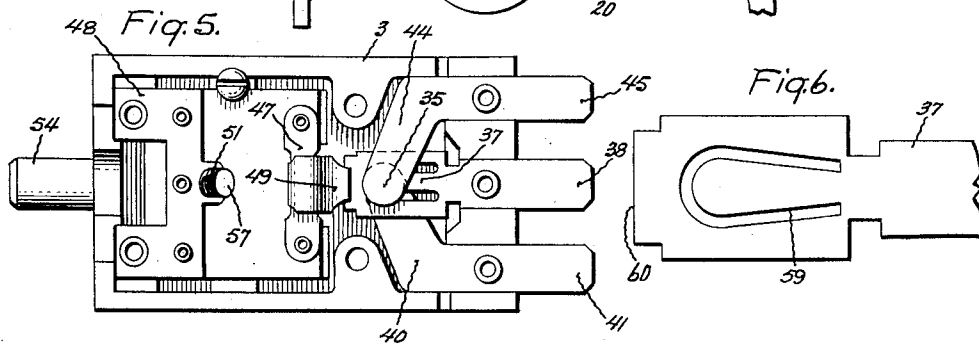
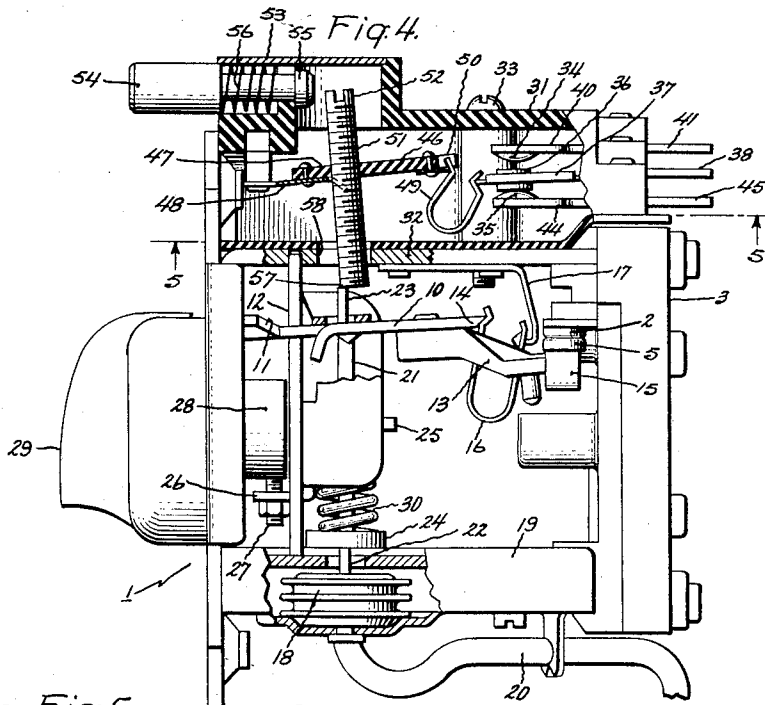
E. B. JUDD

2,885,513

CONTROL DEVICE FOR REFRIGERATION APPARATUS

Filed July 1, 1954

2 Sheets-Sheet 2



INVENTOR.

Edwin B. Judd,

BY

Robert L. Smith
His Attorney.

1

2,885,513

CONTROL DEVICE FOR REFRIGERATION APPARATUS

Edwin B. Judd, Schenectady, N.Y., assignor to General Electric Company, a corporation of New York.

Application July 1, 1954, Serial No. 440,811

16 Claims. (Cl. 200—140)

This invention relates to control devices for refrigeration apparatus and more particularly to devices to control and defrost household type refrigerators.

In the design of domestic household refrigerators, the evaporator is frequently positioned within the main compartment of the refrigerator and serves not only to cool the interior thereof, but also as a small freezing compartment. Such refrigerators are conventionally provided with a control device which automatically energizes the compressor motor when the temperature within the refrigerator rises to a predetermined upper value and subsequently deenergizes the motor when the temperature falls to a predetermined lower value. Such control devices are well known in the art and are commonly referred to as cold controls.

It is well known that there is a tendency for frost to form on the exterior surfaces of the evaporator, this accumulation of frost progressively lowering the efficiency of the unit as the thickness increases since the frost is essentially an insulating blanket surrounding the evaporator. It is therefore necessary, in the interest of efficient operation, that this accumulation of frost be periodically removed. In the past, this has been accomplished by merely turning off the refrigerator and allowing the frost to melt, or in the alternative, the cold control has been provided with an upper temperature setting sufficiently high to permit the frost to melt. In either case however, it is necessary that the cold control be manually reset to the desired temperature after the frost has melted. In order to eliminate this objectionable feature, various devices have been proposed for periodically and automatically removing the frost which has accumulated on the evaporator. In general, these devices accomplish the defrosting operation by providing an auxiliary heating element which when energized will rapidly melt the frost formation from the evaporator. While the automatic defrosting devices have many desirable features, in general they are characterized by their complexity and relatively high cost thus adding appreciably to the overall cost of the refrigerator. Furthermore, many automatic defrosting devices will initiate a defrost cycle at times when it is not needed thus resulting in excessive power consumption. It is therefore desirable to provide a control device for refrigeration apparatus in which defrosting can be initiated manually when needed but automatically terminated without requiring readjustment of the cold control. It is also desirable that the mechanism for manually initiating and automatically terminating defrosting be arranged for utilization with and actuation by a standard cold control device. It is further desirable that such a device be simple, inexpensive, and relatively fool proof.

It is therefore an object of this invention to provide a control device for refrigeration apparatus incorporating the desirable features set forth above.

Further objects and advantages of this invention will become apparent and the invention will be better under-

2

stood by reference to the following description and the accompanying drawing, and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

This invention in its broadest aspects provides a control device for refrigeration apparatus with means for normally controlling the apparatus having first contacts adapted to be connected in circuit with the compressor motor. Thermally responsive means are provided adapted to sense the temperature in the apparatus and arranged to open the first contacts in response to a predetermined lower temperature in the apparatus thereby to deenergize the motor and to close the contacts in response to a predetermined upper temperature thereby to reenergize the motor. Means for defrosting the apparatus are providing having second contacts also adapted to be connected in circuit with the motor. Manually actuated means are provided arranged to open the second contacts thereby to deenergize the motor and initiate a defrosting cycle, and means actuated by the thermally responsive means are provided arranged to close the second contacts in response to another predetermined upper temperature in the apparatus thereby terminating the defrosting cycle and permitting the first contacts to control the motor. If desired, third contacts may be provided connected in circuit with an auxiliary heater for rapidly melting the frost, these third contacts being closed by the manually actuated means at the time the second contacts are opened and conversely opened at the time the second contacts are closed.

In the drawing, Fig. 1 is a side elevation view of the improved control device of this invention, partly in section, showing the normal position of the defrosting section;

Fig. 2 is an end view, partly broken away, of the device of Fig. 1;

Fig. 3 is a side elevational view, partly in section, showing the defrosting section of the device in its defrosting position and also schematically showing the connections to the compressor motor and auxiliary heating element;

Fig. 4 is a side elevational view, also partly in section, showing the relative relationship of the elements at the time defrosting is automatically terminated;

Fig. 5 is a view taken along the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary top view of the flexible element used in the defrosting system of the device;

Fig. 7 is a fragmentary side view, partially in section, showing the switch elements of the defrosting section of the device in one position; and

Fig. 8 is another fragmentary side view, partially in section, showing the elements of Fig. 7 in another position.

Referring now to the drawing, there is shown a cold control device, generally identified as 1, of the type shown and described in Patent 2,658,121 to Robert L. Gray and Charles S. Grimshaw, issued November 3, 1953 and assigned to the assignee of the present application. This cold control device includes a stationary contact 2 mounted on a supporting member 3, preferably formed of suitable insulating material. Stationary contact 2 is connected to a terminal strip 4 arranged on the side of supporting member 3 remote from stationary contact 2. A movable contact 5 is provided resiliently mounted on supporting member 3 as more fully described in the aforementioned Patent 2,658,121. Movable contact 5 cooperates with and normally engages stationary contact 2 and is provided with an external terminal strip 6 also arranged on the side of supporting member 3 remote from stationary contacts 2 and 5 respectively. As seen in Fig. 3, stationary contact 2 and movable contact 5 are

adapted to be connected by means of lines 8 and 9 in series with the motor 7 which drives the compressor of the refrigeration apparatus.

An operating lever 10 is provided having its end 11 pivotally mounted on stationary support 12 and having an extension portion 13 formed at its other end 14. It will be seen that extension portion 13 of operating lever 10 engages resilient mounting element 15 of movable contact 5 and that operating lever 10 has a first position as shown in Fig. 1 in which contacts 2 and 5 are closed, and a second position as shown in Fig. 3, in which extension portion 13 has moved the resilient mounting portion 15 to open contacts 2 and 5. A non-overcenter toggle spring 16 is arranged with one end engaging end 14 of operating lever 10 and its other end engaging the bracket 17. Non-overcenter toggle spring 16 normally biases operating lever 10 to its first position as shown in Fig. 1 with contacts 2 and 5 closed.

In order to effect the desired operation of contacts 2 and 5, a suitable condition responsive device, such as a bellows 18, is positioned in base 19 and is connected to tube 20 containing any suitable thermally expansible fluid. Tube 20 is conventionally arranged within the refrigeration apparatus to sense the temperature therein in accordance with general practice in the art. An operating rod 21 is provided having its lower end 22 engaging the upper surface of bellows 18 and its upper end 23 engaging and bearing downwardly on operating lever 10. A spring seat 24 is secured to operating rod 21 adjacent its lower end 22 and another spring seat 25 is provided spaced from spring seat 24 and having an opening formed therein through which operating rod 21 slidably projects. Spring seat 25 is provided with an extension 26 having an adjusting screw 27 positioned therein which engages a suitable cam 28 connected to temperature selecting dial 29. A coil spring 30 is provided arranged around operating rod 21 and held in compression between spring seats 24 and 25.

To describe the operation of the cold control thus far recited, it is assumed that the temperature within the refrigerator is above the predetermined point at which the compressor motor 7 is energized and that therefore contacts 2 and 5 are closed. As indicated above, non-overcenter toggle spring 16 tends to bias operating lever 10 upwardly so that contacts 2 and 5 are closed. Conversely, coil spring 30 tends to expand downwardly thus biasing operating rod 21 against the upper surface of bellows 18 and also tending to bias operating lever 10 into its second or contacts open position. The downward force applied by coil spring 30 is opposed by the force exerted by bellows 18 by virtue of the vapor pressure therein. It is thus seen that in the arrangement in Fig. 1, the upward forces exerted by non-overcenter toggle spring 16 and bellows 18 exceed the downward force exerted by 30 and that contacts 2 and 5 are therefore closed. Compressor motor 7 will thus be operating and the temperature within the device, as sensed by tube 20 and bellows 18 is gradually being lowered. As the temperature within the refrigerator is lowered, the vapor pressure in bellows 18 decreases thus lowering the opposing force applied thereby. When the temperature within the refrigerator reaches a lower predetermined level, the force exerted by coil spring 30 will overcome the combined opposing forces of bellows 18 and non-overcenter toggle spring 16 thus causing operating lever 10 to move to its second position, as shown in Fig. 3 thereby to open contacts 2 and 5 to deenergize compressor motor 7. Toggle springs are characterized by the requirement for a higher force to initially deflect the spring than is required to maintain it in its deflected position. Thus, a greater force is required to deflect non-overcenter toggle spring 16 from its initial position as shown in Fig. 1 to its deflected position as shown in Fig. 3, than is required to maintain it in its deflected position. Thus, once non-overcenter spring 16 has moved to its deflected position, as shown in Fig. 3,

the bellows 18 must exert a higher force opposing coil spring 30 in order for the combined forces of bellows 18 and non-overcenter toggle spring 16 to overcome the opposing force exerted by coil spring 30 to return operating lever 10 to its first position as shown in Fig. 1 and thus to close contacts 2 and 5. Therefore, after contacts 2 and 5 have been opened to deenergize compressor motor 7, the ambient temperature in the refrigerator will begin to rise thus causing the vapor pressure in bellows 18 to increase. When the ambient temperature reaches the desired predetermined upper level, the combined forces of bellows 18 and non-overcenter toggle spring 16 will overcome the opposing downward force exerted by coil spring 30 thus moving operating lever 10 to its first position as shown in Fig. 1 closing contacts 2 and 5 and reenergizing compressor motor 7.

It will be readily seen that rotation of temperature selecting dial 29 is accompanied by rotation of cam 28 which moves extension portion 26 of spring seat 25 up or down as the case may be thus varying the degree of compression of coil spring 30. It is thus seen that if coil spring 30 is placed under greater compression, a higher combined force must be exerted by bellows 18 and non-overcenter toggle spring 16 in order to overcome coil spring 30 and thus contacts 2 and 5 will be reclosed at a higher temperature. Temperature selecting dial 29 and cam 28 thus determines the predetermined temperature at which contacts 2 and 5 will close to reenergize compressor motor 7 and thus determines the average ambient temperature within the refrigerator. It is to be understood that the cold control described above is for illustrative purposes only and that other cold control devices may be utilized within the spirit of this invention.

In order to provide for manually initiating a defrosting cycle and for automatically terminating the cycle, the arrangement now to be described is provided. A housing member 31 is provided, preferably formed of suitable insulating material, and adapted in this case to be mounted directly on top portion 32 of cold control 1 by means for example, of screws 33. Within housing 31 there is provided a pair of spaced apart stationary contacts 34 and 35 with movable contact 36 arranged therebetween and adapted to engage one or the other of stationary contacts. Movable contact 36 is mounted on a flexible element 37 which terminates in external terminal 38. External terminal 38 is adapted to be connected to one side 39 of a suitable external source of power. Stationary contact 34 is mounted on a supporting member 40 which terminates in external terminal 41. External terminal 41 is adapted to be connected to one side of an auxiliary heating element 42 which in turn has its other side connected to the other side 43 of the external source of power. Stationary contact 35 is mounted on a supporting member 44 which terminates in external terminal 45, which in turn is connected to line 9. It is thus seen that one circuit may be completed from line 43 through compressor motor 7, contacts 2 and 5 of cold control 1, stationary contact 35, and movable contact 36 to line 39; and that another circuit may be completed from line 43 through heating element 42, stationary contact 34, and movable contact 36 to line 39.

Another operating lever 46 is provided having its end 47 pivotally connected to housing member 31 as by a suitable leaf spring 48. An overcenter toggle spring 49 is provided having one end engaging the other end 50 of operating lever 46 and its other end engaging flexible mounting member 37 of movable contact 36. Operating lever 46 has a first stable position, as shown in Fig. 1, with movable contact 36 engaging stationary contact 35 to enable contacts 2 and 5 to control the operation of compressor motor 7; and a second overcenter position as shown in Fig. 3 with movable contact 36 engaging stationary contact 34 thus breaking the circuit of compressor motor 7 and closing the circuit to heating element 42.

In order to move operating lever 46 from its first stable position as shown in Fig. 1 to its second stable position as shown in Fig. 3, an adjustable operating screw 51 is threadingly arranged in a suitable opening in operating lever 46. Operating screw 51 has an upper extremity 52 which extends into a projection portion 53 of housing 31. A push button 54 is provided having its inner extremity 55 arranged in projection portion 53 of housing member 31 and adapted to engage the upper extremity 52 of operating screw 51. Push button 54 is biased to its normal position as shown in Fig. 1 by means of a suitable coil spring 56. It will be readily seen that manually depressing push button 54 to the position shown in Fig. 3 causes its inner extremity 55 to engage the upper extremity 52 of operating screw 51 thus moving operating lever 46 to its second stable position thereby to open contacts 35 and 36 breaking the circuit of compressor motor 7 whether or not cold control contacts 2 and 5 are closed; and closing contacts 34 and 36 thereby to energize heater 42 to initiate the defrosting cycle.

In order to automatically terminate the defrosting cycle, operating rod 51 has a lower extremity 57 extending through opening 58 in top portion 32 of cold control 1 and in housing 31, into the interior of cold control 1. It will be seen that lower extremity 57 of operating screw 51 is in close proximity to the upper end 23 of operating rod 21. After push button 54 has been manually depressed to move operating lever 46 to its second stable position, opening contacts 35 and 36 to deenergize compressor motor 7 and closing contacts 34 and 36, heater 42 will be energized and will thus heat the evaporator to remove the accumulation of frost therefrom. This increase in temperature caused by energization of heater 42 is sensed by capillary tube 20 in bellows 18. If contacts 2 and 5 had been open when push button 54 was depressed, bellows 18 will expand under the influence of the increasing vapor pressure and will first cause contacts 2 and 5 to close, as described in connection with the operation of cold control 1. Since contacts 35 and 36 are open however, compressor motor 7 will not be re-energized, as would normally be the case, and thus the temperature adjacent the evaporator sensed by the capillary tube 20 will continue to rise under the influence of the heater 42. Bellows 18 will continue to expand therefore thus moving operating rod 21 upwardly against the opposing force of spring 30. Referring now specifically to Fig. 4, when an upper predetermined temperature has been reached at which the accumulation of frost on the evaporator will have been removed, the upper end 23 of operating rod 21 will engage the lower extremity 57 of operating screw 51 moving it upwardly and thereby moving operating lever 46 back to its first stable position thereby opening contacts 34 and 36 to deenergize heater 42 and closing contacts 35 and 36 to again energize compressor motor 7.

Referring now to Figs. 6, 7 and 8, it will be seen that the flexible element 37 has a separate spring portion 59 formed therefrom adjacent its free end 60. Movable contact 36 is mounted on spring portion 59 and is provided with an annular slot 61 so that the outer periphery thereof overlays the adjacent surface of the end 60 of flexible element 37. This arrangement is provided in order to insure a positive contact between movable contact 36 and stationary contact 34 while the toggle spring 49 is being moved from the position shown in Fig. 1 to the position shown in Fig. 4. If such an arrangement were not provided, as the toggle system moved slowly over-center by virtue of operating rod 21 engaging operating screw 51 to thereby move operating lever 46, the force supplied by movable contact 36 against stationary contact 34 would go to zero just before toggle spring 49 moved over-center to its other stable position. As this contact force becomes small, the pivot friction becomes appreciable and some shock, such as slamming the refrigerator door, might cause the contacts to open slightly

and they would be held in the open position by the pivot friction. This could shut off the heater 42 without re-energizing the compressor 7. With the arrangement shown in Figs. 6 to 7, however, the contact pressure between movable contact 36 and stationary contact 34 is maintained primarily by spring portion 59 as the toggle spring 99 moves over-center to its other stable position. Thus, as shown in Fig. 7, with the device in the defrosting position as shown in Fig. 3, movable contact 36 is held in engagement with stationary contact 34 by engagement of end 60 of flexible element 37 with the upper surface of groove 61. However, when toggle spring 49 moves toward its dead center position, as shown in Fig. 8, thus moving end 60 away from the upper surface of groove 61 in movable contact 36, spring portion 59 maintains adequate pressure between movable contact 36 and stationary contact 34, thus assuring positive contact pressure during the critical period.

Once contacts 35 and 36 have been reclosed by operating lever 46 returning to its first stable position, operation of compressor motor 7 is controlled by contacts 2 and 5 of cold control 1 in the normal manner. It will be readily seen that the temperature at which end 23 of operating rod 21 engages the lower extremity 57 of operating screw 51 is determined by adjustment of operating screw 51 within the threaded opening in which it is seated in operating lever 46.

It will now be readily apparent that this invention provides an improved control device for refrigeration apparatus in which defrosting is manually actuated and automatically terminated without a requirement for adjusting the temperature selection dial of the cold control. It will further be readily apparent that the device is characterized by its simplicity and that the defrosting portion is readily adaptable for use with a standard cold control.

While I have shown and described a particular embodiment of this invention, further modifications and improvements will occur to those skilled in the art. I desire that it be understood therefore that this invention is not limited to the particular form shown and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of this invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A control device for refrigeration apparatus comprising first and second switches each having a pivoted operating lever in generally parallel spaced relation to one another, temperature sensing means, a first operating member actuated by said temperature sensing means and arranged transverse to and engaging one of said operating levers, a second operating member having one end aligned for engagement with one end of said first operating member and arranged transverse to and engaging the other of said operating levers, and means for adjusting the position of said one end of said second operating member relative to said one end of said first operating member.

2. The control device of claim 1 further comprising first manually operable means acting upon said first operating member to adjust the range of actuation thereof by said temperature sensing means, and second manually operable means for engaging and actuating said second operating member, said first and second manually operable means extending from the same side of said control device.

3. A control device for refrigeration apparatus comprising a cold control having an aperture in one wall thereof, said cold control having a first switch and temperature responsive means for operating said first switch, a defrost control attached to the apertured wall of said cold control, said defrost control having a second switch and an operating member for said second switch, said operating member extending through the aperture of said wall for actuation by said temperature responsive operating means of said cold control, and manually

operable means for engaging and actuating said operating member.

4. A control device for refrigeration apparatus comprising a cold control having an aperture on one wall thereof, said cold control having a first switch, a first pivoted operating lever for said first switch, a temperature sensing means and a first operating member actuated by said temperature sensing means and arranged transverse to and engaging said first operating lever, a defrost control attached to the apertured wall of said cold control, said defrost control having a second switch, a second pivoted operating lever for said second switch generally parallel with said first lever, and a second operating member extending through the aperture of said wall for engagement with said first operating member, said second operating member being arranged transverse to and engaging said second pivoted lever.

5. The cold control device of claim 4 further comprising manually operable means for engaging and actuating said second operating member.

6. The control device of claim 4 wherein said defrost control further comprises a third switch arranged for operation by said second pivoted lever.

7. A temperature responsive multiple circuit controlling switch comprising: first switch means including first contacts, condition responsive means adapted to sense an external temperature, and actuating means connecting said first contacts and said condition responsive means arranged to open said first contacts in response to a predetermined lower temperature and to close said first contacts in response to a first predetermined upper temperature; and second switch means including second and third contacts, manually actuated means arranged to open said second contacts and to close said third contacts; said actuating means being operable upon said manually actuated means to open said third contacts and to close said second contacts in response to a second predetermined upper temperature higher than said first predetermined upper temperature.

8. A temperature responsive multiple circuit controlling switch comprising: first switch means including first contacts, condition responsive means adapted to sense an external temperature, and actuating means connecting said first contacts and said condition responsive means arranged to open said first contacts in response to a predetermined lower temperature and to close said first contacts in response to a first predetermined upper temperature; said actuating means including an operating member having a first position with said first contacts closed and a second position with said contacts open; and second switch means including second contacts, a pivoted operating lever, over center spring means connecting said lever and said second contacts whereby said lever has a first stable position with said second contacts closed and a second stable position with said second contacts open; an actuating member secured to said lever, and a manually actuated push button arranged to engage said actuating member to move said lever from said first position to said second position thereof to open said second contacts; said operating member having a third position responsive to a second predetermined upper temperature higher than said first predetermined upper temperature, said operating member being arranged in said third position thereof to engage said actuating member to move said lever from said second position to said first position thereof thereby to close said second contacts.

9. A temperature responsive multiple circuit controlling switch comprising: first switch means including first contacts, condition responsive means adapted to sense an external temperature, an actuating means connecting said first contacts and said condition responsive means and arranged to open said first contacts in response to a predetermined lower temperature and to close said first contacts in response to a first predetermined upper temperature, said actuating means including an operating

member having a first position with said first contacts closed and a second position with said first contacts open; and second switch means including a stationary contact and a movable contact, a pivoted operating lever, and an over-center toggle spring connecting said lever and said movable contact whereby said lever has a first stable position with said stationary and movable contacts closed and a second stable position with said stationary and movable contacts open, an actuating member secured to said lever, and a manually actuated push button arranged to engage said actuating member to move said lever from said first position to said second position thereof to open said stationary and movable contacts; said operating member having a third position responsive to a second predetermined upper temperature higher than said first predetermined upper temperature, said operating member being arranged in said third position thereof to engage said actuating member to move said lever from said second position to said first position thereof thereby to close said stationary and movable contacts.

10. A temperature responsive multiple circuit controlling switch comprising: first switch means including first contacts, condition responsive means adapted to sense an external temperature, and actuating means connecting said first contacts and said condition responsive means and arranged to open said first contacts in response to a predetermined lower temperature and to close said first contacts in response to a first predetermined upper temperature, said actuating means including an operating member having a first position with said first contacts closed and a second position with said first contacts open; and second switch means including first and second stationary contacts and a movable contact, a pivoted operating lever, an over-center toggle spring connecting said lever and said movable contact whereby said lever has a first stable position with said first stationary contact and said movable contact closed and a second stable position with said second stationary contact and said movable contact closed, an actuating member secured to said lever, a manually actuated push button arranged to engage said actuating member to move said lever from said first position to said second position thereof thereby to open said first stationary and movable contacts and to close said second stationary and movable contacts, and spring means biasing said push button out of engagement with said actuating member; said operating member having a third position responsive to a second predetermined upper temperature higher than said first predetermined upper temperature, said operating member being arranged in said third position thereof to engage said actuating member to move said lever from said second position to said first position thereof thereby to open said second stationary and movable contacts and to close said first stationary and movable contacts.

11. An auxiliary circuit controlling switch for use with a temperature responsive circuit controlling switch, said temperature responsive switch including actuating means for opening switch contacts in response to a predetermined lower temperature and for closing said switch contacts in response to a first predetermined upper temperature, said auxiliary switch comprising: first and second contacts, manually actuated means arranged to open said first contacts and to close said second contacts, said manually actuated means including an actuating member arranged for actuation by said temperature responsive actuating means to open said second contacts and to close said first contacts in response to a second predetermined upper temperature higher than said first predetermined upper temperature.

12. An auxiliary circuit controlling switch for use with a temperature responsive circuit controlling switch, said temperature responsive switch including actuating means for opening contacts in response to a predetermined lower temperature and for closing said contacts in response to

a first predetermined upper temperature, said auxiliary switch comprising: contacts, a pivoted operating lever, over-center spring means connecting said lever and said auxiliary switch contacts whereby said lever has a first stable position with said auxiliary switch contacts closed and a second stable position with said auxiliary switch contacts open, and manually actuated means arranged to engage said lever and to move the same from said first position to said second position thereof to open said auxiliary switch contacts, said manually actuated means being adapted to be engaged by said temperature responsive switch actuating means to move said lever from said second position to said first position thereof in response to a second predetermined upper temperature higher than said first predetermined upper temperature to close said auxiliary switch contacts.

13. An auxiliary circuit controlling switch for use with a temperature responsive circuit controlling switch, said temperature responsive switch including actuating means for opening contacts in response to a predetermined lower temperature and for closing said contacts in response to a first predetermined upper temperature, said auxiliary switch comprising: contacts, a pivoted operating lever, over-center spring means connecting said lever and said auxiliary switch contacts whereby said lever has a first stable position with said auxiliary switch contacts closed and a second stable position with said auxiliary switch contacts open, an actuating member secured to said lever, and a manually actuated push button arranged to engage said actuating member to move said lever from said first position to said second position thereof to open said auxiliary switch contacts, said actuating member being adapted to be engaged by said temperature responsive switch actuating means and to be moved thereby from said second position to said first position thereof in response to a second predetermined upper temperature higher than said first predetermined upper temperature thereby to close said auxiliary switch contacts.

14. An auxiliary circuit controlling switch for use with a temperature responsive circuit controlling switch, said temperature responsive switch including actuating means for opening contacts in response to a predetermined lower temperature and for closing said contacts in response to a first predetermined upper temperature, said auxiliary switch comprising: a stationary contact and a movable contact, a pivoted operating lever, an over-center toggle spring connecting said lever and said movable contact whereby said lever has a first stable position with said stationary and movable contacts closed and a second stable position with said stationary and movable contacts open, an actuating member secured to said lever, and a manually actuated push button arranged to engage said actuating member to move said lever from said first position to said second position thereof to open said stationary and movable contacts, said actuating member being adapted to be engaged by said temperature responsive switch actuating means and to be moved thereby to move said lever from said second position thereof to said first position thereof thereby to close said stationary and movable contacts.

15. An auxiliary circuit controlling switch for use with a temperature responsive circuit controlling switch, said temperature responsive switch including actuating means for opening contacts in response to a predetermined lower temperature and for closing said contacts in response to a

first predetermined upper temperature, said auxiliary switch comprising: first and second stationary contacts and a movable contact, a pivoted operating lever, an over-center toggle spring connecting said lever and said movable contact whereby said lever has a first stable position with said first stationary contact and said movable contact closed, and a second stable position with said second stationary contact and said movable contact closed, an actuating member secured to said lever, a manually actuated push button arranged to engage said actuating member to move said lever from said first position to said second position thereof thereby to open said first stationary and movable contacts and to close said second stationary and movable contacts, and spring means biasing said push button out of engagement with said actuating member, said actuating member being adapted to be engaged by said temperature responsive actuating means and to be moved thereby to move said lever from said second position to said first position thereof thereby to open said second stationary and movable contacts and to close said first stationary and movable contacts.

16. An auxiliary circuit controlling switch for use with a temperature responsive circuit controlling switch, said temperature responsive switch including actuating means for opening contacts in response to a predetermined lower temperature and for closing said contacts in response to a first predetermined upper temperature, said auxiliary switch comprising: first and second stationary contacts and a movable contact, a flexible contact member for said movable contact having one end fixed and the other end free, said contact member having a flexible element formed therefrom adjacent said free end thereof, said flexible element being joined to said contact adjacent its fixed end and having a free end adjacent the free end of said contact member, said movable contact being mounted on said free end of said flexible element, a pivoted operating lever, an over-center toggle spring connecting said lever and said free end of said movable contact member whereby said lever has a first stable position with said first stationary contact and said movable contact closed and a second stable position with said second stationary contact and said movable contact closed, an actuating member secured to said lever, a manually actuated push button arranged to engage said actuating member to move said lever from said first position to said second position thereof thereby to open said first stationary and movable contacts and to close said second stationary and movable contacts, and spring means biasing said push button out of engagement with said actuating member, said actuating member being adapted to be engaged by said temperature responsive switch actuating means and to be moved thereby to move said lever from said second position to said first position thereof thereby to open said second stationary and movable contacts and to close said first stationary and movable contacts in response to a second predetermined upper temperature higher than said first predetermined upper temperature.

References Cited in the file of this patent

UNITED STATES PATENTS

2,095,014	Stark	Oct. 5, 1937
2,215,414	Wilcox	Sept. 17, 1940
2,459,083	McCloy	Jan. 11, 1949
2,647,190	Lieberman	July 28, 1953
2,711,456	Goodhouse et al.	June 21, 1955