ELECTRICAL CONTACT ASSEMBLY

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The present invention relates to control devices and more particularly to defrost control devices wherein a single pole double throw switch is provided to initiate and terminate defrosting and refrigeration circuits.

An important object of the present invention is to provide a new and improved defrost control device which is economically constructed and very efficient in operation.

Another object of my invention is to provide an improved switching mechanism for a defrost control device, which mechanism includes a readily manufacturable and extremely dependable means for obtaining snap action of switch blades.

In carrying out my invention, in one form thereof, I have provided a defrost control device which includes a timing motor and a rotatable cam driven by the motor for operating a single pole double throw switch. The switch includes three elongated spring blades and a spacer of insulating material arranged between the two outer blades to achieve snap action of the switch blades. The spacer includes a body section which extends loosely through the central blade for allowing the central blade to be shifted into alternative engagement with either of the two outer blades. The body section has shoulders formed thereon for engaging the outer blades to operate them conjointly in response to rotation of the cam by the timing motor. On opposite sides of the body section of the spacer there are formed generally L-shaped lugs. Each of these lugs extends loosely outwardly through an aperture in one of the outer blades and has an outer end disposed in coplanarity with an outwardly facing surface of the associated outer blade. With such an arrangement the turned over outer ends of the lugs of the spacer are engageable by the outer blades to preclude any inadvertent dislodgement of the spacer from its loose engagement with the blades with improved and readily assemblable device is thereby obtained.

Further aspects of my invention will become apparent hereinafter, and the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which I regard as my invention. The invention, however, as to organization and method of operation, together with other objects and advantages thereof, may best be understood by reference to the following description when taken in conjunction with the accompanying drawing, in which:

FIG. 1 is a side elevation view of a defrost control device embodying my invention, with the housing wall of the device broken away to show the switch and its operating cam;

FIG. 2 is a plan view of the device of FIG. 1, with the housing partially broken away to show the interior thereof; and

FIG. 3 is a fragmentary and exploded perspective view showing the snap acting spacing mechanism of the device illustrated in FIG. 1.

Referring to the drawing, and initially to FIG. 2 thereof, there is illustrated a defrost control device 10 which generally includes a timing motor 12, a reduction gear train 14, a rotatable cam 16 driven by the gear train 14, and a single-pole double-throw switch 18 which is actuated in time-responsive fashion by the cam 16 to initiate and terminate a defrosting cycle.

The motor 12 is mounted upon side 20 of the supporting plate 22 via the screws 24 (FIG. 2), and its pinion 12a is extended through a suitable aperture formed in plate 22 for meshing engagement with the reduction gear train 14. Plate 22 is secured to an open side of box shaped casing 25 by screws 27 to form a housing which encloses gear train 14, cam 16, and the switch 18. The reduction gear train 14 is connected to cam shaft 26 by way of a clutch 28 which is provided to permit the shaft to be turned in a clockwise direction (viewing FIG. 1) independently of the motor. The cam shaft 26 has the rotatable cam 16 secured thereto and located in the casing 25.

Turning now to a detailed discussion of the single-pole double-throw switch 18, as shown in FIG. 1, a terminal board 30 of insulating material is fitted into engagement with supporting plate 22 and an open end of the casing 25 to close the housing and support the tab terminals 32, 34, 36 and 38. The terminals 32, 34 and 36 are disposed with their outer ends in parallel side-by-side alignment (FIG. 2) and they extend through and are staked to the terminal board 30. The inner ends of the terminals 32, 34 and 36 have the three spring blades 42, 44 and 46 secured respectively thereto. The blades 42, 44 and 46 are thus anchored at corresponding ends to the terminal board 30 and they include generally flat and elongated body sections 52, 54, and 56. The sections 52, 54 and 56 of the blades are disposed in generally parallel side-by-side alignment and they extend inwardly in a general direction toward cam 16. To provide the desired operating proximity between the body sections 52 and 54 of the contact blades, the upper and outer blade 42 includes an L-shaped supporting section 63 integrally connected to the outer end 52a of the elongated sections 52 and terminals 32 and to terminals 32 and the supporting body section of the supporting end 52a of section 52 downwarly from terminal 32 (viewing FIG. 1) toward blade 44. The middle blade 44 is connected to terminal 34 by means of an end section 44a bent very slightly from the plane of its body section 54 (as shown in FIG. 1). The bottom and outer blade 46 of the switch 18 is secured to its supporting terminal 36 by means of downwardly bent leg 66 which spaces the supported end 56a of section 56 upwarly toward blade 44.

It will thus be seen from viewing FIGS. 1 and 2 that the blades 42, 44 and 46 are disposed at one of their ends upon terminal board 30 so that they are in edgewise relationship to supporting plate 22. The other or free ends 72, 74, and 76 of the blades carry contact buttons 82, 84, which is a double sided button) and 86, respectively, which are disposed so that contact button 84 can be engaged by either of the contact buttons 82 and 86. The blades 42, 44 and 46 are arranged with respect to the cam 16 so that they are all inherently biased toward the surface of the cam 16. (See FIG. 1.) It will be noted that the end 74 of middle blade 44 projects beyond contact button 84 and overlies the end 76 of bottom blade 46 so that the extreme end of each blade 42, 44 and 46 may ride on the high portion 16a of the surface of the cam after the blade 46 has been dropped to the low portion 16b.

Turning now to an important aspect of the present invention, which concerns itself with an improved means for operating the blades 42, 44 and 46 of the switch 18 by the cam 16, attention is directed to FIGS. 2 and 3. As shown therein, I have provided a spacer 100 of insulating material which is arranged to cooperate with the contact blades 42, 44, and 46. More particularly, the spacer 100 is constructed from a thin sheet of insulating material, and it includes a rectilinear body section 102, a generally L-shaped upper lug 104 projecting upwardly from section 102 and to the right (viewing FIG. 1) and a generally L-shaped lower lug 106 projecting downwardly from the bottom of section 102 and to the left (viewing FIG. 3). The spacer 100 is held in position by the cam 16, and the blades 42, 44, and 46 are urged into engagement with the spacer 100 by a biasing element 108. Additionally, the spacer 100 is positioned with the contact blade 44 in the cam 16 in a position for engaging the contact button 82.

The invention, as described, may be utilized in connection with a major appliance such as a refrigerator or a deep freezer. As shown in FIG. 3, the spacing mechanism is incorporated into a single piece housing 112 of insulating material which is held in place by the terminal board 114 and secured to the terminal board 114 by the screws 116. The housing 112 is shown in the casing 118 of the major appliance.
ing FIG. 1). Thus, as will be noted from viewing FIGS. 1 and 3, the lugs 104 and 106 assumes an S-shaped configuration with an enlarged rectangular body section 102 interposed between the outer ends thereof. The purpose and advantages of such a configuration of the spacer 100 shall become apparent hereinafter.

For receiving the spacer 100, the central contact blade 44 and elongated slot 110 formed therein near contact button 84 (but spaced toward terminal board 30). The slot 108 is considerably larger than the cross sectional periphery of body section 102 of the spacer 100 to allow the spacer to pass freely through it. In the outer blades 42 and 46 there are slots 110 and 112, respectively, which are also oblong shaped. The slots 110 and 112 are considerably smaller than the slot 108 and are also smaller than the cross sectional periphery of body section 102 of the spacer 100. Slots 110 and 112 of the outer blades 42 and 46 are in alignment with slot 108 of blade 44 for receiving the L-shaped lugs 104 and 106 of the spacer. It will also be noted that the dimension "a" of the L-shaped lugs 104 and 106 of the spacer is slightly larger than the dimension "b" (i.e., length) of the slots 110 and 112. However, the L-shaped lugs are suitably dimensioned to fit loosely through the slots 110 and 112, as shown in FIGS. 1 and 3. Thus, more particularly, the size of the upright sections 184a and 185a of the lugs 104 and 106, respectively, is such that it may be fitted loosely through slots 110 and 112. With such an arrangement, the L-shaped lugs 104 and 106 may be readily fitted into loose cooperation with the slots 110 and 112, respectively, of the outer blades 42 and 46, so that the turned over ends 104b and 106b of the lugs overlie the edges 110a and 112a of the slots 110 and 112 to preclude any inadvertent dislodgement of the spacer 100 from cooperative engagement with the blades. The body section 102 of the spacer 100 thereupon fitted freely through slot 108 of the middle blade 44 so that blade 44 is not restricted by the spacer for movement toward or away from either of the two outer blades 42 and 46.

In operation, it will be seen that the motor 12 is connected across terminals 34 and 38 by suitable conductors (FIG. 1). Motor 12 is continuously energized in the illustrated defrost control device 10, and when it is energized the cam 16 is rotated clockwise (viewing FIG. 1). As shown in FIG. 1, the switch 18 is in the refrigeration cycle position, and the circuit for this cycle is closed by means of the engagement of contacts 84 and 86 of the middle blade 44 and bottom blade 46. The contacts 82 and 84, which are the defrost cycle contacts, are held open by the engagement of the shoulders of body section 102 of spacer 100 with upper blade 42. The high portion 16a of cam 16 thus acts upon bottom blade 46 against its biasing force to maintain switch 18 in the refrigeration cycling position.

When cam 16 is rotated clockwise from the position where it is shown in FIG. 1, the high portion 16a of the cam step then will pass the right end 74 of both blades 44 and 46. When this occurs, the right end edge of blade 46 will drop by a snapping action to the foot of the cam step or low portion 16b, and the end 74 of the central blade 44 will drop by a snapping action to then ride upon the high portion 16a of the cam 16. By this action, the refrigeration contacts 84 and 86 of the blades 44 and 46 are snapped open, and the defrost contacts 82 and 84 are thereupon snapped closed. The refrigeration cycle which was energized across terminals 34 and 36 during engagement of contacts 84 and 86 is thus terminated, and a defrosting cycle is initiated across the terminals 33 and 34. Upon further clockwise rotation of the cam 16, the end 74 of common blade 44 drops from the high portion 16a of the cam step to the low portion 16b thereof. This action re-engages the refrigeration contacts 84 and 86 and due to the spacer 100, defrost contact 82 is held in disengagement from the contact 84. Thus, the original refrigeration cycle is re-established and the defrost cycle is terminated after a given timed period. This period is determined by the angular rotation of the cam 16 required to traverse the high edge of the cam step from the end edge of bottom blade 46 to the end edge of common blade 44.

It will now, therefore, be seen that the present invention provides a new and improved means for obtaining snap action of the contacts of a defrost control switch, which means is low in cost, readily manufacturable, and extremely dependable in operation.

While in accordance with the patent statutes, I have described what at present are considered to be the preferred embodiments of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from my invention, and I, therefore, aim in the following claims to cover all such equivalent variations as fall within the true spirit and scope of this invention.

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

1. In a control switch, three elongated spring blades disposed in generally parallel fashion and anchored at corresponding ends, and a spacer of insulating material with a portion arranged between the two outer blades and passing loosely through the central blade thereby to enable said central blade to be shifted into engagement with either outer blade and to allow said outer blades to be operated conjointly, said spacer having at its ends lugs which extend loosely in first and second opposite directions through both outer blades, the outer ends of said lugs extending in opposite directions and transversely to said first and second directions and being disposed in contiguity with outwardly facing surfaces of the outer blades, whereby the transverse outer ends of said lugs are engageable by their associated outer blades to preclude the inadvertent dislodgement of the spacer from its loose engagement with said blades.

2. In an electric contact assembly, three elongated moveable spring blades disposed in generally parallel fashion and anchored at corresponding ends, and a spacer of insulating material with a portion arranged between the two outer blades and passing loosely through the central blade thereby to enable said central blade to be shifted into engagement with either outer blade and to allow said outer blades to be operated conjointly, said outer blades supporting said spacer as they move, said spacer having at its ends L-shaped lugs, an upright section of each of said lugs extending loosely through an aperture of one of said outer blades, and an outer turned over section of each of said lugs connected to said upright section and extending in a direction generally perpendicular to said upright section and disposed in contiguity with outwardly facing surfaces of the outer blades, the length of each of the outer turned over sections being greater than the respective apertures in the blades through which the lugs extend, whereby the turned over sections of said lugs are engageable by their associated outer blades to preclude the inadvertent dislodgement of the spacer from its loose engagement with said blades.

3. In an electric contact assembly, three elongated moveable spring blades disposed in generally parallel fashion and anchored at corresponding ends, a spacer of insulating material with a portion arranged between the two outer blades and passing loosely through the central blade thereby to enable said central blade to be shifted into engagement with either outer blade and to allow said outer blades to be operated conjointly, said outer blades supporting said spacer as they move, and said spacer having L-shaped lugs at its ends; an upright section of each of said lugs extending loosely through an aperture of one of said outer blades; and an outer turned over section of each of said lugs connected to said upright section and extending in a direction gen-
erally perpendicular to said upright section, said outer 5
turned over sections extending in opposite, spaced apart
and parallel directions from their associated upright sec-
tions, and each of the outer turned over sections being
of greater length than the apertures in the blades through
which the lugs extend and being disposed in contiguity
with outwardly facing surfaces of the outer blades where-
by the turned over sections of said lugs are engageable
by their associated outer blades to preclude the in-
advertent dislodgement of the spacer from its loose en-
gagement with said blades.

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