This invention relates to snap-action control devices and, more particularly, to latched lever mechanisms adapted to be tripped to produce the snap-action.

An object of the invention is to simplify the latch trip mechanism of the control device for installation in a compact space.

Another object of the invention is to avoid reduction of the capacity of the control device while rendering the mechanism more compact.

Another object of the invention is to facilitate assembly and ensure economy in manufacture of the control device.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a longitudinal sectional view of the control device of this invention; Fig. 2 is a cross section taken on the line II—II of Fig. 1; and Fig. 3 is a schematic view of certain essential portions of the control device in latched position.

Referring more particularly to the drawing, the snap-action mechanism is housed within a casing 10 provided with a detachable front cover 12 and a mounting bracket 14 on the rear wall thereof. The upper end of the casing 10 is open and an insulating block 16 secured to the rear wall of the casing 10 provides a partial closure therefor. Adjoining the front cover 12 the insulating block 16 carries a pair of spaced terminals 18 from which a pair of contact means 20 depend into the interior of the casing 10.

The contact means 20 are relatively stationary and are insulated from the front cover 12 by an insulating liner 22 for the front cover 12. Relatively movable contact means in the form of a contact bar 24 is cooperative with the contact means 20 for opening and closing a circuit connected to the terminals 18. The contact bar 24 is loosely mounted on an insulating strip 26 which is rigidly connected to a control lever 28.

The control lever 28 is provided with a pair of ears 30 extending one from each side thereof toward the rear wall of the casing 10. The ears 30 are spaced from the side walls of the casing 10 and are apertured to receive pin means 32 projecting from the side walls and by which the control lever 28 is pivoted intermediate its ends. The end of the lever 28 adjacent the lower wall of the casing 10 is provided with a rearward angularly bent portion 34 for a purpose apparent hereinafter.

Operating means are provided for opening the contact means 20, 24 by operative engagement with the control lever 28. The operating means consists of a plate 40 positioned between the control lever 28 and the front cover 12 and having a pair of ears 42 extending between the ears 30 of the control lever and the side walls of the casing 10. The pin means 32 extend through suitable apertures in the ears 42 to provide a common pivot for the control lever 28 and the operating means 40. One of the ears 42 is also extended rearwardly to form an interrupted bent portion 44 provided with a notch 46. An operating finger 47 projects from the plate 40 for operative engagement with the control lever 28 when the parts are suitably positioned.

A second lever 48 is positioned on the opposite side of the control lever 28 to the operating means 40 and is provided with a pair of ears 50 suitably apertured to accommodate pin means 52 projecting from the side walls of the casing 10 and upon which the second lever 48 is pivoted at one end thereof. The second lever 48 extends substantially parallel with the control lever 28 which is cut-away at one side to accommodate yieldable means in the form of a coil spring 54 mounted for operative engagement with the operating means 40 and the second lever 48, respectively. This arrangement of the yieldable means or coil spring 54 serves to bias the operating means 40 and the second lever 48 apart. A second biasing means in the form of a coil spring 56 is mounted to operatively engage the operating means 40 and the control lever 28 at the location of the bent portion 34 which serves to accommodate this second biasing means. The coil spring 56 serves to bias the control lever 28 to maintain the contact means 20, 24 closed.

Latching means are operatively associated with the second lever 48 and the operating means 40 and are effective for preventing movement of the operating means 40 into operative relation with the control lever 28 such as would cause the operating finger 47 to operatively engage the control lever 28 for moving the same. To this end, a portion of the second lever 48 is bent rearwardly as at 58 and provided with a notch 60 which is adapted to be engaged by the notch 46 formed on the interrupted portion 44 of the operating means 40.

Condition responsive means for the control device are shown as comprising an actuating element 62 provided with a stud 64 by which it is secured to the rear wall of the casing 10 on the interior thereof with the usual capillary tube 66 and bulb element (not shown) positioned exter-
The condition responsive means is filled with a suitable liquid which will expand upon temperature changes sensed by the bulb element or for pressure changes in pressure where a pressure responsive device is employed. Expansion of the actuating element 62 serves to move a button 68 carried by the actuating element 62 into operative engagement with an adjustment screw 70 which projects from the second lever 48 intermediate the pivot 62 and the latching means 46, 60. When the actuating element 62 has operated the device to open the contacts 20, 24, then manual resetting means are employed to return the control lever 28 to its original position. This means comprises a reset button 72 which is reciprocable in a bearing 74 provided in the front cover 12 and which is operatively engageable with the operating means 40 for rotating it on its pivot formed by the pin means 32.

The control lever 28 is in a clockwise direction due to the force exerted by the finger 47 of the operating means 40 which also moves in a clockwise direction upon tripping of the latching means.

The contacts 20, 24 remain open and can only be reset to closed position after the actuating element 62 has contracted in response to a decrease in the temperature or pressure to which it responds. The reset button 72 can then be operated manually to move the operating means 40 in a clockwise direction about the pivot formed by pin means 32 to latch the latching means by reengaging notches 46, 60 and restore the control lever 28 to its original position.

The control device can be calibrated by adjustment of the screw 70. In the device shown and described herein the control device is fixed as will be apparent. However, it will be understood that the adjustment screw 70 could be extended to the exterior of the cover 12 to make the control device adjustable if desired. Due to the absence of mechanical linkage and reliance upon the springs 54 and 56 the control is rendered simple to manufacture and assemble. While a preferred embodiment of the invention is shown and described herein, it will be understood that many changes may be made in the combination and arrangement of parts and in the details of construction within the scope of the appended claims without departing from the invention disclosed herein.

We claim:

1. A control device comprising in combination, a pivoted lever movable between controlling positions, means for biasing said lever to one of said positions, operating means movable from an initial position into operative engagement with said lever for exerting a force thereon sufficient to overcome said biasing means, a second pivoted lever movable relative to said operating means, yieldable means operative for biasing said operating means and said second lever apart, and latching means for holding said operating means in said initial position for a limited period during which said second lever is movable against the bias of said yieldable means, said limited period being terminated upon tripping of said latching means to cause snap-action movement of said second lever from said initial position by said yieldable means.

2. A control device comprising in combination, a pivoted lever movable between controlling positions, means for biasing said lever to one of said positions, operating means movable from an initial position into operative engagement with said lever for exerting a force thereon sufficient to overcome said biasing means, a second pivoted lever movable relative to said operating means, yieldable means operative for biasing said operating means and said second lever apart, and latching means for holding said operating means and said second lever for holding said operating means in said initial position for a limited period during which said second lever is movable against the bias of said yieldable means, said limited period being terminated upon tripping of said latching means to cause snap-action movement of said operating means from said initial position by said yieldable means.

3. A control device comprising in combination, a pivoted lever movable between controlling positions, means for biasing said lever to one of said positions, operating means movable from an initial position into operative engagement with said lever for exerting a force thereon sufficient to overcome said biasing means, a second pivoted lever movable relative to said operating means, yieldable means operative for biasing said operating means and said second lever apart, and latching means for holding said operating means and said second lever for holding said operating means in said initial position, said latching means being adapted to be tripped after a relative movement of said operating means and said second lever has occurred against the bias of said yieldable means thereby causing snap-action movement of said operating means from said initial position by said yieldable means.

4. A control device comprising in combination, a control lever pivoted intermediate its ends for movement between controlling positions, means for biasing said control lever to one of said positions, operating means positioned on one side of said lever and movable from an initial position into operative engagement therewith for exerting a
force thereon sufficient to overcome said biasing means, a second lever pivoted at one end thereof and extending substantially parallel with said control lever on the opposite side thereof to said operating means, yieldable means operative for biasing said operating means and said second lever apart, and latching means operatively associated with said operating means and said second lever for holding said operating means in said initial position, said latching means being adapted to be tripped after a relative movement of said operating means and said second lever has occurred against the bias of said yieldable means thereby causing snap-action movement of said operating means from said initial position by said yieldable means.

5. A control device comprising in combination, a control lever pivoted intermediate its ends for movement between controlling positions, contact means cooperable with said lever, means operatively engageable with one end of said lever for biasing said lever to close said contact means, operating means positioned on one side of said lever and movable from an initial position into operative engagement with the opposite end of said lever for opening said contact means, a second lever pivoted at one end thereof and extending substantially parallel with said control lever on the opposite side thereof to said operating means, yieldable means operative for biasing said operating means and said second lever apart, latching means for holding said operating means in said initial position for a limited period during which said second lever is movable against the bias of said yieldable means, said limited period being terminated upon tripping of said latching means to cause snap-action movement of said operating means from said initial position by said yieldable means, and means operatively engageable with said operating means for returning said control lever to its original position.

6. A snap-action device comprising in combination, a control lever, pivoted operating means movable into operative relation with said control lever, means for biasing said operating means toward said control lever, a second lever, latching means operatively associated with said second lever and said operating means and effective for preventing said movement of the operating means, biasing means for urging said second lever and said operating means apart, and condition responsive means for compressing said biasing means while said latching means is effective and thereafter causing release of said operating means with snap-action.

7. A snap-action device comprising in combination, a control lever pivoted intermediate its ends, operating means pivotally mounted for movement into operative relation with said control lever, means for biasing said operating means toward said control lever, a second lever pivoted adjacent one end and extending substantially parallel with said control lever, latching means operatively associated with said second lever and said operating means and effective for preventing said movement of the operating means, a coil spring for biasing said second lever and said operating means apart, and condition responsive means for compressing said spring while said latching means is effective and thereafter causing release of said operating means with snap-action.

3. A snap-action device comprising in combination, a control lever pivoted intermediate its ends, contact means mounted upon one end of said lever, relatively stationary contact means cooperable with the first said contact means, operating means pivotally mounted for movement into operative relation with said control lever, means for biasing said operating means toward said control lever and said first contact means toward said stationary contact means, a second lever pivoted adjacent one end and extending substantially parallel with said control lever, latching means operatively associated with said second lever and said operating means and effective for preventing said movement of the operating means, a coil spring for biasing said second lever and said operating means apart, condition responsive means for compressing said spring while said latching means is effective and thereafter causing release of said operating means with snap-action to move said first contact means away from said stationary contact means, and manually operable means engageable with said operating means for returning said control lever to its original position.

VICTOR WEBER,
WILLIAM S. KUNZLER.

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