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CONDITION RESPONSIVE DEVICE

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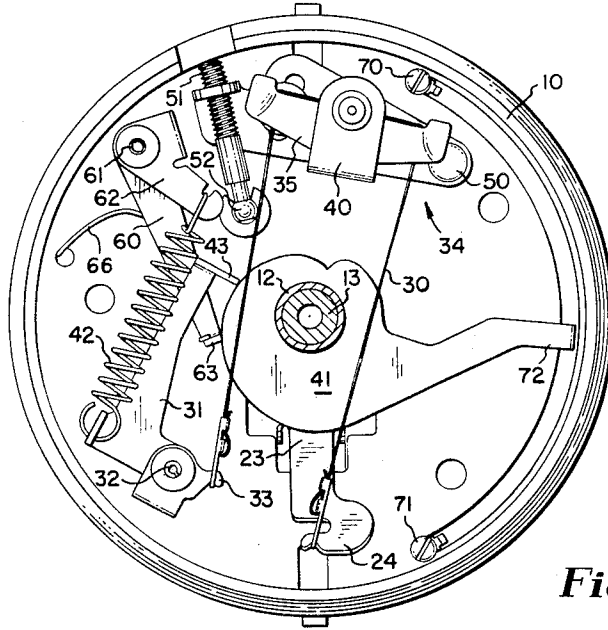


Fig-1

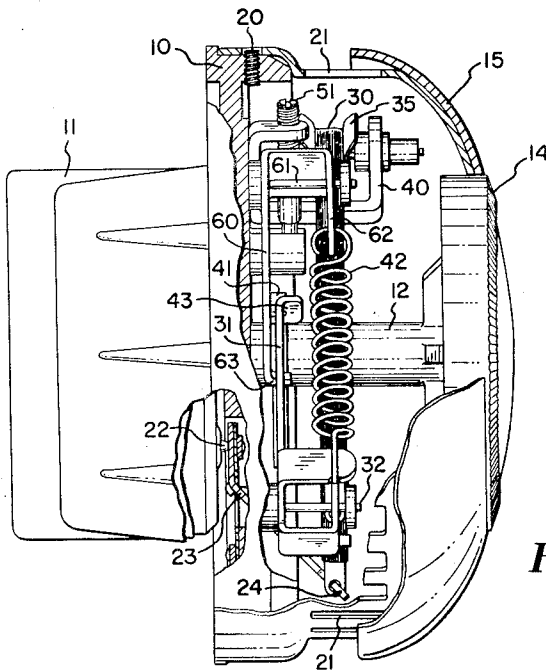


Fig-2

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CONDITION RESPONSIVE DEVICE

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5 Claims. (Cl. 200—61.06)

The present invention is concerned with an improved humidity responsive device; in particular, the device has a means for providing a constant strain release for the responsive element.

Where a moisture responsive element such as a human hair element is used for control or indicating purposes, the reliability of the element depends greatly upon the type of physical forces which are applied to the element. Since such elements are generally under tension, a means is often provided to prevent the tension from exceeding a destructive limit. The element might be connected at one end to a movable support which is biased by a strain release spring; however, the physical size of the instrument can limit the type of strain release spring used.

In the present invention a strain release means is provided for limiting the maximum tension which can be applied through a moisture responsive element. The strain release means is maintained substantially constant throughout the calibration range of the device.

An object of the present invention is to provide an improved condition responsive device.

Another object of the present invention is to provide an improved condition responsive device which has a means for providing a substantially constant strain release on the condition responsive means.

These and other objects will become apparent upon the study of the following specification and drawings of which:

Figure 1 is a front view of the humidity responsive device with the cover and control point adjustment knob removed.

Figure 2 is a side sectional view of the device of Figure 1 with the portion of the cover and the control point adjustment knob shown.

Referring to Figures 1 and 2, a base 10 is shown. The base is adapted to be mounted on a wall or surface to cover a hole for housing an associated actuator or switch 11. A rotatable shaft 12 is pivotally supported on a pin 13 projecting outward from the center of base 10. A control point adjustment knob 14 is connected as an integral part of shaft 12. A cover 15 for the unit has an opening for receiving the control point adjustment knob 14. The cover is held onto the base by a pair of screws 20, only one of which is shown in Figure 2. Around the outer periphery of cover 15, a shielded grill 21 provides an opening for the transfer of moisture to and from the space inside the cover. Switch 11 is of a conventional snap switch type having an operating button 22 which is moved by a pivoted lever 23 having a portion 24 projecting to the front of base 10.

A condition or moisture responsive element 30 is of the human hair type which changes in length as the moisture in the air surrounding the element changes. A cam rider or lever 31 is pivotally mounted on a post 32 projecting from base 10. Element 30 is connected at its extremities between a projecting arm 33 of rider 31 and portion 24 of the switch operating lever. The element is looped over a tension equalizer 34 which is

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made up of a yoke 35 pivotally supported upon a member 40. The tension equalizer provides for two portions of the element 30 which have an equal tension.

A cam 41 is attached to shaft 12. The cam is characterized to provide calibration of the device when the position of the cam is adjusted between the limits established upon lever 72 engaging stops 70 and 71. Cam rider 31 is biased in a clockwise direction by a spring 42; so that, a foot 43 of the cam rider engages a surface of cam 41. Upon rotation of the control point adjustment knob 14, cam rider 31 is adjusted to change the position of arm 33 and thus one extremity of element 30 to select a change of length of the element which is necessary to operate switch 11.

While the control point adjustment is done by the positioning of cam 41, a factory calibration is accomplished by re-positioning member 40 about one end 50 which is pivotally attached to base 10. A screw 51 is attached to the base by means of a ball and socket connection 52, and the other extremity of the screw is threaded into member 40. By rotating screw 51, the position of the tension equalizer 34 is changed to recalibrate the length of element 30 necessary to operate the switch.

A second cam rider or lever 60 is pivotally supported about a post 61 projecting from base 10. Cam rider 60 has an arm 62 to which spring 42 is connected. A foot 63 of cam rider 60 is biased against the surface of cam 41 by a spring 66. When cam 41 is rotated, the relative positions of cam riders 31 and 60 are adjusted to maintain the distance between the extremities of the spring, or the spring length, substantially constant.

If a long spring is used for strain release spring 42, any change in the position of cam rider 31 with the other end of the spring fixed has relatively little affect upon the change in tension of the spring. In the particular application, the inventor was required to keep the size of the device at a minimum. To use a short spring such as 42, the tension of the spring changes appreciably as the length of the spring changes. By moving both ends of the spring together, when the control point adjustment knob 14 is rotated, a substantially constant strain release is provided for element 30.

The operation of the condition responsive device is as follows. When lever 24 moves to a certain position to push in operating button 22, switch 11 is operated. Whether the switch operates to close a circuit or open a circuit is a matter of choice and depends upon the type of apparatus to be controlled. During factory calibration, screw 51 is adjusted; so that, when the moisture content of element 30 is at a predetermined value, the switch 11 will operate if control point adjustment knob 14 is turned past the selected position. After calibration, screw 51 is sealed.

Upon the rotation of knob 14 to a predetermined position selecting a desired moisture level as indicated by an appropriate scale (not shown), cam 41 is rotated to change the position of cam rider 31 and thus the one end of element 30 connected to arm 33. When the moisture content of element 30 increases beyond the selected level, the element will expand to move lever 23 in a clockwise direction as shown in Figure 2 to operate switch 22. As lever 31 moves, one end of spring 42 is re-adjusted which would normally change the tension of spring 42; however, since lever 60 is also re-adjusted by cam 41, spring 42 is maintained at a length constant.

Let us assume that the humidity affecting element 30 decreases to such a level that element 30 is shortened to lift foot 43 off of cam 41. The movement of lever 31 provides the strain release to prevent damage to the element which might stretch beyond its elastic limit if the end attached to arm 33 were fixed. Since the length of spring

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42 is maintained substantially constant, the strain release is substantially constant. The substantially constant strain release can be provided by a short spring 42 since the position of lever 33 does not affect the length of the spring.

The present invention has been described in connection with a moisture responsive device; however, the invention should not be limited to the one particular use, but the scope of the invention should be limited only by the appended claims.

I claim:

1. In a humidity control device, a round shaped base, a switch mounted on the back side of said base, said switch having an operating lever protruding through said base to the front of said base, a cam, a shaft rotatably mounted at the center of said base and extending perpendicular to the front of said base, an adjustment knob attached to the end of said shaft, said cam being attached to said shaft, a first cam rider pivotally mounted on said base, a humidity responsive element being long with respect to its cross sectional dimensions, said cam rider having a first projecting arm, means connecting said responsive element between said operating lever and said arm so that upon a change in the length of said element as the humidity changes said switch is actuated, said cam rider determining the position of one end of said responsive element whereby the control point of said switch can be adjusted by said knob, a second cam rider pivotally mounted on said base and having a second projecting arm, a bias spring, said first cam rider having a third arm, means connecting said spring between said second arm and said third arm for providing a strain release for said responsive element whereby upon rotation of said knob to adjust the position of said first arm and the control point, said second cam rider is adjusted to maintain said spring at a constant tension, and a cup-shaped cover mounted on said base, said cover having an opening for said knob.

2. In a humidity control device, a base, actuator means, said actuator means being mounted on said base, said actuator means being adapted to control humidity changing apparatus, an adjustable cam, a first cam rider, a humidity responsive element changing in length as the moisture content of the surrounding air changes, means connecting said element between said actuator and said cam rider whereby the position of said rider on said cam is effective to determine the control point of said actuator, a second cam rider engaging said cam at different position than said first rider, and a strain release spring connected

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between said first and said second cam riders whereby upon the tension of said element exceeding a predetermined value said first cam rider is lifted off of said cam, said spring being maintained at a constant length and thus a constant tension when the control point is changed by moving said cam.

3. In a device responding to the condition, a condition responsive element having a length indicative of a condition, first means to be positioned, a pivotally mounted lever, an adjustable stop, said stop supporting said lever, means connecting said element between said lever and said first means whereby a change in the length of said element is effective to position said first means, said lever being effective upon a change in position to change the control point of said element, a second pivotally mounted lever, a strain release resilient means connected between said first and second levers for holding said first lever on said stop, said first lever being free from said stop when a tension in said element exceeds said strain release, and means for adjusting the position of said stop and a position of said second lever along a predetermined relationship to vary the calibration of said element and to maintain a constant strain release.

4. In a condition responsive device, a condition responsive element changing in length as a condition changes, means connected to respond to a change in length of said element, said means being connected to one extremity of said element, a calibration level attached to another extremity of said element whereby the effect of the length of said element on said first mentioned means can be selected, a strain release means, means connecting said release means to said lever, and means for adjusting said strain release means as said calibration level is adjusted.

5. In a condition responsive device, a condition responsive element changing in position as a condition changes, means connected to respond to a change in position of said element, said means being connected to said element, a calibration lever attached to said element whereby the effect of the position of said element on said first mentioned means can be selected, a strain release means, means connecting said release means to said lever, and means for adjusting said means as said calibration level is adjusted to maintain said strain release substantially constant.

No reference cited.