March 3, 1964 T. K. KJELLMAN ETAL 3,123,687

HUMIDITY RESPONSIVE DEVICE

Filed April 13, 1962 3 Sheets-Sheet 1

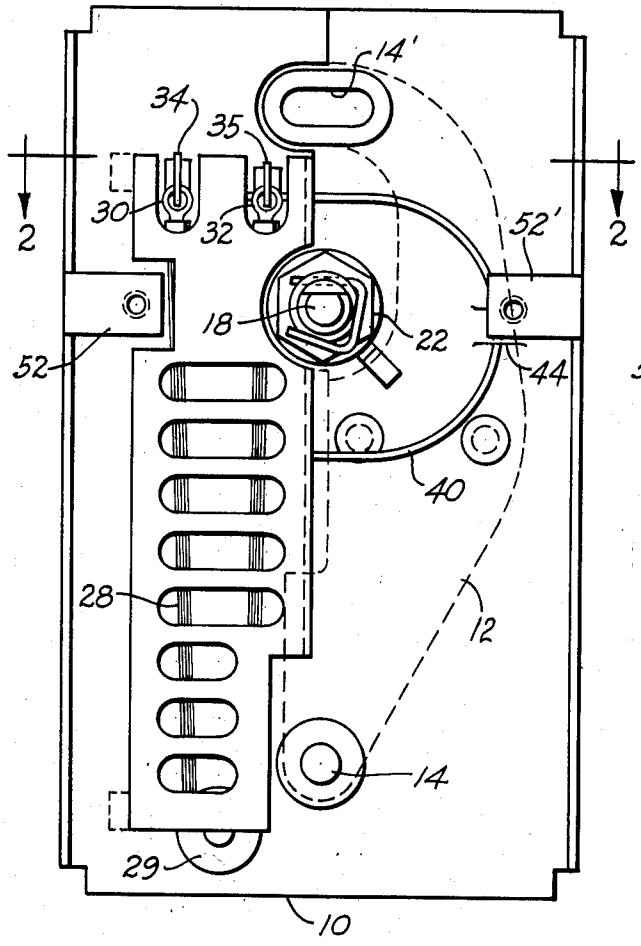


FIG. 1

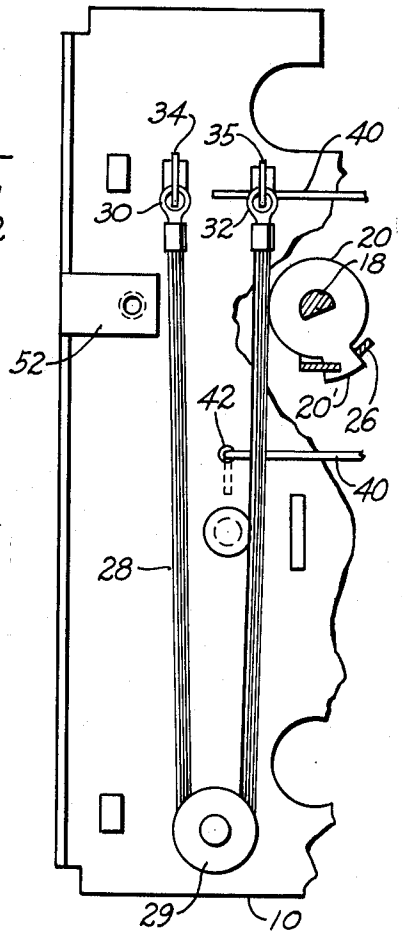


FIG. 1A

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HUMIDITY RESPONSIVE DEVICE

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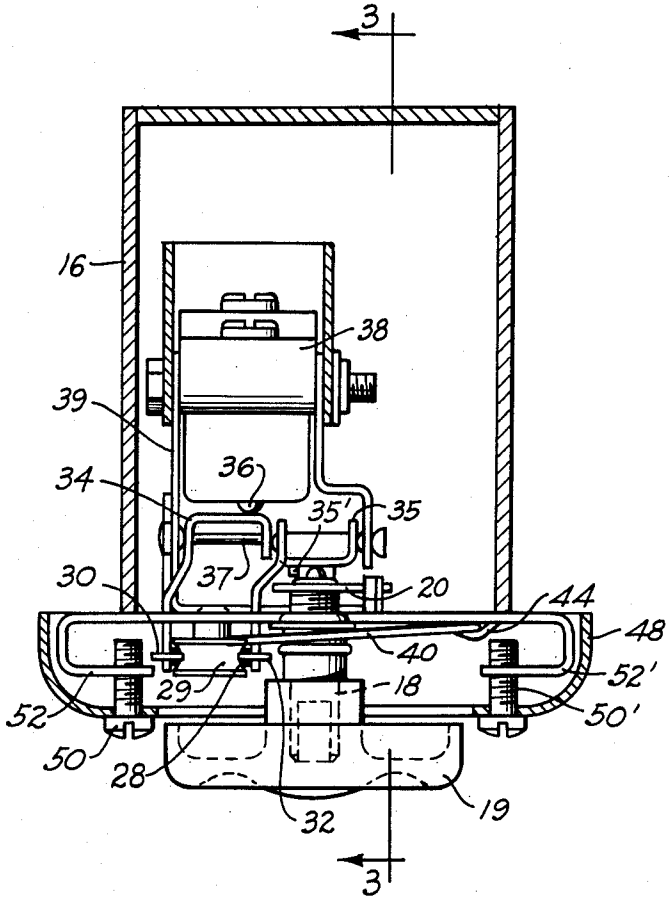


FIG. 2

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HUMIDITY RESPONSIVE DEVICE

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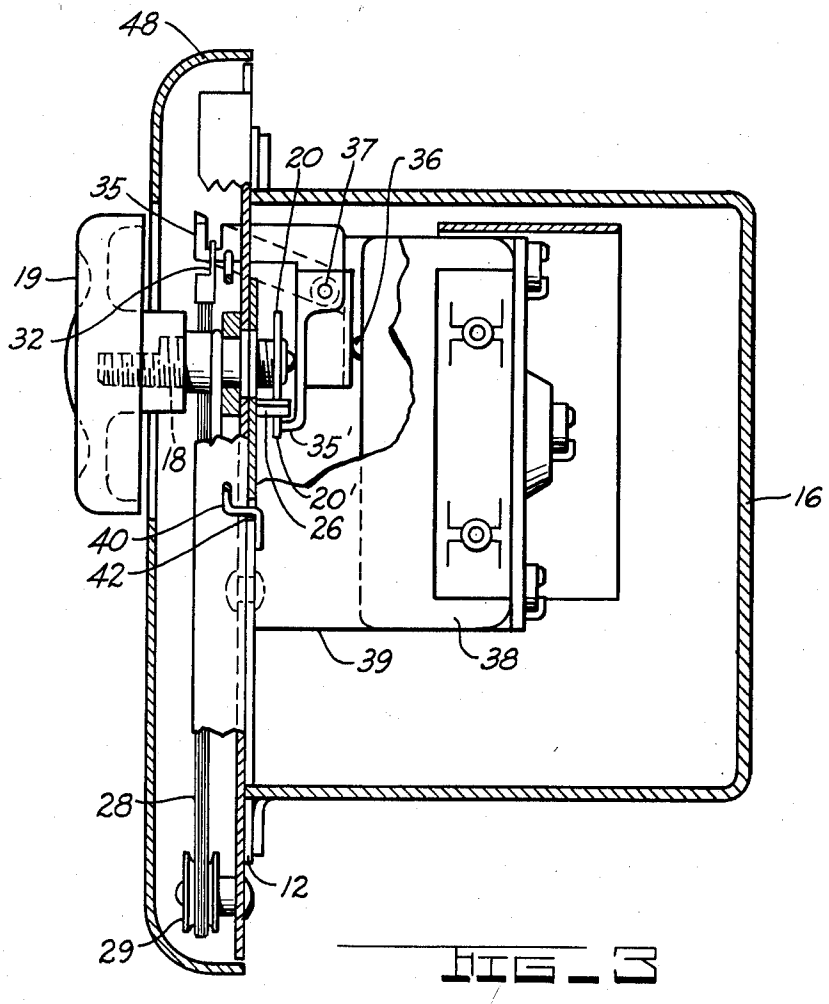


FIG. 3

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3,123,687

HUMIDITY RESPONSIVE DEVICE

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2 Claims. (Cl. 200—61.06)

This invention relates to humidity responsive devices, and more particularly to a humidity responsive device including means for providing a strain release for the humidity responsive element.

Moisture responsive elements typically consist of a small cable of human hair which is kept under tension. It is possible for the calibrating mechanism to impose so much force on these hair elements that a destructive limit is exceeded. To avoid this, a strain release spring may be at one end of the element but the introduction of such a spring creates its own problems. The coil springs often used have considerable thickness and may take up more room that is available. They also have the characteristic of imposing a force on the hair element which varies with the setting of the calibrating mechanism, thus introducing an error into the response of the humidity element. It is, therefore, an object of the present invention to provide an improved humidity responsive device having a strain release spring effectively connected to the humidity element which spring has a substantially constant spring force and therefore does not interpose a significant error in the calibration.

It is another object of the present invention to provide a humidity responsive device having a strain release spring which meets the above objective while requiring minimum volume within the device.

It is a further object of the present invention to provide a humidity responsive device which meets the above objectives and is so arranged that it may be mounted on a standard electrical wall junction box with a minimum of thickness of depth extending outside of said junction box.

Other objects and advantages will become apparent from the following specification taken in connection with the accompanying drawings in which:

FIG. 1 is a plan view of our humidity control device as seen from the front with the control knob and decorative cover plate removed;

FIG. 1A is a view of the device of FIG. 1 taken from the front with part of the mounting plate broken away and the protective cover for the humidity element removed to show more detail of the internal mechanism;

FIG. 2 is a sectional view of the device of FIG. 1 taken on line 2—2 of FIG. 1; and

FIG. 3 is a sectional view of the device of FIG. 2, taken on line 3—3 of FIG. 2.

Referring now to FIG. 1, our humidity responsive device includes a mounting plate **10** having attached at its back a resilient mounting member **12** (shown in dotted outline) which includes holes **14**, **14'** for receiving screws to be attached to a standard electrical wall junction box **16** (see FIGS. 2 and 3). Hole **14'** is elongated to compensate for small errors in alignment of box **16** and the resilient member **12** compensates for errors in mounting of the box **16** which might be behind the plaster and which mounting could result in the humidistat mounting plate **10** being distorted. Fastened through mounting plate **10** is a threaded member **18** carrying knob **19** and a calibrating cam **20** (see FIG. 1A) provided with a projecting stop **20'**. Member **18** and cam **20** are held to mounting plate **10** by means of a bushing and nut assembly **22** which also provides a means for zero set adjustment of cam **20**. Threaded member **18** is held in position by means for a friction spring **24**. Cam **20** is stopped at each end of its

rotational travel by means of a stop **26** which, as shown, is a tab cut from plate **10** and which contacts the projection **20'**. The humidity responsive element **28** is a cable of human hair which is secured by means of a pair of clamping terminals **30**, **32** having ring portions hooked over a switch lever **34** and a setting lever **35**, respectively, both of which pivot on a common shaft **37**. Element **28** doubles back on itself between its terminals **30**, **32** by passing over a roller **29** attached to plate **10**. Switch lever **34** engages a switch contact **36** (see FIGS. 2 and 3) forming part of a switch assembly **38** attached to a bracket **39**, contact **36** being normally biased against lever **34** by spring means internal of assembly **38**. An arcuate relief spring **40** is fastened to plate **10** by inserting a hooked end thereof into a hole **42** and by being passed through a channel **44**. The opposite end of spring **40** bears against setting lever **35** and thereby keeps a certain amount of tension on hair element **28**. A guard **46** fastened to plate **10** provides protection for the hair element **28** even though the cover plate **48**, which is attached to plate **10** by screws **50**, **50'** engaging tabs **52**, **52'** is removed.

The device described operates to push switch contact **36** into the switch assembly **38** with shortening (tightening) of the hair element **28** and obviously the switch **38** can be made so that this action either opens or closes the associated circuit. The switch **38** includes an over-center snap switch arrangement and is of a type available on the open market. As the knob **19** is turned in a clockwise direction as seen in FIG. 1, the threaded member **18** moves axially away from setting lever **35**, thus permitting spring **40** to force lever **35** upward. The switch member **36** is, therefore, opened and closed at a higher humidity value. If, while the knob is adjusted to a comparatively high humidity value, the relative humidity drops considerably, the hair element **28** will tend to shorten and the tension thereon will increase considerably and could reach such values as to destroy the hair element, except for the fact that such increased tension merely opposes the force exerted by spring **40** and this spring, therefore, provides an upper limit on the force opposing the contractive force of the hair element **28**. The spring **40** is designed so that this limit is considerably below that which would destroy or damage hair element **28**. As the knob **19** is turned counter-clockwise, the humidity setting is lowered, the member **18** being moved axially against the setting lever **35** causing it to be lowered, slackening the tension in element **28**, permitting lever **34** to raise and causing it to be pivoted such as to permit switch member **36** to move out of the switch assembly. When the member **18** has been moved to a very low value, the projecting stop **20'** engages an inclined edge **35'** on the lever **35** and the hair element **28** is slackened such that the switch contact **36** is positively maintained in its extended position by its internal biasing means. In the present instance this constitutes a positive "off" position for the switching mechanism.

It will be observed that the device provided is compact and requires very little depth, other than for the part of the switch mechanism which fits into the standard junction box. Consequently, the installation projects only slightly from the wall in which it is installed. It is self-protecting so far as the hair element is concerned because of the relief spring **40**, which sets an upper limit on the tension to which the hair element may be subjected. It has been found that a relief spring of this configuration has a substantially constant spring force throughout the useful length of travel of the setting lever **35** and, therefore, complicated means for insuring that the spring is always operating in the same narrow part of its travel are not required Its effect on the hair element is substantially the same irrespective of the setting of the knob **19**. This spring also acts as the biasing means for maintaining the hair element **28** in tension.

While only one embodiment has been shown and described herein, modifications may be made without departing from the spirit and scope of the present invention.

We claim:

1. In a humidity control device adapted for wall mounting,

a substantially flat base member adapted to be mounted substantially parallel with said wall,

a roller secured to the outside surface of said base member,

a humidity responsive element mounted on the outside surface of said base member and doubled over said roller in a plane substantially parallel to the plane of said base member, said element changing in length as the moisture content of the surrounding air changes,

a control shaft rotatably mounted on said base and extending perpendicularly therefrom and a cam on said shaft behind said base member,

actuator means mounted at the back of said base member including spring biased electrical switch means, a first lever operating said switch means against its spring bias and connected to one end of said humidity element, a second lever movable in response to rotation of said shaft and connected to the opposite end of said humidity element whereby the position of said second lever determines the operating point of said electrical switch means relative to the length of said humidity element,

and an elongated arcuate strain release spring connected between an anchor point on said base and said second lever, whereby upon the tension of said element exceeding a predetermined value, said second lever is permitted to move in a direction to reduce the tension on said humidity responsive element, said spring having a substantially constant spring force over the extent of its deflection.

2. In a humidity control device adapted for wall mounting,

a substantially flat base member adapted to be mounted substantially parallel with said wall,

a humidity responsive element mounted on the outside surface of said base member, said element changing in length as the moisture content of the surrounding air changes,

a control shaft rotatably mounted on said base and extending perpendicularly therefrom and a cam member having a projection carried on said shaft,

stop means secured with respect to said base member for coacting with said projection to act as a stop on the rotation of said shaft in both directions,

actuator means mounted at the back of said base member including spring biased electrical switch means,

a first lever operating said switch means against its spring bias and connected to one end of said humidity element, a second lever movable in response to rotation of said shaft and connected to the opposite end of said humidity element whereby the position of said second lever determines the operating point of said electrical switch means relative to the length of said humidity element, said second lever including an inclined edge portion cooperating with said cam projection to move said second lever in a direction to substantially reduce the tension on said element such that said switch member is positively held in one of its control conditions,

and an elongated arcuate strain release spring connected between an anchor point on said base and said second lever, whereby upon the tension of said element exceeding a predetermined value, said second lever is permitted to move in a direction to reduce the tension on said humidity responsive element, said spring having a substantially constant spring force over the extent of its deflection.

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