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CALIBRATING MEANS FOR A HUMIDITY CONTROL DEVICE

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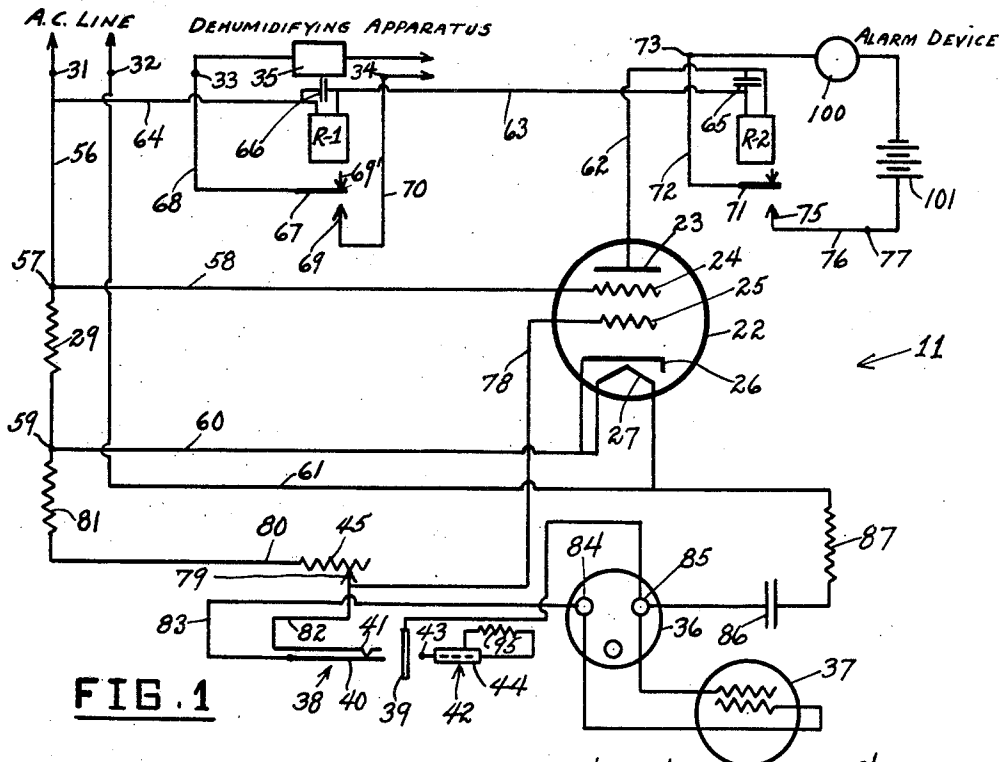


FIG. 1

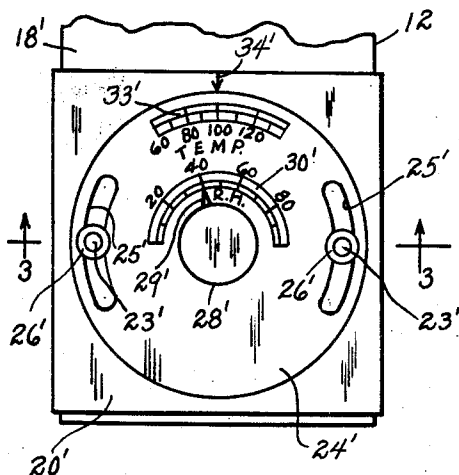


FIG. 2

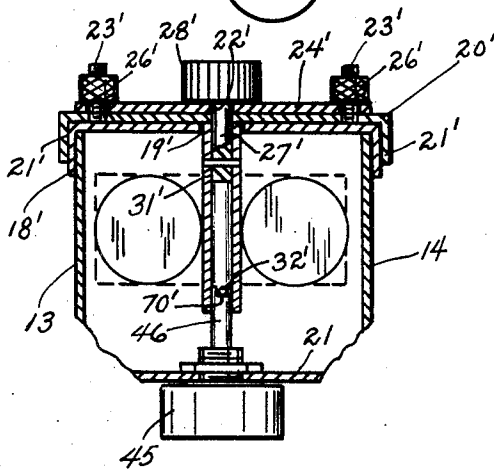


FIG. 3

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CALIBRATING MEANS FOR A HUMIDITY CONTROL DEVICE

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Original application June 20, 1955, Ser. No. 516,462, now Patent No. 2,943,245, dated June 28, 1960. Divided and this application June 13, 1960, Ser. No. 35,796 5 Claims. (Cl. 116—133)

This is a division of applicant's co-pending application, Serial No. 516,462, filed June 20, 1955, now U.S. Patent No. 2,943,245, entitled "Humidity Control Device."

This invention relates to humidity control devices, and more particularly to means to apply a temperature correction to an electrical humidity control apparatus.

A main object of the invention is to provide a novel and improved means for applying a temperature correction to an electrical humidity control apparatus when the apparatus is calibrated for operation around a specified value of relative humidity.

A further object of the invention is to provide an improved calibrating means for a humidity-responsive electrical control device, said means being simple in construction, being easy to apply to the control device, and enabling a suitable temperature correction to be applied to the device when it is set for operation around a specified value of relative humidity.

A still further object of the invention is to provide an improved calibrating means for a humidity-responsive control device which enables a required temperature correction to be applied to the device without involving recourse to temperature correction charts or tables and which enables the device to be accurately set to respond to a specified condition of relative humidity.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

FIGURE 1 is a schematic wiring diagram of a humidity-responsive control device of a type with which the calibrating device of the present invention is adapted to be employed, the diagram being shown schematically with a plug-in calibrating resistor unit for setting the apparatus for operation around a specified value of humidity.

FIGURE 2 is a fragmentary front elevational view of a humidity control apparatus having means according to the present invention for applying a temperature correction when the apparatus is calibrated for operation around a specified value of humidity.

FIGURE 3 is a fragmentary cross-sectional view taken substantially on the line 3—3 of FIGURE 2.

Referring to the drawings, 11 generally designates the schematic wiring diagram of a humidity-sensitive control device, described in detail in applicant's U.S. Patent No. 2,943,245. The device includes a housing 12 having parallel side walls 13 and 14 and a front cover 18', as shown in FIGURE 3, provided with an aperture 19' aligned with the shaft 46 of a rheostat 45 mounted on the chassis 21, said chassis serving as the support for the electrical components of the device, as is fully described and illustrated in the above mentioned Patent No. 2,943,245.

As shown in FIGURE 1, the humidity-sensitive control device 11 comprises a vacuum tube 22 having a plate 23, a screen grid 24, a control grid 25, a cathode 26, and a filament 27. The device is mounted in the housing 12 on the chassis 21.

The device includes terminals 31, 32, 33 and 34. Terminals 33 and 34 are connected in series with the power supply of a dehumidifying apparatus 35, for dehumidifying the area to be controlled.

The chassis 21 is provided with a suitable socket 36

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receiving a conventional humidity sensing element 37 of the bifilar-wound type. The chassis is provided with a jack 38 having a ring element 39, a stationary contact 40, and a flexible contact 41 normally engaging stationary contact 40 but being moved out of engagement therewith responsive to the insertion of a conventional ball-end plug 42 into the jack, whereby the ball 43 of the plug engages contact 41 and the sleeve 44 of the plug engages the ring element 39.

Mounted on the chassis 21 is the rheostat 45 having the outwardly projecting slotted control shaft 46.

As shown in FIGURE 1, terminal 31 is connected by a wire 56 to one terminal 57 of resistor 29. Terminal 57 is connected by a wire 58 to screen grid 24. The other terminal 59 of resistor 29 is connected by a wire 60 to cathode 26 and a terminal of filament 27. The other terminal of said filament is connected by a wire 61 to line terminal 32.

Plate 23 is connected by a wire 62 to one terminal of the winding of a relay R-2 mounted beneath chassis 21. The other terminal of this winding is connected by a wire 63 to one terminal of the winding of a second relay R-1 mounted beneath chassis 21. The remaining terminal of the winding of relay R-1 is connected by a wire 64 to the line terminal 31.

A first filter condenser 65 is connected across the terminals of the winding of relay R-2 and a second filter condenser 66 is connected across the terminals of the winding of relay R-1.

Relay R-1 has the armature 67 which is connected by a wire 68 to terminal 33. Said relay has a stationary contact 69 engageable by armature 67 when less than a first predetermined value of plate current flows through the winding of relay R-1. Contact 69 is connected by a wire 70 to terminal 34.

Relay R-2 has the armature 71 which is connected by a wire 72 to a terminal 73 on chassis 21. Relay R-2 has the stationary contact 75 engageable by armature 71 when less than a second predetermined value of plate current flows through the winding of relay R-2, said second value being less than the above-mentioned first value of plate current. Contact 75 is connected by a wire 76 to a terminal 77.

Control grid 25 is connected by a wire 78 to the sliding tap 79 of the rheostat 45. The remaining terminal 80 of the rheostat is connected through a resistor 81 to the terminal 59.

Flexible jack contact 41 is connected by a wire 82 to sliding tap 79. Stationary jack contact 40 is connected by a wire 83 to one terminal 84 of the humidity sensing element socket 36. The other terminal 85 of said socket is connected through a condenser 86 and a resistor 87 to the wire 61.

It will be apparent from FIGURE 1 that the filament 27 is energized through a circuit comprising line terminal 31, wire 56, resistor 29, wire 60, filament 27, wire 61 and line terminal 32. Rectified plate current flows between cathode 26 and plate 23, and through the series-connected windings of relays R-2 and R-1 through a circuit comprising wire 60, cathode 26, plate 23, wire 62, the winding of relay R-2, wire 63, the winding of relay R-1, wire 64, and terminal 31. The amount of such current is governed by the amplitude of the alternating current signal on grid 25 with respect to cathode 26. The amplitude of said signal is in turn governed by the resistance of humidity sensing element 37, since said sensing element is connected in series with resistor 87, condenser 86, rheostat 45 and resistor 81, defining a current path across the filament 27. Since grid 25 is connected to tap 79, after said tap has been adjusted to a predetermined position the alternating current potential on grid 25 will vary in accordance with changes in resistance of the humidity sens-

ing element 37. With increased humidity the resistance of said humidity sensing element decreases, increasing the effective value of the negative signal potential on grid 25, thus reducing the flow of rectified plate current through tube 22. A reverse action occurs when the humidity decreases.

For purposes of calibration, a plug 42 is employed containing a calibrating resistance 95 having a value corresponding to the value of the humidity sensing element resistance at the humidity control point, namely, at the value of humidity at which the dehumidifying apparatus 35 must be energized. When the plug 42 is inserted in jack 38, the calibrating resistor 95 is substituted for the humidity sensing element 37. The sliding tap 79 of rheostat 45 is then manually adjusted until contacts 67, 69 of relay R-1 just close, the adjustment being made in a direction decreasing the resistance of rheostat 45 since this reduces the amplitude of the signal on grid 25.

When the humidity increases to a value corresponding to the desired upper humidity limit, the relay R-1 closes its contacts, energizing the dehumidifying apparatus 35. When the humidity increases beyond this value by a predetermined amount, relay R-2 closes its contacts and energizes an alarm device 100, connected through a battery 101, or other suitable power supply, to the terminals 73, 77.

In order to calibrate the device, the plug 42 is inserted in jack 38 and the rheostat shaft 46 is rotated. The calibrating resistor 95 enables the device to be set for operation at a predetermined value of absolute humidity. To set the device in terms of relative humidity, temperature corrections must be applied, and one way of doing this is to provide respective calibration plugs for respective different temperature bands, each calibration plug being provided with a calibrating resistor whose value includes the temperature correction. As an alternative, and to provide a more accurate setting of the device for operation at a desired value of relative humidity, the temperature correction may be applied at the time the device is calibrated for operation, as by means illustrated in FIGURES 2 and 3.

A plate member 20' is provided, said plate member having depending end flanges 21', 21' spaced so that the plate member 20' may be engaged transversely over front cover 18' in the manner shown in FIGURE 3, with the end flanges 21', 21' disposed outwardly adjacent and engaging the side flanges of the cover 18'.

Rigidly secured to plate member 20' at diametrically opposite sides thereof with respect to a central aperture 22' therein are upstanding studs 23', 23'. Designated at 24' is a circular scale plate having arcuate slots 25', 25' at diametrically opposite peripheral portions thereof, said slots being concentric with the plate 24' and being located at equal radial distances thereon. The circular plate 24' is disposed on plate member 20' with the studs 23' extending through the arcuate slots 25', as shown in FIGURE 2. Knurled nuts 26' are provided on the studs 23' to lock plate 24' in adjusted position on plate member 20'.

A vertical shaft 27' extends rotatably through the center of plate 24' and through the central aperture 22' of plate member 20'. Rigidly secured to the top end of shaft 27' is a knob 28' having a pointer 29' which may be moved along an arcuate relative humidity scale 30' inscribed on plate 24'. Secured to the lower portion of shaft 27' and being rotatably engageable through the aperture 19' is a sleeve 31'. Sleeve 31' is engageable over the top end of shaft 46, as viewed in FIGURE 3, and is provided with a transverse pin element 32' which is engageable in the slot 70' in the top portion of shaft 46, whereby shaft 46 may be rotated by rotating the knob 28'.

The peripheral portion of circular plate 24' is inscribed with an arcuate temperature scale 33' and the plate member 20' is inscribed with an index pointer 34' adjacent scale 33', so that plate member 24' may be rotated until pointer 34' is located at the ambient temperature value on

scale 33'. This introduces the required temperature correction. Knob 28' may then be rotated to set pointer 29' adjacent the value of relative humidity to be maintained in the area controlled by the device.

Plate member 20' may then be removed from the front cover 18', leaving the device set to maintain the desired relative humidity.

While a specific embodiment of an improved calibrating means for a humidity-responsive electrical control device has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. Calibrating means for a humidity control device of the type comprising a support including a calibrating impedance having a rotatable shaft, said calibrating means comprising a removable main plate member having flanges spaced to receive the support therebetween and to thereby interlock with said support with the main plate member disposed over said shaft, a scale plate rotatably mounted on said main plate member, a coupling member extending rotatably through said scale plate and main plate member, and means on said coupling member formed and arranged to interlock with said rotatable shaft.

2. Calibrating means for a humidity control device of the type comprising a support including a calibrating impedance having a rotatable shaft, said calibrating means comprising a removable main plate member having flanges spaced to receive the support therebetween and to thereby interlock with said support with the main plate member disposed over said shaft, a scale plate rotatably mounted on said main plate member, a coupling member extending rotatably through said scale plate and main plate member, means on said coupling member arranged to interlock with said rotatable shaft, a temperature scale on one arcuate portion of said scale plate, and a relative humidity scale on another arcuate portion of said scale plate.

3. Calibrating means for a humidity control device of the type comprising a support including a calibrating impedance having a rotatable shaft, said calibrating means comprising a removable main plate member having flanges spaced to receive the support therebetween and to thereby interlock with said support with the main plate member disposed over said shaft, a scale plate rotatably mounted on said main plate member, a coupling member extending rotatably through said scale plate and main plate member, a coupling sleeve secured to said coupling member and being of sufficient length to receive said shaft, and means in said sleeve lockingly engageable with said shaft.

4. Calibrating means for a humidity control device of the type comprising a support including a calibrating impedance having a rotatable shaft, said calibrating means comprising a removable main plate member having flanges spaced to receive the support therebetween and to thereby interlock with said support with the main plate member disposed over said shaft, a scale plate rotatably mounted on said main plate member, a coupling member extending rotatably through said scale plate and main plate member, a coupling sleeve secured to said coupling member and being of sufficient length to receive said shaft, means in said sleeve lockingly engageable with said shaft, a temperature scale on one arcuate portion of said scale plate, and a relative humidity scale on another arcuate portion of said scale plate.

5. Calibrating means for a humidity control device of the type comprising a support including a calibrating impedance having a rotatable shaft, said calibrating means comprising a removable main plate member having flanges spaced to receive the support therebetween and to thereby interlock with said support with the main plate member disposed over said shaft, a scale plate on said main plate

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member formed with a pair of opposing concentric arcuate slots, a pair of upstanding studs on said main plate member slidably received in said slots, whereby to guide the scale plate for rotation on said main plate member, a coupling member extending rotatably through said scale plate and main plate member, a coupling sleeve secured to said coupling member and being of sufficient length to receive said shaft, means in said sleeve lockingly engageable with said shaft, a temperature scale on one arcuate

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portion of said scale plate, and a relative humidity scale on another arcuate portion of said scale plate.

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