Nov. 4, 1958 C. E. OHLHEISER 2,859,318

ELECTRICAL HUMIDITY-SENSING UNIT

Filed Feb. 20, 1956

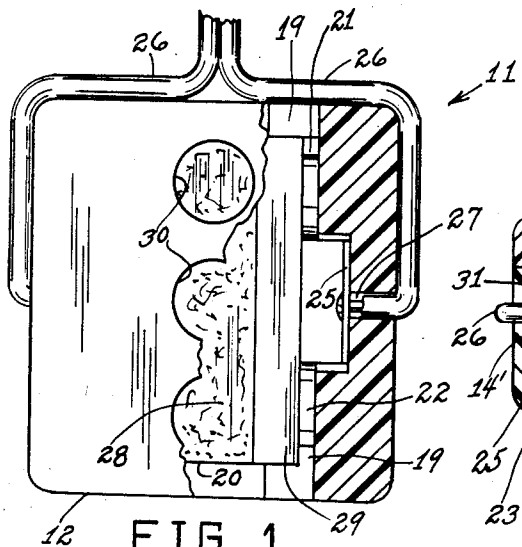


FIG. 1

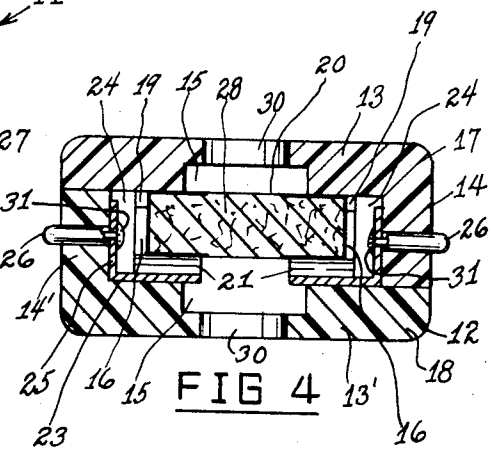


FIG 4

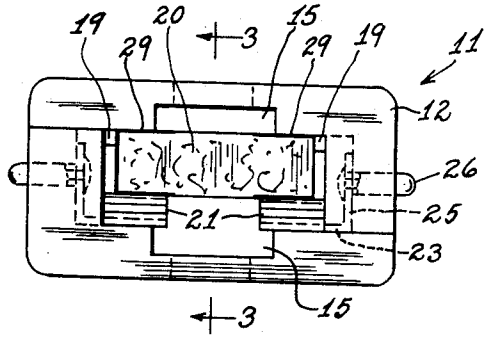


FIG. 2

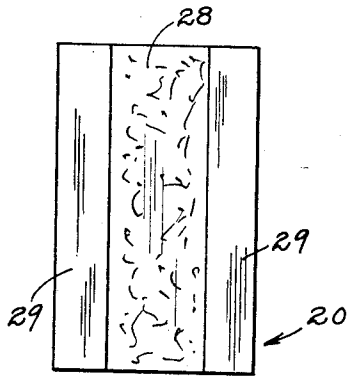


FIG. 5

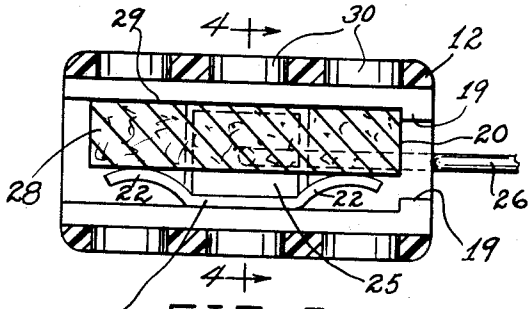


FIG. 3

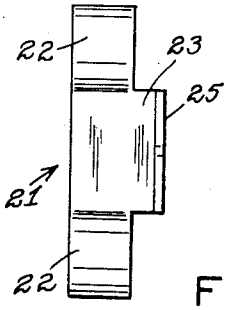


FIG. 6

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United States Patent Office 2,859,318
Patented Nov. 4, 1958

2,859,318

ELECTRICAL HUMIDITY-SENSING UNIT

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Application February 20, 1956, Serial No. 566,453

9 Claims. (Cl. 201—63)

This invention relates to electrical humidity sensing units, and more particularly to a humidity sensing unit employing a humidity-responsive resistance element of the type comprising a body of porous ceramic material.

A main object of the invention is to provide a novel and improved electrical humidity sensing unit which is simple in construction, which is compact in size, and which is arranged so that the resistance element thereof may be readily inserted or removed whenever required.

A further object of the invention is to provide an improved electrical humidity sensing unit of the resistance type which is relatively inexpensive to manufacture, which is highly resistant to mechanical shock and vibration, and which is stable in performance.

A still further object of the invention is to provide an improved electrical humidity sensing unit which may be made in a very small size so that it can be employed in locations where space is limited, which is rugged in construction, and which possesses substantially the same accuracy as units of much larger size.

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 greatly enlarged front elevational view, partly in cross-section, of an improved electrical humidity sensing unit constructed in accordance with the present invention.

Figure 2 is a bottom view of the humidity sensing unit of Figure 1.

Figure 3 is a cross-sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a front elevational view of the humidity-responsive resistance element employed in the unit of Figures 1 to 4, drawn substantially to the same scale as said figures.

Figure 6 is a side elevational view of one of the leaf spring contact members employed in the unit of Figures 1 to 4, drawn substantially to the same scale as said figures.

Referring to the drawings, wherein a typical humidity sensing unit according to this invention is illustrated to a greatly enlarged scale, the unit is designated generally at **11**. Said unit comprises a relatively flat, sleeve-like housing **12** of insulating material, such as a suitable plastic material, which may be, for example, generally rectangular in shape, but which obviously may have any other desired shape.

In the typical embodiment illustrated in the drawings, the housing **12** comprises a pair of substantially right angled molded plastic bodies **17** and **18** having the major flanges **13**, **13'** and the relatively short minor flanges **14**, **14'** extending at right angles to said major flanges. The right angled bodies are secured together, as by suitable cement, with the edges of the minor flanges abutting the

inside margins of the major flanges, to define the aforesaid sleeve-like housing.

The inside portions of the major flanges **13**, **13'** are formed with intermediate longitudinal grooves or channels **15**, whereby opposing side grooves **16**, **16** are defined inside the housing cavity on opposite sides of the channels **15**, as shown in Figure 4.

Each body **17** and **18** is formed on the inner surface of its major flange with respective integral stop lugs **19**, **19** located at one end of the housing **12** at opposite sides of the channels **15**, whereby a pair of stop lugs **19**, **19** serves as a positioning means for the humidity-responsive resistance element **20** contained in the housing, as will be presently described.

Disposed longitudinally in the respective side grooves **16**, **16** and bearing on the inside surface of the flange **13'** on opposite sides of its channel **15** are respective conductive leaf springs **21**, **21**, each spring comprising a flat intermediate portion and respective arcuately curved resilient leaf portions **22**, **22** integrally connected to the ends of the flat intermediate portion. The flat intermediate portions of the leaf springs are laterally extended with respect to the leaf portions **22**, **22**, as shown at **23**, and are received in respective rectangular recesses **24**, **24**, formed in the intermediate portions of the grooves **16**, **16**. The laterally extended portions **23** are formed with respective right-angled lugs **25** which engage the inside surfaces of the associated recesses **24**, as shown in Figure 4. Respective insulated conductors **26**, **26** extend around the upper side portions of the housing **12** and enter the flanges **14** and **14'** through apertures **27** provided substantially centrally in said flanges. The terminals of the conductors **26**, **26** are electrically connected, as by soldering, as by soldering, to the respective lugs **25**, **25**.

The humidity-responsive resistance element **20** comprises a relatively flat rectangular body **28** of humidity-sensitive resistance material, for example, porous unglazed red pottery clay, such as described in U. S. Patent No. 2,358,406 to Fred Lichtgarn, or any of the other porous ceramic materials described in said patent, for example, a mixture which includes finely divided material of relatively high conductivity. This mixture is capable of adsorbing water vapor from the atmosphere in direct relation to the relative humidity, producing a change in electrical conductivity of the material.

The side marginal portions of the body **28** are each suitably coated with a layer **29** of conductive material, as shown in Figure 5, said layers **29** preferably extending around the longitudinal edges of body **28** and defining electrodes at said longitudinal edges.

As shown, the element **20** is of sufficient width and thickness so that it is receivable in the sleeve-like housing **12** with the electrode portions **29** thereof disposed in the respective side grooves **16**, **16** and the surfaces of said electrode portions clampingly and conductively engaged by the resilient portions **22**, **22** of the respective leaf springs **21**, as shown in Figures 2, 3 and 4. Thus, each leaf spring **21** clampingly and conductively engages a respective electrode **29** and is thus electrically connected to one side margin of element **20** while frictionally securing the element in the sleeve-like housing **12** with the end of the element in abutment with a pair of stop lugs **19**, **19**.

The channels **15**, **15** allow the atmosphere to circulate longitudinally through the unit around the humidity-sensitive resistance element **20**. The outer walls of said channels are further formed with a plurality of longitudinally spaced circular apertures **30** which directly expose the major surfaces of the element **20** to the atmosphere.

The leaf springs **21**, **21** are permanently secured in the side grooves **19**, **19** by the soldered connections, shown at **31**, **31** of the terminals of conductors **26**, **26** to the

lugs **25**, **25**. However, the humidity-responsive resistance element **20** may be removed and replaced, as required, through the open end of the sleeve-like housing **12** opposite the positioning lugs **19**. This allows the housing or holder **12** to be employed with humidity-responsivee resistance elements **20** having different operating ranges, and also allows an element to be readily replaced whenever it has become damaged or is otherwise unsuitable for further use.

While a specific embodiment of an improved humidity sensing unit 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. An electrical humidity sensing unit of the resistance type comprising a housing of insulating material formed with opposing parallel internal grooves and being apertured between said grooves, respective conductive spring members disposed in said grooves, respective terminal conductors connected to said spring members and extending outside the housing, and a body of humidity-sensitive resistance material slidably disposed in said housing and being clampingly and conductively engaged at its opposite margins by said spring members.

2. An electrical humidity sensing unit of the resistance type comprising a housing of insulating material formed with opposing parallel internal grooves and being apertured between said grooves, respective conductive leaf springs disposed in said grooves, respective terminal conductors connected to said leaf springs and extending outside the housing, and a body of humidity-sensitive resistance material slidably disposed in said housing and being clampingly and conductively engaged at its opposite margins by said leaf springs.

3. An electrical humidity sensing unit of the resistance type comprising a housing of insulating material formed with opposing parallel internal grooves and being apertured between said grooves, respective conductive spring members disposed in said grooves, respective terminal conductors connected to said spring members and extending outside the housing, and a body of porous ceramic material whose electrical resistance varies with humidity slidably disposed in said housing, said body having substantially parallel opposite side margins and being clampingly and conductively engaged at said opposite side margins by said spring members.

4. An electrical humidity sensing unit of the resistance type comprising a relatively flat housing of insulating material open at least at one end and formed with opposing parallel internal grooves at its opposite side portions and being apertured between said grooves, respective conductive leaf springs disposed longitudinally in said grooves, respective terminal conductors connected to said leaf springs and extending outside the housing, and a relatively flat rigid body of humidity-sensitive resistance material slidably disposed in said housing, said body having substantially parallel opposite side margins and being clampingly and conductively engaged at said opposite side margins by said leaf springs.

5. An electrical humudity-sensing unit of the resistance type comprising a relatively flat, sleeve-like housing of insulating material formed with opposing internal grooves at its opposite side portions, respective conductive leaf springs disposed longitudinally in said grooves substantially parallel to the major walls of the housing, at least one of said major walls being formed between said grooves with an internal channel to allow air to move longitudinally through the housing, respective terminal elements electrically connected to the leaf springs and extending outside the housing, and a relatively flat rigid body of humidity-sensitive resistance material disposed in said housing, said last-named body having substantially parallel opposite side edges and being of sufficient width so that its side edges are slidably received in said grooves and being of sufficient thickness so that its side marginal portions are clampingly and conductively engaged by said leaf springs.

6. The structure of claim 5, and wherein said one major wall is apertured at said channel to directly expose a face of said body to the atmosphere at said one major wall.

7. An electrical humidity-sensing unit of the resistance type comprising a relatively flat, sleeve-like housing of insulating material formed with opposing internal grooves at its opposite side portions, respective conductive leaf springs disposed longitudinally in said grooves substantially parallel to the major walls of the housing, at least one of said major walls being formed between said grooves with an internal longitudinal channel to allow air to move longitudinally through the housing, said grooves being respectively formed at their intermediate portions with recesses, respective retaining lugs formed on said leaf springs and lockingly engaging in said recesses, respective terminal conductors electrically connected to said lugs and extending outside the housing, and a relatively flat body of humidity-sensitive resistance material disposed in said housing, said last-named body being of sufficient width so that its side edges are received in said grooves and being of sufficient thickness so that its side marginal portions are clampingly and conductively engaged by said leaf springs.

8. The structure of claim 7, and wherein said one major wall is apertured at said channel to directly expose a face of said body to the atmosphere at said one major wall.

9. The structure of claim 8, and abutment means in one end portion of the housing engageable with an end of said body to limit movement of the body toward said one end portion of the housing.

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