May 10, 1949. H. WOHRER 2,469,537

HUMIDOSTATIC ELEMENT

Filed Jan. 12, 1945

Fig.1

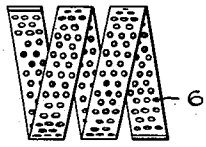



Fig.2

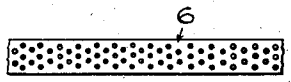



Fig.3

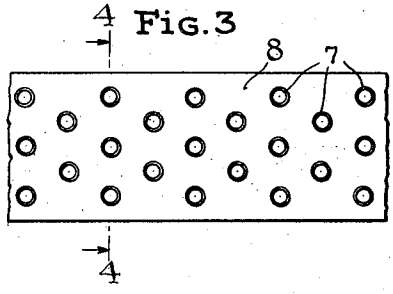
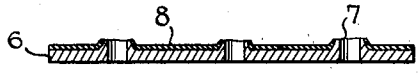



Fig.4




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2,469,537

## HUMIDOSTATIC ELEMENT

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2 Claims. (Cl. 117—127)

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This invention relates to hygrostats and particularly to a hygrostatic element unaffected by temperature changes, or substantially so.

The invention contemplates the use of a thin flexible strip of metal whose coefficient of thermal expansion is zero or so small as to be negligible, coated on one side with a closely adherent layer of material which expands as it absorbs moisture. In this way a flexing bar or coil characterized by very good response to atmospheric humidity may be produced.

The preferred metal is a ferrous alloy known by the trade name of "Invar." The preferred coating is gelatin rendered flexible by the addition of a small quantity of glycerin, and rendered insoluble by the addition of a small quantity of formaldehyde.

The invention will now be described by reference to the accompanying drawing, in which—

Figure 1 is an elevation of a strip coiled to form a helical unit according to the invention.

Figure 2 is a face view of a straight strip element.

Figure 3 is an enlarged view of the strip shown in Figure 2.

Figure 4 is a section on the line 4—4 of Figure 3, still further enlarged.

A flat strip 6 of Invar, or other metal having a negligible coefficient of thermal expansion is provided with closely spaced fine burrs 7 on one face. This may be done by punching, or by drilling with a dull drill, or by any equivalent procedure. The strip may be about 0.25'' wide and 0.010'' thick. This strip is laid with its burred side up on a level, polished metal plate (not shown).

Ten grams of pure gelatin are dissolved in 100 c. c. of distilled water at approximately 130° F. Care is taken to avoid the presence of air bubbles. When the gelatin has dissolved, 2 drops of glycerin are added, after which 2 drops of formaldehyde are added. This solution after drying remains flexible, resists decay and the growth of mold, and will not redissolve. The glycerin may accelerate its response to atmospheric humidity and contributes to its elasticity.

The above solution is poured onto the burred side of the Invar strip while the latter is supported in a horizontal position by the polished plate. When the gelatin has dried, the strip is removed from the plate, after which any gelatin adhering to the smooth side of the strip is removed by the use of fine emery paper. The coat or film 8 remains on the burred side.

This produces a compound strip in which the metal strip 6 is unaffected by changes of temperature or humidity. The gelatin film 8, however, changes in length with changes of moisture content, and has a substantially straight line

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characteristic in its dimensional response to changes of atmospheric relative humidity over a wide range. This causes proportional flexure of the strip. This hygrostatic unit has been tested by changing temperature while maintaining uniform relative humidity. The unit is indifferent to temperature changes of as much as 50 Fahrenheit degrees and continues to indicate uniform relative humidity so long as this value is held constant.

Aside from this advantage over prior art substances such as hair, horn, wood and gold-beaters skin, the element is homogeneous and can be readily reproduced.

It may be used flat or may be curled to the helical form shown in Figure 1. The burred side is preferably the outer side in such case.

What is claimed is:

1. A hygrometric element comprising a flexible supporting strip of ferrous metal alloy having a negligible coefficient of thermal expansion; and a thin layer adherent to one face of said flexible strip insoluble in water and composed primarily of glycerin and gelatin in the proportion of two drops of glycerin to ten grams of gelatin, said layer being characterized, over a temperature range of the order of 50 Fahrenheit degrees, by a lineal expansion which is proportional to and closely follows the relative humidity of air in contact therewith.

2. The element defined in claim 1 in which insolubility of the layer is caused by the presence of a minor quantity of formaldehyde.

HENRY WOHRER.


### REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 614,029 | Rottach | Nov. 8, 1898 |
| 798,413 | Howard | Aug. 29, 1905 |
| 798,938 | Wetherill | Sept. 5, 1905 |
| 1,293,527 | Ovington | Feb. 4, 1919 |
| 1,540,152 | Weber | June 2, 1925 |
| 2,093,767 | Rollefson | Sept. 21, 1937 |
| 2,131,554 | Rayville | Sept. 27, 1938 |
| 2,247,349 | Champion | July 1, 1941 |
| 2,267,164 | Newton | Dec. 23, 1941 |
| 2,298,162 | Ralston | Oct. 6, 1942 |
| 2,364,436 | Frisch et al. | Dec. 5, 1944 |

FOREIGN PATENTS

| Number | Country | Date |
|---|---|---|
| 3,678 | Great Britain | 1898 |
| 3,371 | Great Britain | 1902 |
| 727,512 | France | Mar. 29, 1932 |