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W. M. CHACE

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THERMOSTAT

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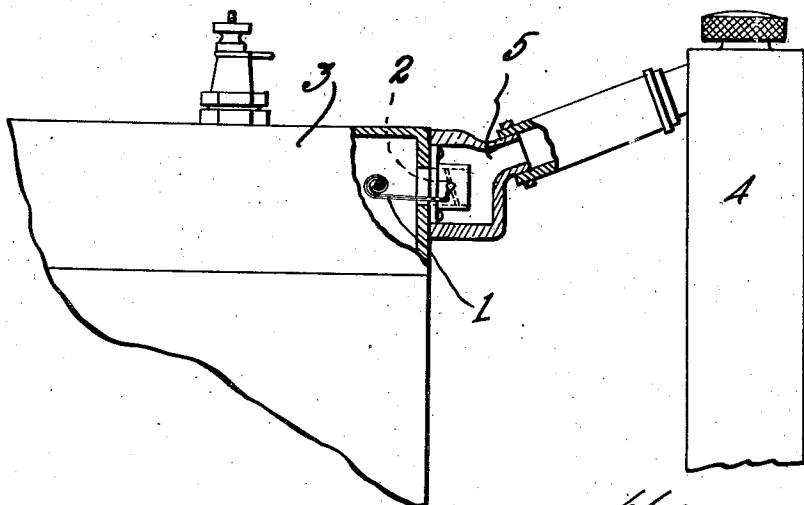


Fig. 1

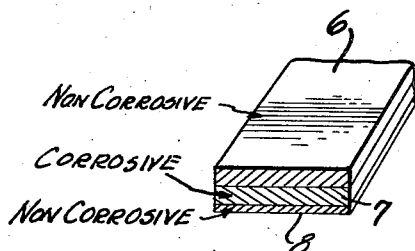


Fig. 2

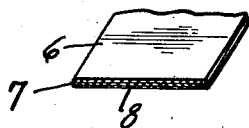


Fig. 3

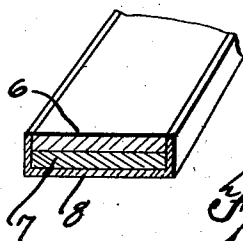


Fig. 4

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THERMOSTAT

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This invention relates to thermostats of that type in which two metals of dissimilar thermal characteristics are welded together to provide a bar which, upon subjection to varying degrees of heat, tends to move by reason of the element having the greatest coefficient of expansion tending to expand or contract more rapidly than that having the lower coefficient of expansion.

Bimetallic elements of this type are made in various forms as in spiral or helical coils or in normally straight bars. This character of element is used in various arts and heretofore wherever the element is used in a position in which it is in contact with steam or moisture or with water, as in a flow control, the thermostat by reason of at least one of its elements being made of a composition of nickel and iron tends to rust and becomes pitted and finally deteriorates to such extent as to become inoperative.

Considerable effort has been made to increase the life of the element where subjected to moisture as for instance by plating the same with nickel or other non-ferrous metal but such method has been unsuccessful in that the plating deteriorates and peels thus exposing greater or less surface of the ferrous element or elements of which the thermostat is composed to contact with water or moisture.

The object of this invention is to provide a thermostatic element that is not materially affected by moisture and this object may be accomplished by use of a non-ferrous material such as brass for the high expansion element welded to nickel steel alloy as the non-expansion or low expansion element and welding a comparatively thin sheet of non-ferrous material to the exposed surface of the nickel steel alloy whereby both of the flat surfaces of the element are sufficiently protected from contact with moisture by non-ferrous material as to prevent rust as is hereinafter more particularly pointed out. An example of a structure embodying my invention is shown in the accompanying drawings in which—

Fig. 1 is a view showing a portion of an automobile engine and radiator therefor with my improved thermostatic element in the

conduit therebetween and controlling a valve by operation of which the flow to the radiator is controlled.

Fig. 2 is a view of a portion of my improved thermostatic element before it has been formed to the desired thinness.

Fig. 3 is a similar view showing a portion of the thermostatic blade subsequent to the finishing operation.

Fig. 4 is a detail showing an alternative form of construction.

I have illustrated a portion of an internal combustion motor and a radiator such as is used in automobiles to indicate one of the uses to which my improved thermostat may be utilized and in which it is subjected to deterioration by moisture and in such relationship the thermostat 1 when normally cool tends to hold the valve 2 closed to prevent flow from the water space of the engine 3 to a radiator indicated at 4, the thermostat being located in the conduit 5 therebetween. This illustration is to be understood as being only a single instance of use of my non-corrosive thermostat.

In situations of this character where the thermostat is not subjected to high heat, the expansion side of the element, indicated at 6, may be of brass but other non-corrosive material having the necessary coefficient of expansion may be used. This is welded to a strip of ferrous material 7 usually such as invar or other nickel steel alloy having a very low coefficient of expansion. These two elements 6 and 7, that is, a corrosive and a non-corrosive element have been welded together heretofore but in such previous cases one face and two edges of the corrosive element 7 is in contact with water or with moisture in many instances of use and therefore such previous device is of short life.

To overcome this defect I weld to the face of the corrosive element 7, opposite that to which the non-corrosive element 6 is welded, another non-corrosive element 8 which may be also of the same character as the element 6 and an element of high coefficient of expansion or other non-corrosive element may be employed.

In the making of such elements it is usual

to start with a block 6 and a block 7, each approximately one-half inch thick and to the exposed surface of the nickel steel element 7 I weld a non-corrosive element of approximately .080 thick. These three elements then are rolled to secure the desired thickness of the final thermostat approximately .050 thick under which condition the part 8 would have been rolled to .004 and the other parts approximately .023 each. Under this condition and as previously stated the ferrous or corrosive material has both the flat faces thereof covered by non-ferrous or non-corrosive material and while the two edges may be exposed to moisture, in the situations in which this element may be used, the deterioration at the edge is not of material moment for the reason that rust may not eat into the body of the ferrous material to such an extent as to produce inoperativeness in the natural life of the structure with which the thermostat is to be used; but should it be necessary to protect these edges they may have non-ferrous material welded to the edges as well as to the otherwise exposed surface of the ferrous material as is suggested in Fig. 4 in which case the ferrous material is entirely enclosed within a non-ferrous shell welded thereto.

It will be observed that in my improved construction the ferrous nickel steel alloy has an expansion element welded to both sides thereof which is a condition unknown in previous art in the manufacture of thermostats of this character but the sheet 8 which is welded to the outer face of the ferrous material is of such thinness in the final element as to have little or no detrimental effect in the movement of the thermostat under variations in temperature but, nevertheless, is sufficiently thick and so intimately associated with the ferrous material by the welding process as not to flake or peel as with the plating methods heretofore used and thus provides a very effective method of preventing deterioration through contact with moisture. My improved thermostat is practically as efficient as the usual thermostatic blades by reason of the fact that the expansion element 6 is of so much greater thickness that it will cause practically the usual movement of the blade less the counteracting effect of the thin sheet 8 welded to the opposite side of the element of lower coefficient of expansion and thus within commercial practicability the thermostat is sufficiently effective for all the purposes for which such device may be used and provides a structure of long life and efficiency in such positions wherein it is subjected to or in contact with water or moisture in various forms as in flow control as is above suggested, or in the relief valves of steam radiators and various other situations wherein it is subject to moisture.

In the construction as above described the

non-corrosive element 8 is welded to the previously exposed surface of the corrosive non-expansible element or element of low coefficient of expansion 7 and preferably is an expansion element or element of fairly high coefficient of expansion in order not to increase the relative influence of the non-expansion element but in the event it is desired to use a non-corrosive non-expansion element on the heretofore exposed side of the corrosive non-expansion element 7 of the thermostatic couple, the thickness of the corrosive non-expansible element may be decreased to maintain the influence of the non-expansive side in normal relation with that of the expansion element.

It is also to be understood that, while in the foregoing description I have referred to the welding of the elements together, these elements may in many cases be brazed together to form a unitary structure. Therefore, it is to be understood that by welding as the term occurs in the appended claims is meant any method whereby the various metal elements of which my improved thermostat is composed have the surfaces thereof secured together in a manner to provide a unitary structure having the described thermal and non-corrosive characteristics.

From the foregoing description it will be evident that the structure is simple and efficient in operation preventing deterioration through contact with moisture and it is further understood that the invention is not confined to the form in which the thermostatic couple is made.

Having thus fully described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is—

1. A thermostat consisting of a bar of ferrous metal having a low coefficient of expansion and a bar of non-ferrous metal having a higher coefficient of expansion, the elements being of substantially equal thickness and welded together, and a thinner bar of the said non-ferrous metal welded to the opposite face of the bar of ferrous metal.
2. A thermostatic element consisting of a bar of ferrous metal to one side of which is welded a bar of non-ferrous metal of different thermal characteristics and to the other side of which is welded a relatively thin bar of the said non-ferrous metal.
3. A thermostatic blade consisting of a ferrous element having a low coefficient of expansion encased in non-ferrous metal of a higher coefficient of expansion, the non-ferrous metal on one of the flat sides of the blade being materially greater in thickness than that on the opposite side and joined together by a thin wall of the same metal covering the edges of the ferrous element.
4. A thermostatic blade consisting of a bar of nickel steel alloy having practically no

variation in expansion under variations in temperature, and a bar of brass welded thereto on one side of substantially the same thickness as the ferrous metal, and a relatively thin bar of brass welded to the opposite side of the ferrous bar.

5. A thermostatic blade consisting of two metal elements of dissimilar thermal characteristics welded together one of which is non-corrosive and the other of which is corrosive through the action of moisture, and a relatively thin bar of non-corrosive metal welded to the exposed side of the corrosive element.

6. A thermostatic blade consisting of two elements of dissimilar thermal characteristics having two similar surfaces secured together in such manner that the thermal characteristics of one are opposed by that of the other and one of which is of non-corrosive metal or composition and the other of which is corrosive in the presence of moisture, and a relatively thin element of the same non-corrosive metal secured to the remaining sides of the corrosive element in a manner to shield the otherwise exposed surfaces thereof from moisture.

7. A thermostatic blade consisting of a corrosive non-expansion element and a non-corrosive expansion element welded thereto in a manner to encase the same thereby preventing oxidation of the corrosive element, the casing being of greater thickness on one side of the corrosive element than on the other to such degree as to counteract the expansion effect of the thinner portion of the expansion element.

In testimony whereof, I sign this specification.

WILLIAM M. CHACE.