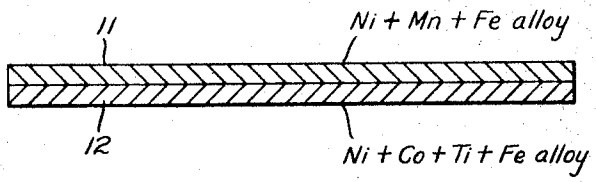
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BIMETAL THERMOSTAT

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WITNESSES:

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BIMETAL THERMOSTAT

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4 Claims. (Cl. 297—15)

My invention relates to thermally actuable devices and particularly to bimetal thermostats.

An object of my invention is to provide a bimetal thermostat which shall have the following characteristics: first, a relatively large deflection for a given temperature variation; second, the two elements of the bimetal combination to have the same hardness characteristic; third, a relatively large range of temperature over which the bimetal thermostat is active; and fourth, that the bimetal element shall not be permanently deformed on moderate overheating, such as may occur if the upper temperature limit is accidentally exceeded.

Another object of my invention is to provide a bimetal thermostat which shall be operable to relatively high temperatures and which, in general, shall have improved fabricating characteristics.

In practicing my invention, I provide a high-expansion element for a bimetal thermostat which shall have a major portion of iron, smaller, but appreciable, portions of nickel and manganese, with or without chromium, and smaller quantites of silicon and carbon, while the low-expansion member, if a ferrous alloy, shall include nickel, with or without cobalt, a lesser portion of titanium and a small portion of manganese.

The single figure of the drawing is a view in section of a bimetal bar embodying my invention.

One of the important characteristics of the two members of a bimetal thermostat is that the hardness characteristic of the two members shall be substantially the same in order that the fabrication or manufacture thereof shall be made quickly and with as little trouble as may be possible.

I have found that a bimetal thermostat embodying two members of substantially the following ranges of composition will have, when properly treated, all of the hereinbefore mentioned desirable characteristics, not only as to relatively large deflection over the temperature range, but also substantially the same hardness characteristics and will be a combination which may be subjected to cyclic variations of temperature for a relatively large number of times without loss of strength or a change in the degree of response to a given temperature variation.

The high-expansion member of my improved bimetal thermostat may be any one of the combinations shown in the following table:

Percent Fe	Percent Ni	Percent Cr	Percent Si	Percent Mn	Percent C
Remainder	21.9	7.8	1.7	0.8	0.47
Do	0.	0.	0.7	23.0	0.1
Do	10.0	0.	0.2	10.0	0.2
Do	13.0	0.	0.2	8.0	0.
Do	20.0	0.	0.2	6.0	0.
Do	5.9	0.	0.5	13.5	0.2

The low-expansion member may be any one of the following combinations:

Percent Fe	Percent Ni	Percent Co	Percent Ti	Percent Mn
Remainder	20. to 45.	0. to 25.	.5 to 10.	0. to 1.0
Do	42.	0.	3.	.5
Do	28.	15.	3.	.3

I have illustrated one form of device embodying my invention. A high-expansion member 11 and a low-expansion member 12, each of the composition set forth above, are suitably secured to each other, as by welding. Other forms of thermostats may, however, be made from my improved bimetal combination.

It may be noted that, in the high-expansion member, I prefer to employ not over 22% of nickel and, when this relatively large percentage of nickel is utilized, the percentage of manganese is relatively small. I prefer an alloy in which the nickel content plus two and one half times the manganese content plus eighteen times the carbon content, all content values being in percent, are greater than thirty two percent, but not over thirty eight percent.

In the low-expansion member, the amount of nickel is relatively large but does not exceed 45%, while the amount of cobalt is preferably less than 20%, the amount of manganese is not over 1%, and the amount of titanium is not over 10%.

I have found that a bimetal combination made from one of these alloys in the high-expansion table may be combined with any one of the alloys shown in the low-expansion table and that the hardness characteristics of the two elements will be substantially the same, after appropriate heat treatment. The deflection of a bimetal element of this kind will be relatively large and it will operate properly up to relatively high operating temperatures.

While I have set forth preferred constituents for the two members of my new bimetal thermo-

stat, it is obvious that various modifications may be made therein, and I desire that all such modifications shall be included as are covered by the appended claims.

I claim as my invention:

1. A thermostat comprising a pair of cooperating metallic elements having different temperature coefficients of expansion, the element having the higher expansion being an iron alloy including nickel, manganese and carbon, the nickel content, plus eighteen times the carbon content being not less than thirty-two per cent and not over thirty-eight per cent, and the low expansion element being an iron alloy including not less than twenty per cent and not over forty-five per cent of nickel, from a trace to twenty-five per cent of cobalt, from a trace to ten per cent of titanium and from a trace to one per cent of manganese.

2. A thermostat comprising a pair of cooperating metallic elements having different temperature coefficients of expansion, the element having the higher expansion being an iron alloy including nickel and manganese the nickel content varying between six per cent and twenty per cent and the manganese content varying from twenty per cent to one per cent and the combined percentage of the nickel and manganese being approximately twenty per cent, and from a trace to forty-seven hundredths of one per cent of carbon, and the low expansion element being an iron alloy including between twenty to forty-five per cent of nickel, from a trace to twenty-five per cent of cobalt, between one-half per cent and ten per cent of titanium and from a trace to one per cent of manganese.

3. A bimetal thermostat comprising a pair of cooperating metallic elements having different temperature coefficients of expansion, the high expansion element being an iron alloy including from a minute amount to not over twenty-one and nine-tenths per cent of nickel, from twenty-three per cent to eight-tenths of one per cent of manganese, the combined percentages of nickel and manganese being not under fifteen per cent, from ten-hundredths to forty-seven hundredths of one per cent of carbon and from two-tenths to one and seven-tenths per cent of silicon, the low expansion element being an iron alloy including from twenty to forty-five per cent of nickel, from a minute amount to twenty-five per cent of cobalt, one-half of one per cent to ten per cent of titanium and from a minute amount to one per cent of manganese.

4. A bimetal thermostat comprising a pair of cooperating metallic elements having different temperature coefficients of expansion, the high expansion element including from a trace to twenty-one and nine-tenths per cent of nickel, from twenty-three per cent to eight-tenths per cent of manganese, the combined percentages of nickel and manganese being not under fifteen per cent, from one and seven-tenths to two-tenths per cent of silicon, from a trace to forty-seven hundredths of one per cent of carbon, the remainder being iron, and the low expansion element including the following in substantially the proportions indicated.

	Per cent
Nickel	28.
Cobalt	15.
Titanium	3.
Manganese	.3
Iron	53.7

HOWARD SCOTT.