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BIMETALLIC TEMPERATURE SENSORS

Abstract. *For the purpose of sensitivity and accuracy of temperature measurement, also simplifying the construction and manufacturing process of proposed bimetallic sensors of temperature. Furthermore, the sensitive element is cantilevered bimetallic plate, which free end connected by transmission mechanism with axle of acapacitor with a variable capacitance (or with magnetic core inductors), which turn on in the loop of the auto-oscillator of electricity oscillations.*

Key words: *temperature, bimetallic plate, capacitor, inductor, generator of electricity oscillation.*

Known Bimetallic sensors of temperature [1,2] have next disadvantages: lack of sensitivity and accuracy of measurement, complexity of a construction and manufacture of the sensitive element, relatively large cost coating of a spring.

For the purpose of sensitivity and accuracy of temperature measurement,simplifying the construction and manufacturing process of proposed bimetallic a sensor of temperature (Fig.1).

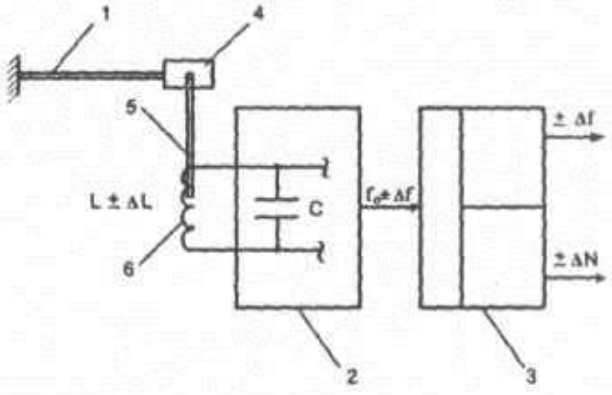

Fig. 1 – Bimetallic temperature sensor, made of inductance change

Bimetallic sensor of temperature contains sensitive element 1, auto-oscillator of electricity oscillation 2 and microcontroller 3. Sensitive element 1is cantilevered bimetallic plate 1, which free end connected with magnetic core 3 of inductor6 by transmission mechanism 4. Inductor 6 turn on in the loop of the auto-oscillator of electricity oscillations 2, which connected with microcontroller 3.

Sensor functions as follows.

At the start value of temperature T_0 (for example T_0=0°C) is set such a position of magnetic core 5 in inductor 6, at which it will have inductance L_0.The initial frequency value of the

$f_0 = \frac{1}{2\pi\sqrt{L_0 C}}$ auto-oscillator frequency of electric oscillations 2 is applied to the microcontroller, which is programmed to compensate for this value of frequency and the formation of informative parameters of the sensor - the frequency Δf and the digital code ΔN, proportional to the value of temperature measurement. Thus, the outputs of the microcontroller 3 set the initial values of the output signals of the sensor $\Delta f = 0$, $\Delta N = 0$. Changing the temperature by a value ΔT (for example, an increase) leads to the deformation of the bimetal plate 1, the free end of which through the transfer mechanism 4 leads to the movement of the magnetic core 5 inside the coil of inductance 6. This induces a change in the inductance L_0 by the value ΔL and frequency f_0 of the auto-oscillator of electric oscillations 2 by the value Δf. Thus, the frequency and digital outputs of the microcontroller 3 set the values Δf and ΔN, which are proportional to the value of the measured temperature ΔT.

Another possible embodiment of the bimetallic temperature sensor (Fig. 2), in which the sensitive element 1 is made in the form of a console-mounted bimetal flat plate (or plate twisted in the form of a spiral), the free end of which the transmission mechanism 4 is connected to the variable capacitor shaft 5, activated in the LC loop - auto-oscillator of electrical oscillations 2, serially connected to an analog-to-digital converter 3 [3].

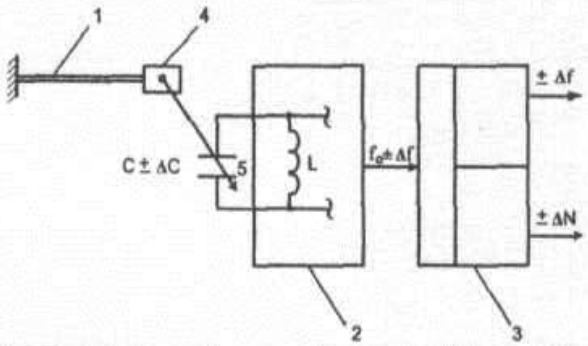

Fig. 2 – Bimetallic temperature sensor, based on capacitor capacity change

Changing the temperature by a value ΔT (for example, an increase) leads to the deformation of the bimetal plate. The deflection of the bimetal plate 1 through the transfer mechanism 4 causes the turn of variable capacitor shaft of the variable capacitance 5 which changes the capacity of C_0 to ΔC and the frequency f_0 to Δf. In this case, frequency and digital outputs of microcontroller 3 have set values of frequency Δf and digital code ΔN, which are proportional to the value of the measured temperature ΔT.

Conclusion. The proposed bimetallic temperature sensors can increase the accuracy, sensitivity of measurement and have a simple and reliable construction.

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