A THERMAL THERMOESTHESIOMETER

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The thermal thermoesthesiometer described can be used to investigate thermal reception in the skin by the functional mobility method.

The concept of functional mobility, first put forward by P. G. Snyakin and confirmed by his researches and those of his pupils, has been widely accepted in physiology and in clinical practice [1-9]. The methods of investigation and the instruments used for them, developed in his laboratory, are being used on an ever-increasing scale. In particular, physiologists, clinicians, and hygiene specialists are turning more and more frequently to the investigation of the functional mobility of the thermoreceptors as the initial link in the chain of thermoregulation in the body. During investigation of the functional mobility of receptor systems, an essential condition is the constancy of the test stimulus. The following demands are thus made on the instrument with which the functional mobility of the thermoreceptors can be investigated: 1) a point stimulus (1 mm), and 2) constancy of temperature of the sensor.

The suggested instrument (Fig. 1), with an electric heater and temperature recording device, can be used for testing over a very wide range of temperatures by regulating the strength of the current. The most important feature is that the assigned temperature of the sensor can be maintained throughout the investigation and checked continuously. The instrument is portable and transportable, strong, simple to use, and self-contained because it can work not only from the 127 and 220 V supply system, but also from batteries.

The instrument (Fig. 1) consists of a probe (1), which is a metallic sensor (copper, silver), 1 mm in diameter, with two windings (4 and 5), mounted in a rigid, heat-insulating body (2). Winding (4) serves to heat the sensor (3). It is connected through a potentiometer (6) to the secondary winding of a transformer (7). The potentiometer (6) changes the strength of the current in winding (4) and thus regulates the degree of heating of the sensor (3). The potentiometer (6) can be fitted with a scale for the initial rough setting of

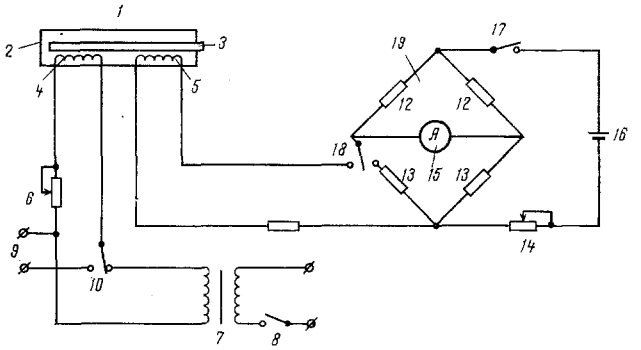

Fig. 1. Theoretical circuit of thermoesthesiometer (explanation in text).

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the assigned temperature to which the sensor is to be heated. The primary winding of the transformer (7) is supplied by the ac system and is operated by the tumbler switch (8). The circuit of winding (4) also includes a lead out (9) for connection to the battery supply. The switch (10) is used to change over from the supply system to the battery and vice versa.

Winding (5) is the sensor of a resistance thermometer for checking the temperature of the sensor (3). It is connected to the recording part of the resistance thermometer (19), based on a bridge compensation circuit. A temperature-sensitive element is connected into one arm of the bridge, and the other three arms consist of fixed resistors (12). The resistor (13) is connected into the bridge arm parallel with the winding of the temperature-sensitive element, and together with the potentiometer (14) it is used to tune and control the instrument.

The galvanometer (microammeter) (15) connected into the bridge circuit is graduated in degrees Centigrade. The bridge circuit is fed from a dc source (battery) (16) collected to the circuit through a tumbler switch (17). The switch (18) converts the instrument from the checking to the working position. The probe (1) is connected to the other components of the scheme by a flexible cable 1-1.5 m long.

The instrument works as follows. The primary winding of the transformer (7) is supplied from the 127-220 V ac system. Current is supplied from the secondary winding of the transformer to the heating coil (4) of the thermosensor (3). If the winding (4) is supplied from a battery, the battery is connected through the terminals (9) and the transformer is disconnected by switch (10). The required temperature of the sensor is assigned by changing the strength of the current in the heating coil through a change in the resistance of the potentiometer (6) included in the circuit. The heating winding (4) of the metallic sensor (3) warms it to the required temperature.

The temperature-sensitive element (winding 5), when heated by the thermosensor (3), changes its resistance, throwing the bridge off balance, which is recorded by the galvanometer (15). Since the e.m.f. of the battery (16) changes with time, the bridge must be tuned before and during the work. To do this, the instrument is converted by the tumbler switch (18) into the testing position, and by means of the variable resistor (14) the needle of the microammeter (15) is adjusted to the control marker (zero setting). The instrument is then switched back to the working position and, having made sure that the temperature of the thermosensor (3) has reached its assigned level, the investigation can begin.

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