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21. Basic principles of attachment an active thermal compensation device to working power line

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Introduction. Method and device for attachment a thermal compensating device made from shape memory alloy (SMA) to working power line were reviewed.

Materials and methods. Graph theory and principles of theory of automatic regulation.

Results of discussion. Taking into account that there is a reverse dependence between temperature extension of power line wires and tension in the wires, the compensation of wire sag can be accomplished by increasing the tension in the wires at maximum temperature. Thermal compensation of wire sag is performed with the help of force elements, which are fastened to the wire and act on it. Using the unique properties of material with shape memory effect (SME), it is possible to have a zero or negative temperature extension of power line wire with an increase in temperature. Due to the fact that the material with SME - nitinol has a significant impact strength, a high endurance limit, is easy to bend, dampens vibration, does not corrode even in seawater, does not oxidize when heated to a temperature of 880 °K, is not cracking under stress and is non-magnetic, it is possible to manufacture from this material a power element in the form of a thread of length 1-8 m and to attach it parallel to the segment of the wire in each span.

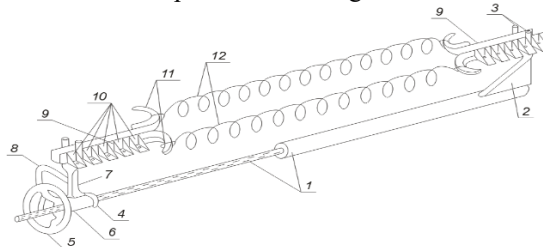


Fig.1. Mounting device with thermal compensator installed.

The device consists of a rod 1, on one side it has a thread, on the other - a mounted bracket 2 with a fork 3. On the threaded side there is a bushing 4 with an internal thread and a flywheel 5. On the bushing there is a joint 6 with a bracket 7 and a fork. From the side of coupling 6 and bracket 7 handle 8 is placed. Forks planes are perpendicular to the rod 1. Forks have semi-circular enclosures 9 (for spring nodes fastening). To the lateral walls of the enclosures brackets 10 with holes, located symmetrically to the axis of the enclosure are attached. The enclosure, from the one side, has brackets 11, to which the power elements of the thermal compensator 12 are attached. The distance between the teeth of the forks is equal to the width of the housing 9, and the thickness of the teeth of the forks is equal to the distance between the side brackets 10. The simplification of the installation of thermal compensators on the wires of power lines is achieved by the fact that the thermal compensating device is preheated to the end temperature of the reverse martensitic transformation, the wire is pulled up by the value of its absolute temperature extension in the given temperature range independently of the environment temperature, and the thermal compensator is fastened to the wire loop, which emerged in the process of installation.

Conclusion. The results should be used in electric networks of all consumers of electric energy.