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Research of microclimate control system integrated in the clothes

Research aim: to create a microclimate control system, which would not contain a liquid, or gaseous fluids, but the heat draining function is based on heat conduction processes in solid states, as well as the source of power should be mobile, environmentally friendly form of energy.

Protection of person from overheating is one of the most difficult referring to clothing tasks, because it is necessary to protect from external heat supply (for example, solar radiation) and at the same time provide heat removal originating in the body. As one of the garment operating parameters is listed the temperature between the body and the first layer of clothing. The optimum temperature of this level is determined by the human physical activity. For example, a person at rest is considered a comfortable temperature 30 to 32 °C, but a person who performs heavy physical work, it is 15 °C.

Smart clothes with integrated cooling system are one of the ways to regulate the microclimate. Here could be mentioned the garments with integrated thermoelectric elements. Such a clothes manufacturing process has to provide a small garment weight, durability and safety, operational efficiency, minimal current flow, clothing comfort, air and vapor permeability and low production costs. The appropriate dress for such a task is considered to be the vest - the shape provides both cooling elements in the configuration of the corresponding body region, but also simple textile technology performance for such a model. Generally the microclimate regulatory vest contains: 4-6 Peltier coolers, which provide cooling effect; electronic control system with heat sensor; solar cells and batteries, charged by solar cells, used for cooling systems stable operation. The article is developed as an experimental prototype of wearable electronic system for garment that can be used for needs of military forces, medicine and health care or casual clothes.

Several experiments have demonstrated the possibility of system operation. To verify microclimate regulatory vests compliance with the general requirements to the garment, it is scheduled to assess the physiologically - hygienic point of wearing by the appropriate operating conditions, during activities by measuring both temperature changes in different locations in space between the body and clothes and other physiological parameters (resistance, humidity etc.). Temperature measurements modeling experiments are performed in the space between the garment first layer and cotton T-shirt, to determine changes of the body microclimate at rest and during the time of physical activities (11 points: area of system operation and control area):

1) measurements with switched off cooling system;
2) measurements with switched on cooling system.

Experimental results have shown that, apparently the system does not work just locally, but affects the entire body microclimate regulation. Research by the article are continued, by developing such problem areas:

- experiments with different types and duration physical activities;
- eksperiments to explore what happens to body temperature when the system is off after physical activities;
- experiments to improve the vapor conductivity of the cooling system.