THE ETERNAL ENGINE… ALREADY ON SALE!

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For several years now, there has been a brisk trade in "perpetual motion machines" in our country, accompanied by even their episodic advertising on television. In fact, the commercials say that the efficiency of the proposed device is much higher than 100%.

We are talking about heating devices like heat generators "Dobroe teplo". Their heating element is a flexible, easy-to-roll mat powered by a simple socket. The advertisement claims an unusually high calorific value of the device, which, allegedly, at the same power as conventional household heaters, gives 30% more heat. For this reason alone, there is a great temptation to buy such an adaptation: the unstable situation with central heating often forces the use of electric fireplaces, and given their energy consumption and current electricity prices, this pleasure is not cheap. And here - an opportunity to save 30% of electricity!

But there is a slight discrepancy here. Let's remember why the efficiency of electrical appliances does not reach 100% - mainly due to heating losses. The electric motor not only produces useful mechanical work, but also heats up, a burning light bulb emits, in addition to light, heat that we do not need (the low energy consumption of fluorescent lamps is due precisely to the fact that their light is “cold”). But when it comes to an iron, a soldering iron, a fireplace, the conversation about efficiency loses all meaning: no matter how much energy an electrical appliance uses, all of it will eventually go to work - into heat. And since the efficiency is the ratio of useful energy to consumed energy, then for electric heaters this ratio is always equal to unity and their efficiency is 100%.

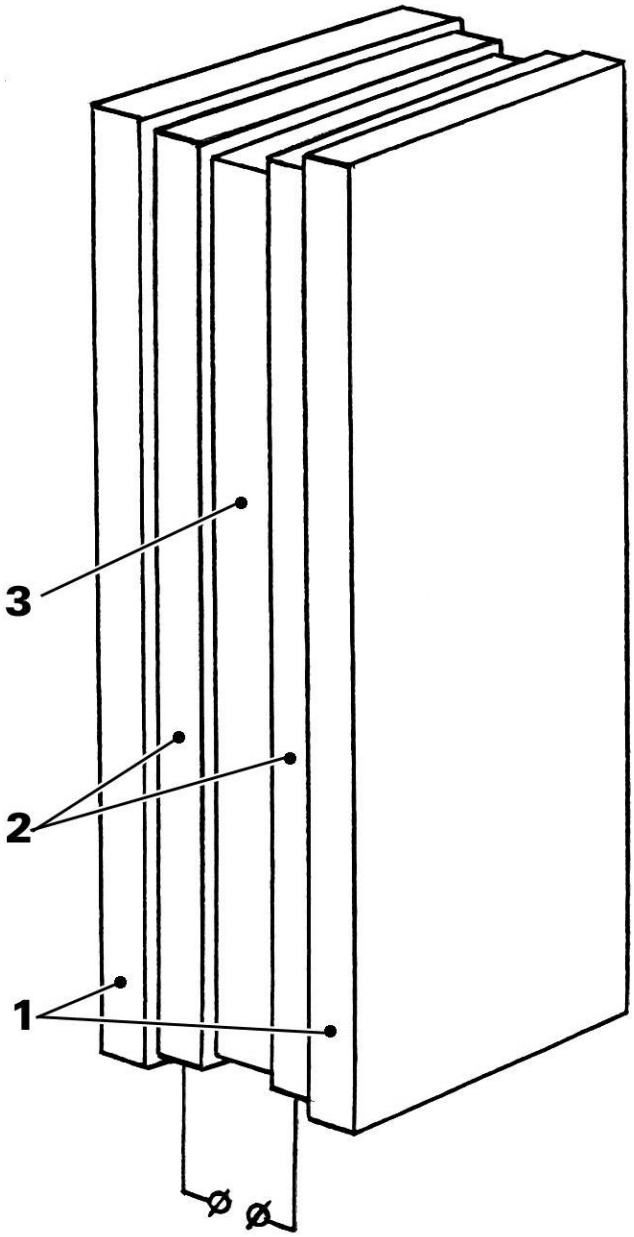
And when they say that the proposed electric heater gives 30% more heat than all others at the same power, this means that its efficiency is 130%. The heater turns out to be essentially a perpetual motion machine, extracting 30% of its energy from the air, from nothing. And from nothing, as the 1st law of thermodynamics says, it is not taken. True, energy (like money) can still be extracted from the air if we are talking about a heat pump. So, the air conditioner can be installed so that it heats the room, generating heat not using the power grid, but taking it from the outside air and sending it into the room - to transfer heat from cold to warm, and electricity is consumed. While giving off the same amount of heat, as well as electric heaters, the air conditioner will consume much less electricity. There is no violation of physical laws here - after all, heat is not born out of nothing, but is taken from the external environment. And the efficiency of the air conditioner, which is according to the formulas for heat engines, does not exceed 100%.

So maybe the advertised devices are heat pumps according to the principle of operation - hence the “extra” 30%? But no, these devices have nothing in common with heat engines (as they are understood in thermodynamics): they work indoors, isolated from external heat reservoirs, and heat in them is generated by the banal passing of current through a conductor.

Where, then, does the extra 30% come from? Many will say, “Just another publicity stunt. You never know the noodles are hanging on the ears in advertising”. For the time being, I myself thought the same way, but as it turned out, the sellers of "perpetual motion machines" did not lie ...

I realized this when I accidentally read in a collection of reports on technical and scientific innovations “Eureka-88” (Moscow: Molodaya gvardiya, 1988) an interesting note called “Economical heating” (p. 250). It talked about heating elements in the form of wall panels, which were installed in houses in Bulgaria instead of steam heating batteries. In them, heat was also generated by passing current through an electrically conductive material - a layer of graphite. But most importantly, it was said that these panels give 30% more heat than heating devices that consume the same amount of electricity. That is why it was said about heating “economical”.

It means that everything is not so simple, since entire neighborhoods with heaters of this type are being built. Either the experts who studied the panels were mistaken, or there is some unknown effect. Maybe the principle of a heat pump in panels still works? In panels - it is possible: after all, unlike the portable devices sold, they are built into the walls, that is, they are in contact with the external environment. The contact of semiconductor graphite with a metal electrode can, in principle, constitute a Peltier element, capable, given the considerable working surface of the panel-walls, to pump heat and give an extra 30% of the heat. If the devices are really economical, then they are extremely interesting and deserve close study by engineers and scientists. But, again, this only applies to wall panels. Manufacturers, it is evident,



1 - Защитное покрытие

2 - Материал электродов

3 - Графитсодержащий материал

Perhaps, however, there is another explanation for the excess calorific value of the device. Graphite enters the central electrically conductive layer in the form of powder, grains, through the contacts between which

current flows. It is in the places of contacts, due to their small area, which means high resistance, that the main heat is released. But such contacts are a temporary thing, they are constantly being broken and then restored again. Therefore, with sufficient voltage, the contacts should spark, creating in places an electric arc - everyone, for sure, saw how the carbon brushes of an electric motor or a socket spark as a result of short-circuits and openings when a powerful device was cut out of it.

And the arc qualitatively changes the nature of the flowing current: the alternating current ceases to be sinusoidal, the shape of the pulse is distorted. Most of the devices that measure the current, voltage and power in the network are designed and calibrated to measure sinusoidal current. Therefore, with a different form of impulse, they can "lie", giving incorrect and sometimes, possibly, underestimated readings. So, with the help of an electric arc, they even tried to extract energy from a vacuum (from that very "nothing"), although in reality the "excess" energy was supplied by the power grid, while the arc simply distorted the energy consumption readings. So, if there is a similar effect in an electric heater, then the efficiency is not higher than 100%, although depending on the type of electricity meter, it can save money by “robbing”, however, the power grid.

In general, whatever the operating principles of the heater and the sources of those additional 30% of energy, one thing is clear - it cannot be a perpetual motion machine, the laws of thermodynamics should not be violated. Even though the device is convenient, practical, electrical and heat-safe, its efficiency is not 130%, as stated in the advertisement. And although advertising is the engine of commerce, fortunately, it does not last forever.

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