HOW TO RAISE THE BODY TEMPERATURE WITHOUT HEAT SUPPLY FROM THE OUTSIDE?

ABSTRACT.

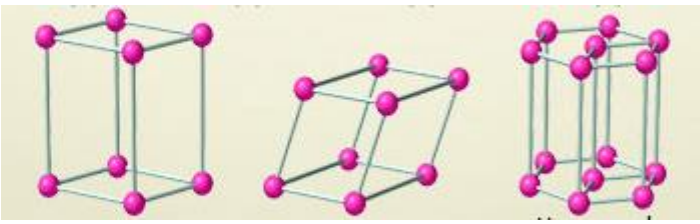
The paper presents what the process of self-heating is. It shows how this process can be enhanced. It presents a new model of the generator that allows to raise a body temperature without supplying heat from the outside. It analyses the existing generators of this type and shows their flaws. It shows how to prevent the negative effects of processes of self-heating. It has been explained why the solid bodies have a crystalline structure.

A bit of theory.

Atoms of all bodies constantly reprocess particles of dark energy into the quanta of energy. The role of these quanta is to prevent the bonding of atoms of all bodies into one single sphere. Figuratively speaking, every body is an engine in which the internal combustion fuel is dark energy, and the product of this combustion (exhaust gas) is quanta of energy. After forming and fulfilling its role inside a body, the energy quanta as any exhaust gases are expelled into the environment. The process:

- is the condition for the existence of the universe in its present form,
- is revealed as (heat) electromagnetic radiation of bodies,
- occurs at any temperature,
- does not depend on the presence of other bodies,
- can not be stopped, it can only be slowed down.

Slowing down quantum expulsion to the environment increases the concentration of quanta inside a body, which means it causes heating of the body (an increase of its temperature).
If a given solid body has the shape of a sphere or cylinder of radius r, then the number of quanta emitted by atoms of the body will be proportional to r^3 of these solids, and the number of quanta leaving the body will be proportional to r^2 of these solids. This means that the concentration of quanta inside the expanding sphere or cylinder increases. As mentioned above, the result of the increase in concentration will be a rise in the body temperature. Moving and colliding atoms of the body generate quanta of energy but at the same time they form obstacles slowing down the outflow of quanta from the interior of the body, through which they contribute to the growth in intensity of the process of self-heating of solids. Not willing to allow overheating of solids, nature "invented" the crystal structure of bodies. In the crystal lattice, emitting quanta solid atoms do not perform chaotic movements, as it happens in fluid, but move and collide along the same well-defined sections that form edges of various polyhedra in a solid.

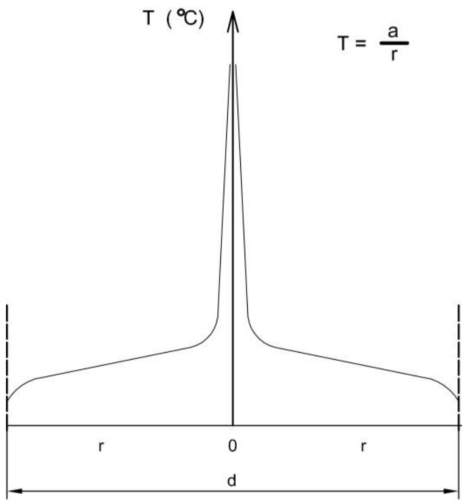


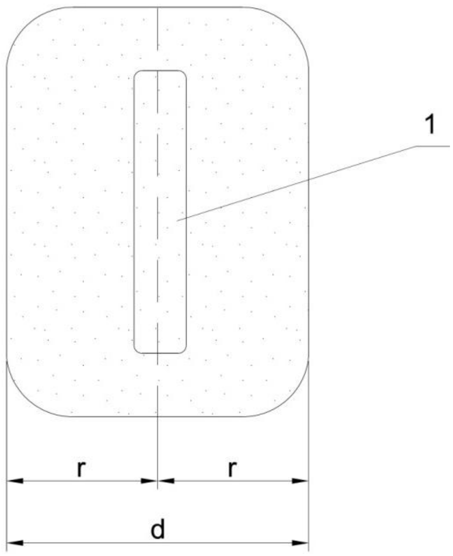
The result is that inside of the polyhedra there are empty spaces through which with the body's growth in size, an increasing number of quanta can leave the body without obstacles. Figuratively speaking, the crystal structure of a solid results in it becoming "transparent" for the energy quanta

emitted by the body. This "invention" causes that in the bodies with a crystal structure there is virtually no growth in temperature when their sizes increase.
The process of self-heating is a generally applicable physical law.
The temperature distribution for this phenomenon is presented in the following formula:

$$T = \frac{a}{r}$$

T –temperature,
a – a factor depending on the material forming a sphere or cylinder,
r – a distance from a point to the centre of the sphere or cylinder axis.
This means that in every sphere or cylinder a temperature increase zone is formed, while the value of the temperature grows rapidly near the centre of the sphere or the axis of the cylinder. The above formula shows that this temperature for r = 0 can grow up to infinity.
For a cylinder, the above dependence is graphically depicted by the following figures.

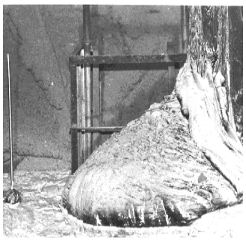




d – the diameter of the cylinder
r – a distance from a point to the axis of the cylinder
1 – a zone of rapid increase of temperature

Along with the increase of temperature of these geometric solids, the following phenomena may occur:
- If the material a solid is made of has a melting point higher than the temperature reached, it heats up to a specified temperature and persists in this condition.

- If the material a solid is made of has a melting point lower than the temperature reached, it melts.



- If the material is flammable, and the material a solid is made of reaches the flash point, the self-ignition occurs.

In each of the above cases, if a rise of temperature in the centre of the solid takes place in a very short time (of the order of microseconds), it will end up in an explosion of the body.

A sphere and cylinder are just examples. Normally, the phenomenon of self-heating applies to all solids, regardless of the shape and size.
If bodies are subject to the phenomenon of self-heating, the ways of enhancing this process and using it as the heat source can be considered.

This can be achieved in a few steps.
Step 1.
The emission of energy quanta should be maximized. Since quanta of energy are emitted by vibrating electrons of atoms, an element should be used, preferably a metal of the largest possible number of electrons, that is a metal of the largest possible atomic number and a high melting point. It can be, for example, tungsten (atomic number 74, melting point 3422^0 C).
Step 2.
The crystal lattice of the body should be damaged as much as possible.
A crystal structure of solids is nature's antidote to the process of self-heating, therefore, in order to

enhance the process of self-heating, the crystal lattice of the body should be damaged as much as possible. Damaging the lattice will disturb the outflow of quanta from the interior of the body, thereby intensifying the process of self-heating. Damaging the crystal lattice of metal is made by powdering it to possibly smallest particles (of the order of micrometres or nanometres). Instead of powdering the metal, there can be used a chemical compound which spontaneously occurs in the form of powder, like uranium dioxide UO_2 (melting point 2847^0 C), plutonium dioxide PuO_2 (melting point 2390^0 C), nickel oxide NiO (melting point 1984^0 C), lead oxide PbO (melting point 888^0 C).
As it is seen, in addition to being in the form of powder, metal oxides have another very advantageous property which is a high melting point.
Step 3.
Another body should be brought into the body, like hydrogen, steam, alpha particles, neutrons. Such "foreign" bodies will disturb the order inside the given body (they will disturb ordered movement of atoms in the crystal lattice, reduce its transparency to quanta), which will impede the outflow of quanta from the interior of the body, thus the process of self-heating will intensify.
Step 4.
The surface of the body should be covered with a layer reflecting light to the interior. The layer will play the role of a reflector directing the quanta which are leaving the body back to the interior. It will increase concentration of quanta inside the body, thus its temperature will grow up. An example of material which can play the role of the mentioned above reflector is aluminium foil.
Step 5.
The body should be insulated from the environment with a thermal insulator of the highest efficacy in order to make the escape of quanta from the interior to the environment as difficult as possible. The best insulator is a vacuum understood as space devoid of atoms. Vacuum insulates several times better than such insulators as foamed polystyrene, mineral wool, polyurethane foam, and others. Vacuum is the best thermal insulator but not perfect. If there existed a perfect insulator, every body could be heated up to such a high temperature that its explosion would occur.
Step 6.
The outer layer of the heating medium can be heated up, for example, with an electric coil or mat. According to the graph presented above, a higher temperature at the surface of the insulated body will increase the temperature in its centre.

A spectacular proof of the correctness of the above is plutonium-238 dioxide (PuO_2). In this compound, which is in the form of powder, step 3, i.e. bringing into the fuel an additional body impeding the outflow of quanta is realised by nature itself through decomposition of plutonium atoms and emission of alpha particles in the interior of the body. These particles disturb the outflow of quanta so effectively that a several-kilogram cylinder made of plutonium-238 dioxide heats up to a few hundreds of degrees Celsius and persists in this temperature for decades.

Red-hot plutonium-238 dioxide as a result of the process of self-heating.

It is worth noting that a cylinder of the same size made of pure plutonium will heat up only to a temperature of several tens of degrees Celsius.

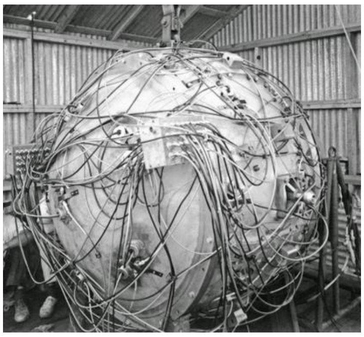
Another, even more spectacular proof of the correctness of the above is a bale of hay in a field. This cylinder of compressed hay can heat up to such a high temperature that its explosion will occur.


A bale of hay heated nearly to flash point as a result of the process of self-heating.

In this case, an additional body to impede the outflow of quanta (intensifying the increase of temperature) is steam in the bale of hay. A spontaneous combustion occurs at a humidity between 20 and 40%.
In the actions of a human, some of the above steps enhancing the process of self-heating are used unintentionally.
In a nuclear reactor, the heating elements are small cylinders (pellets) of powdered uranium dioxide (UO_2). There are implemented the first two steps of the presented above procedure of enhancing the process of self-heating. Uranium is the element with the highest atomic number, which occurs naturally (step 1). Its compound UO2 is in the form of powder with a high melting point (step 2). However, step 3, that is bringing into the fuel an additional body increasing the temperature of the fuel in a nuclear reactor has yet been made in a "non-classical" way. In uranium dioxide, a chain reaction was initiated as a result of which uranium nuclei break into smaller nuclei and, at the same time, a number of neutrons are emitted to the interatomic space. These neutrons play the role of the above mentioned additional body impeding the escape of quanta from the fuel.
Notice.
The idea of gaining heat in a nuclear reactor is to produce the maximum amount of foreign body (neutrons) and maintaining them as long as possible inside uranium dioxide playing the role of a heat generator. This is why the neutrons with minimum kinetic energy play the key role in the process. The inverse relationship between the energy of neutrons and the temperature of the body is a proof that neutrons (as well as alpha particles and entire atoms) are not a source of the thermal energy of the body.
In an unusual way, step 4, that is the use of a reflector, was also performed in a nuclear reactor. As a reflector, there was used a material which reflected neutrons willing to leave the reactor back to its interior. These four steps cause self-heating of the UO_2 pellets to the temperature over 2000 K.

Another apparatus in which the process of self-heating is unintentionally used by a human is the atom bomb. In the atom bomb, the same steps are performed as in the reactor of a nuclear power plant. The difference is that:
- as a fuel, one big several-kilogram uranium ball is used instead of millions of little cylinders of uranium dioxide,
- the particles disturbing the outflow of quanta (neutrons) are produced inside the ball without any control of their number.
It causes a rapid increase in the number of neutrons, which results in a rapid increase in density of quanta (temperature) in the centre of the uranium ball in a very short time (of the order of microseconds) and causes its powerful destructive explosion.

It follows from the above considerations that despite the lack of similarity, the bale of hay (the hairy one on the left) and the atom bomb (the bald one on the right) are two sisters, daughters of the same mother Nature.



A bale of hay is heating up and burning. A uranium ball is heating up and exploding.

The differences in the strengths of these processes result from various speeds of the temperature increase in them.

A bale of hay heats up to a few hundreds of degrees Celsius within a few weeks.

A uranium ball heats up to many millions of degrees in a millionth of a second.

An emotional thought.

Robert Oppenheimer and thousands of his unnamed helpers, using unimaginable financial resources, created an atom bomb in a few years but no scientist, for the decades, has been able to prevent fires in baled hay

in the field in a stack in the barn

which until now have been a cause of life's tragedies of thousands of farmers all over the world. Combustion of hay occurs at a temperature above 300^0C, while the scientists' creativity " in this topic" ended with the assertion that a fire in a bale of hay is initiated by bacteria, which, by the way, die at the temperature of 65^0C.

The process of self-heating is a harmful and inevitable phenomenon, but nature, knowing the essence of this phenomenon, has successfully protected itself against it, creating a crystal lattice in solids. A human does not know the essence of this phenomenon, therefore we are not able to protect ourselves against it, so self-heating of various bodies itself has been accompanying people for

centuries hindering their life perfectly.
The phenomenon of self-heating affects stored in large amounts:
- hay, clover, lucerne, cereal grains, tobacco, dry leaves, straw, silage,
- natural and chemical fertilizers,
- charcoal, hard coal, lignite coal, sawdust,
- metal ores, metal powders, metal particles, metal shavings,
- metal scraps, tyres, rubbish,

and peat bogs "contaminated" by human activity.
The process of self-heating of the above bodies very often leads to fires.
Here are some examples.



A fire of aluminium filings. A fire of a heap of coal. A fire of a grain silo.

Fires of this kind:
- are insidious, difficult to detect until the last moment,
- are violent, sometimes begin with an explosion,
- are very difficult to extinguish because the source of fire is hidden at the deepest place of a burning object.

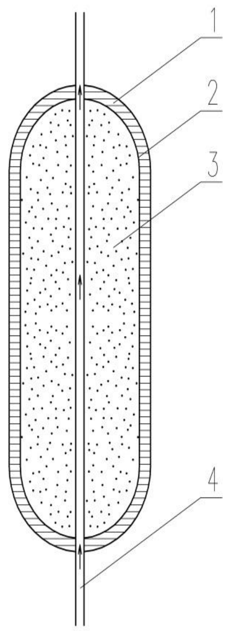
The specificity of these fires frustrates firefighters. They know that in such cases, there awaits them lasting several days, hard and dangerous fire fighting or... the role of extras.



The causes of these fires are often stereotypically explained, i.e. it was an arson, not considering the accounts of witnesses that "the haystack nearly exploded with fire" or, at the landfill site, the fire occurred in its centre "beginning with an explosion of flames to a height of two meters.
The number of fires caused by self-heating is considerable. Only in the USA the number of extremely harmful to the environment landfill site fires exceeds eight thousand yearly. It is estimated that in agriculture self-heating itself is the cause of 5-10% of fires. On a global scale, the numbers are expressed in hundreds of thousands or even millions yearly.
These millions of fires crowning the process of self-heating are a clear proof that a human has only a little idea of what heat is.
Self-heating will be causing fires until a human has known its mechanism and learnt to prevent them. Only when this happens, a lot of companies will avoid huge financial losses, insurance companies will improve their financial results, and firefighters will improve their mood as they will not have to go to hopeless fires.
<u>The construction of a heat generator</u>.

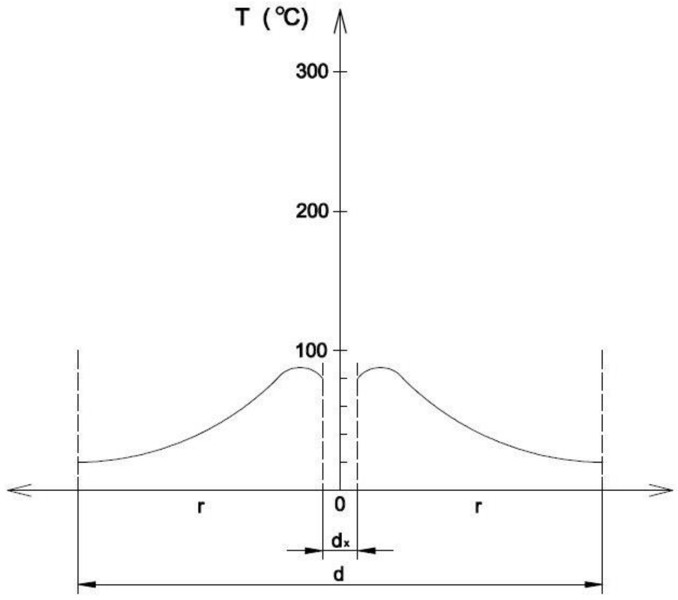
Above there are presented six steps supporting the process of self-heating of solids. However, these actions will be pointless unless a safe heat generator has been developed enabling efficient heat transfer from the self-heating bodies so that no thermal self-destruction of the body occurs. Below there is presented a recipe to build a qualitatively new generator.

A metal cylinder of suitable size should be filled with a material which will function as a heating element, for example tungsten powder. The surface of the cylinder should be covered with a material reflecting thermal radiation, like aluminium foil. The cylinder should be solidly insulated, taking into account that the best insulator is a vacuum. In the axis of the cylinder, there should be placed a thin-walled tube made of metal with high heat conduction capacity. The tube goes through the highest temperature zone of the generator. The tube should be filled with a liquid component which will circulate in the closed circuit between the generator and the heat exchanger, thus collecting heat from the most heated part of the generator.



1. insulation
2. layer reflecting light
3. heating medium
4. coolant

Temperature distribution for a given generator is presented in the figure below.



d – diameter of the heat generator
d_x – diameter of the cooling element of the generator
r – a distance from a point to the axis of the cylinder.

Temperature distribution of fuel in the proposed generator.

As it is seen, an increase of temperature occurs in it, but there is no zone of a rapid increase of temperature in its centre. The temperature in such a generator can be regulated. The temperature regulation will consist in a change of the efficiency of the flow of the coolant, a change of the diameter of the cooling element (d_x) or the diameter of the generator (d). The proposed generator has a flaw. If the cooling has failed or been turned off, the process of self-heating will continue. In the case of a large thermal power of the generator, it can lead to a destructive increase of temperature (a thermal destruction of the generator).
Preventing such a possibility will consist in emptying the generator of the heating medium, or in bringing in the interior a cylinder of rods made of metal with high heat conduction capacity. The rods will transfer the heat to the outside preventing its accumulation in the generator and destruction of the generator.
The advantages of the proposed generator are as follows:
- once loaded with fuel and started, it works forever,
- it has no moving parts, does not wear out, does not require repair nor overhaul, so it can be installed below the ground surface or in outer space,
- a "fuel" for the generator can be a variety of generally available powdered substances undergoing the process of self-heating.

A simple analysis shows that the proposed generator is an accordingly modified (by adding a cooling element) Dewar vessel, commonly known as a thermos. The essence of the structure of this generator is that normally found in nature the flow of thermal radiation (heat) from the inside to the surface of a body has been partially reversed to the flow of thermal radiation from the surface to the inside (the axis) of the body, which results in possibility to acquire an increase of temperature of the body above the ambient temperature without transferring heat from the outside. The above generator is a kind of a temperature transformer. The proposed heat generator a perpetual motion

machine; it is the comprehension and an intelligent use of the phenomenon of thermal radiation.
Notice.
Testing the operation of the generator presented above will be *experimentum crucis* for Model 31 and theoretical physics. If this generator reaches thermal power greater than zero, it will be indisputable proof that achievements of theoretical physics (since the beginning of the XIX century until now) does not reflect reality. The phenomenon of this experiment is that it can be performed by anybody and with its positive result it will not be important what the physicist do or say; nothing will be up to them anymore.
On 19 May 2016 the following text was published on the internet.

Most observers of the LENR/nickel hydride scene are unaware of the details of the Thermacore, Inc. runaway reaction back in 1996.

Unfortunately, this was the last effort that this company made in the field, and the main reason that they dropped LENR. The incident echoes other thermal runaways, including P&F, Mizuno, Mark Snoswell in Australia and Ahern. However, it was far more energetic than any of the prior incidents.

This was to have been an powered experiment but they never had time to apply input power. This was was a follow-on to a Phase one grant from USAF (document in LENR-CANR library) and was simply intended to be an analysis the absorption reaction of a large amount of nickel powder and hydrogen at modest pressure. Instead, it was likely the most energetic single event in the history of LENR.

Recently, Brian Ahern has been in contact with Nelson Gernert, the chief researcher in the new Thermacore (having gone through two changes of ownership) who was also in charge of the runaway. None of this has appeared in print before.

Gernert added 2.5 pounds of nickel powder (200 mesh of Ni-200) into a 3 liter stainless steel Dewar. The Dewar weighed 300 pounds. It was a strong pressure vessel with a hemispherical volume. Thermacore evacuated the nickel under vacuum for several days before adding H2 gas at 2 atmospheres (apparently there was no potassium but this detail needs to be verified).

The most amazing thing happened next. The powder immediately and spontaneously heated before external power could be added. The Dewar glowed orange (800C) and the engineers ran for cover. No external heat had been used and no radiation monitors were running. The nickel had sintered into a glob alloyed into the vessel and could not be removed.

The (then) owner of Thermacore, Yale Eastman was frightened that an explosion was imminent and that someone could be killed. He forbade any further work on LENR. The incident was not published.

The Dewar was no longer safe as a pressure vessel and they junked it. They did not measure it for radiation. Superficial thermal analysis - 3 liters of H2 gas at 2 atmosphere will have a heat of combustion of 74 kilojoules when combined with oxygen (but there was no oxygen in the Dewar).

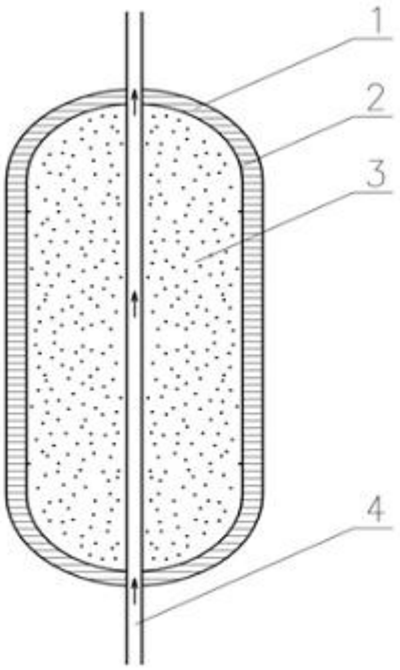
Heating a 300 lb Stainless vessel to 800C requires 21 megajoules. That is ostensibly 289 times the possible chemical energy!

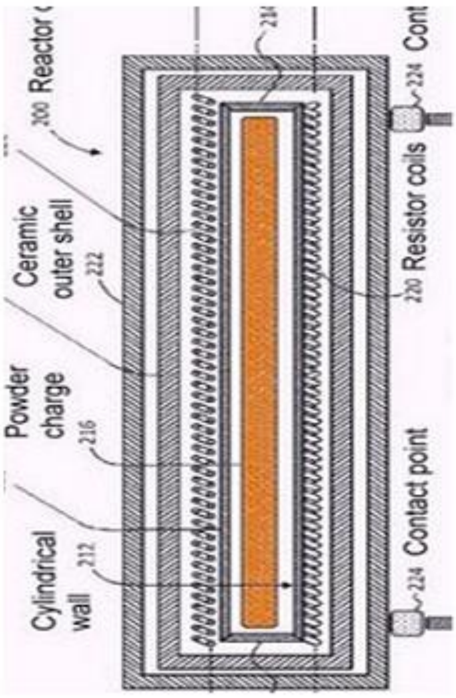
The original can be found here: https://www.mail-archive.com/vortex-l@eskimo.com/msg110068.html

Which means that nothing even has to be checked. The proposed generator works exactly as it was predicted.

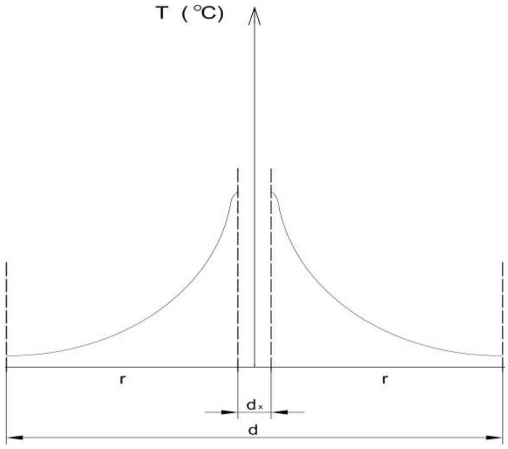
Such a report has been found on the Internet.
Today at 9 o'clock, at the scrap yard in Zdrojowa Street in the village of Bystra, a fire broke out. Metal dust in a heap of waste burnt. When fire fighting units arrived at the scene of fire, there were burning three out of ten big bags (bags for storing powdery materials). The bags contained metal dust: filings from grinding together with the abrasive material.
This seemingly ordinary report contains a piece of very important information that metal dust mixed with abrasive material undergo the process of self-heating. It means that troublesome so far waste materials can be used as a "fuel" in the proposed heat generator. Moreover, it would need to be examined urgently what the ability to self-heat is attributed to ashes from burning coal or other solid fuels, and sand dust.
These days, more and more world known is becoming the Italian inventor Andrea Rossi and his apparatus for acquiring heat, called E-CAT. It is a device which produces several tens of times more thermal energy as compared with the input energy.
After several years of trying, Rossi used in this device some of the mentioned above steps of construction of the heat generator. He used nickel powder (step 2) as the heating medium. As a foreign body enhancing the process of self-heating he used hydrogen (step 3). The generator is insulated (step 5). The heating medium is additionally heated up with an electric coil (step 6).

Let us now compare the generator proposed in this study to Rossi's generator (according to the patent of 2014).

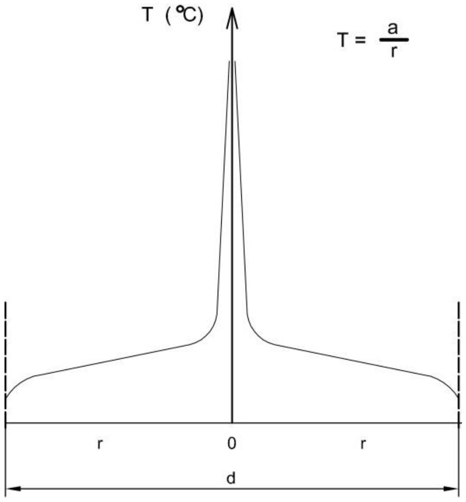




1. insulation
2. layer reflecting light
3. heating medium (powder charge)
4. coolant



Temperature distribution of fuel
in the proposed generator.



Temperature distribution of fuel
in Rossi's generator
according to the patent of 2014.

As it is seen, both heat generators are very similar but they differ in the temperature distribution inside. It is clear that the E-CAT generator has an elementary design flaw. In the centre of the cylinder, where temperature increases rapidly, there is no element enabling direct transfer of emitted heat out from this area. It means that heat must be transferred outside through electric heaters and thermal insulation!!!

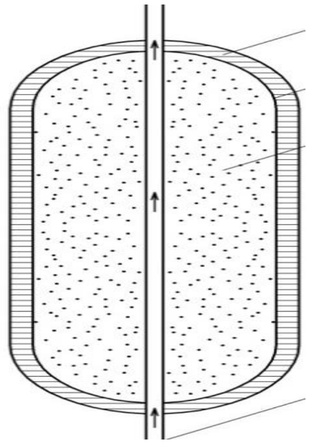
This flaw has far-reaching consequences.

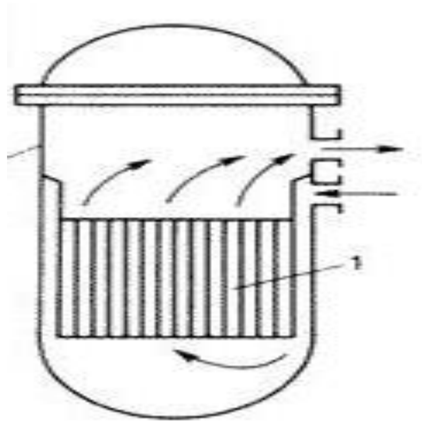
- The E-CAT apparatus is almost impossible to control thermally, therefore controlling its operation is a powerful challenge to engineers.
- The generator tends to overheat, which causes its operation often ends with an explosion.
- The mass of "fuel" in this generator is calculated in grams because with bigger amounts its operation always ends with an explosion.

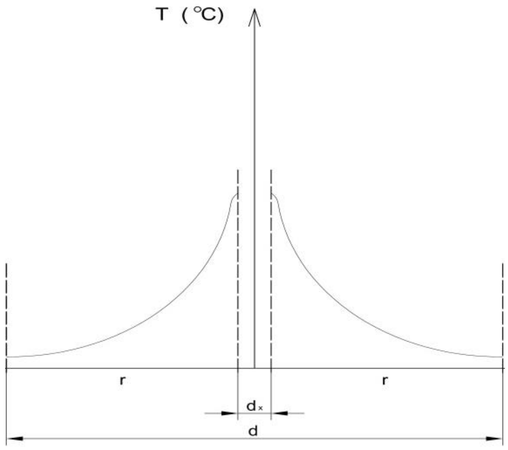
The position of physicists of the E-CAT apparatus is peculiar. They believe that such great amounts of heat can be emitted by nuclear reactions only and they demand that the author of the invention show that his device emits harmful alpha, beta, gamma, and neutron radiation, otherwise will be regarded as a cheat. Wasting time and money, Rossi attempts to detect such a radiation. Moreover, using different shields, he protects his device against non-existing harmful radiation. These elements make the device complicated deteriorating the already unstable parameters of its operation.

Chimerical work and a constant threat of explosion of E-CAT makes Rossi have a huge trouble with obtaining a certificate of quality and safety for his invention. This prevents the massive scale production of the device and a revolution in the energy market.

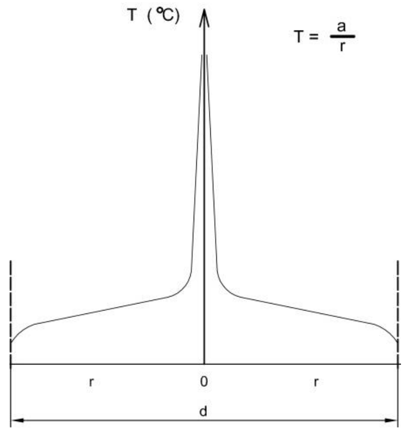
Let us now compare the generator proposed in this study to a nuclear reactor used in nuclear power plants.





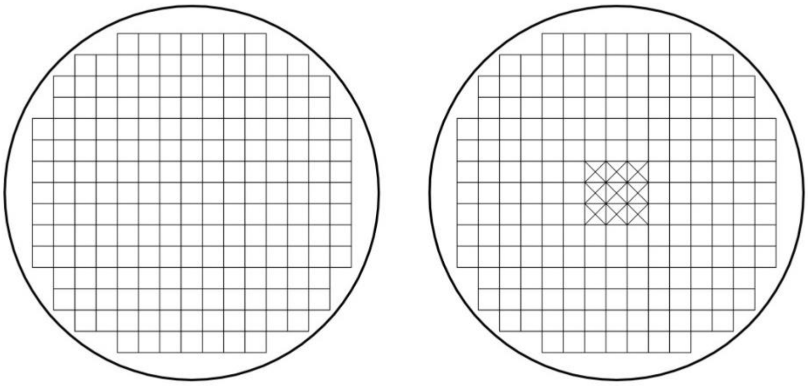


Temperature distribution of fuel in the proposed generator.

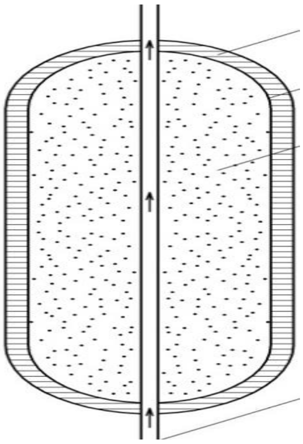


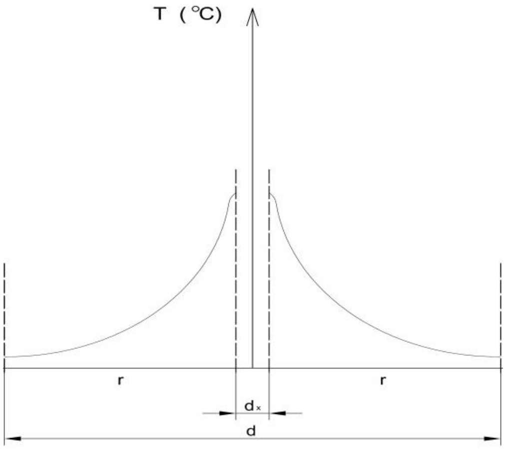
Temperature distribution of fuel in a nuclear generator.

As it is seen, both heat generators are very similar but they differ in the temperature distribution inside. The nuclear generator does not have the element which transfers heat from its central part where temperature increases rapidly. Therefore, although the coolant flows evenly throughout its entire cross section, in the central part around the axis, the temperature of fuel is significantly higher. A proof of the correctness of the above is the fact that during exploitation the fuel in the centre of the reactor "burns out" quicker than at the peripheries, and if it comes to a meltdown of the reactor, its melting starts also in the central part. As it is seen from the above comparison, bringing in the nuclear reactor an element transferring heat out from its central part will allow to reduce the temperature gradient in it. It will allow for a significant (even three times) extension of constant operation time of the reactor through elimination of the process of so called shuffling of fuel assemblies, which consists in moving the fuel assemblies from the peripheries of the reactor to its inner parts and exchanging in the central part 20-30% of the assemblies (the earliest and most burnt out ones). By a lucky coincidence, in some of the currently existing nuclear reactors, this device for transferring heat out from the central part of the reactor can be made at minimum cost. In these reactors, fuel is placed in rods grouped into assemblies, which are inserted in the reactor. If the fuel pellets are removed from the rods of a few or several assemblies in the central part, naturally there arises a channel for transferring the excess heat out from the centre of the reactor, without disturbing the flow of the coolant in the reactor, and the power of the reactor will reduce a little. In such a reactor, in the case of loss of the coolant, the central part of the reactor with no fissile material will melt first, thus mitigating the effects of this catastrophic event.

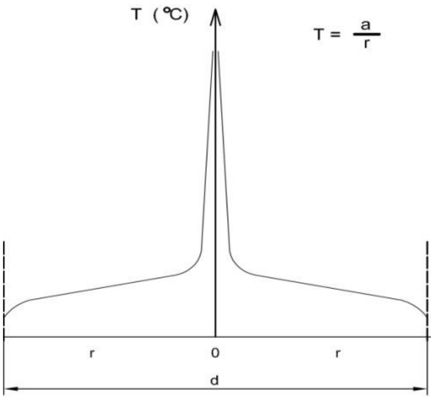


Let us now compare the generator proposed in this study to a generator made of plutonium-238 dioxide.



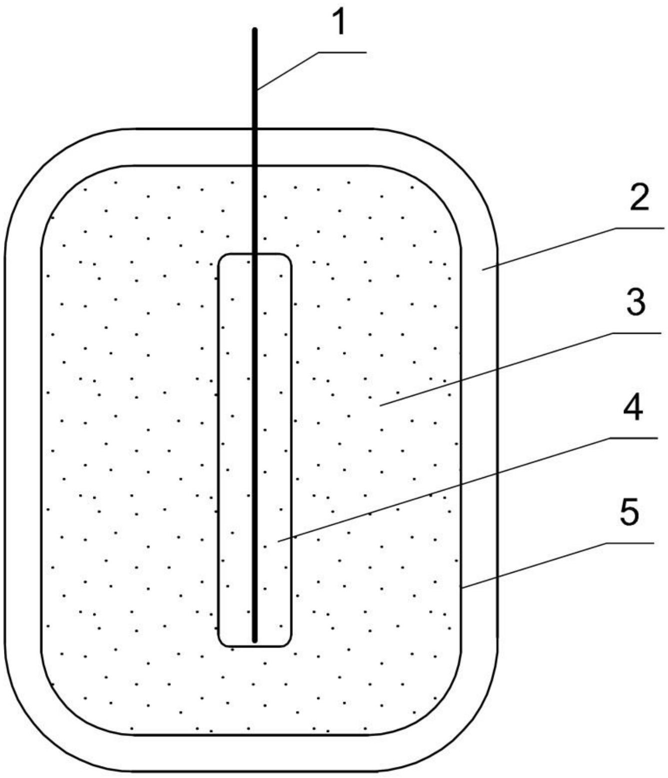


Temperature distribution of fuel in the proposed generator.

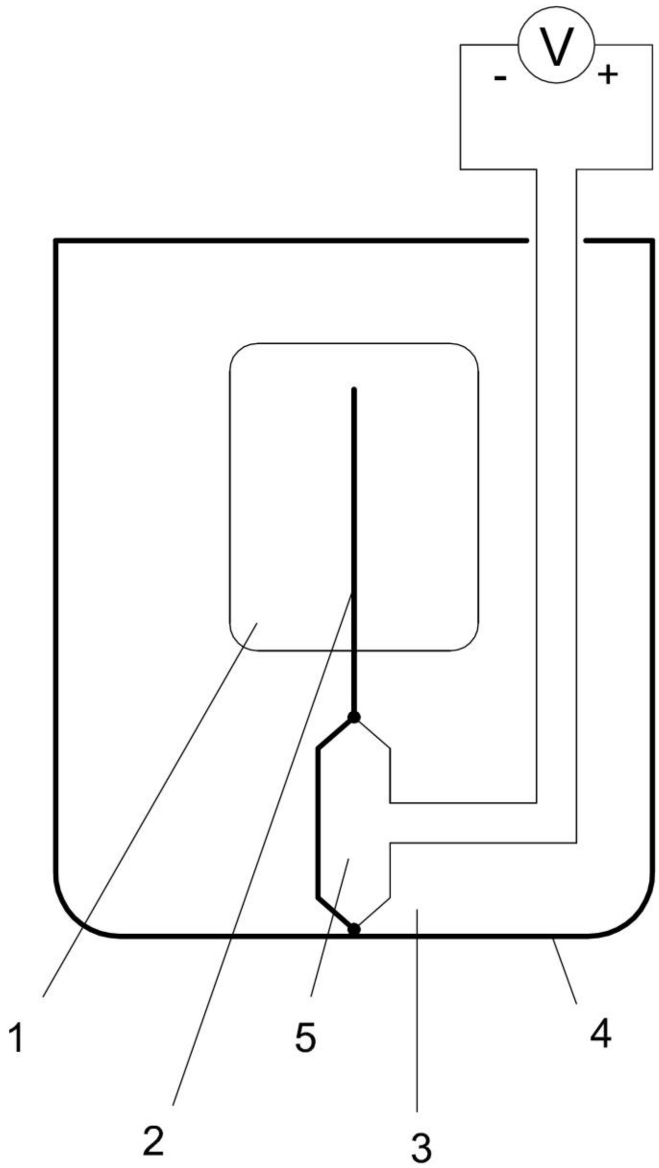


Temperature distribution of fuel in a plutonium generator.

As it is seen, both heat generators are very similar but they differ in the temperature distribution inside. A plutonium dioxide generator, just like a nuclear reactor and Rossi's reactor, does not have an element transferring heat out of its central and hottest part. It means that this generator can be modified in such a way that it will be possible to acquire even higher temperature from it (see the figure below).



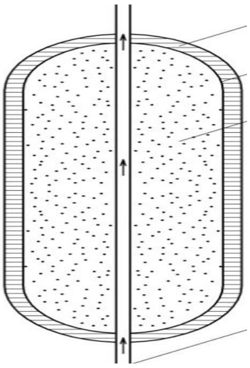
In the axis of a cylinder made of plutonium dioxide (3) should be placed a coolant (1) in the form of a metal wire, e.g. tungsten, protruding from one side. As it is seen, the wire is "immersed" in the zone of the highest temperature (4) of the generator. The surface of the cylinder should be covered with a reflector (5) reflecting light and alpha particles, as in this generator, alpha particles play the same role as neutrons in a nuclear reactor. The whole should be solidly insulated (2), taking into account that the best insulator is a vacuum. In this "candle", the temperature of the "wick", that is the protruding end of the wire, will be significantly higher than the temperature of the surface of the cylinder, which is now about 800 K. Why is it a good idea to perform this modification? A cylinder made of plutonium-238 dioxide is the main element of electric power generators on long-range spacecraft. Its thermal energy is changed into electricity, and the power of this apparatus is proportional to the temperature of the heat source. Practically then, at no costs, the power of electricity generator can be greatly increased. The figure below shows a scheme of such a cosmic electricity generator.

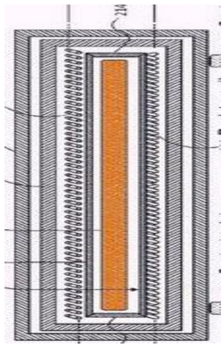


1 - plutonium 238
2 - tungsten wire
3 - vacuum insulation
4 - tight housing
5 - thermocouple

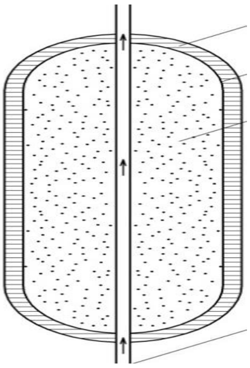
Summary.

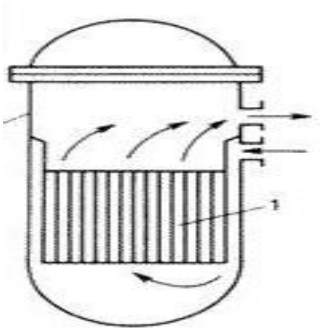
At present there are three kinds of heat generators which use the process of self-heating.



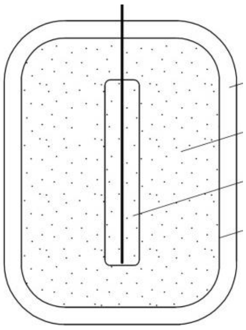


1. Rossi's generator





2. a nuclear reactor



3. a plutonium generator

These generators have a design flaw. This is a lack of an element which allows to transfer heat from the zone of the highest temperature. For each of them it results in very important technical and operational problems. The generator proposed in this study does not have the above mentioned flaw, therefore it will not struggle with problems affecting the existing generators.