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(54) **Procedure for transforming electrical energy to anti-matter with positron storage.**

(57) Procedure for the transformation of electrical energy to anti-matter, consisting of the production of a beam of charged particles (electrons) using a suitable accelerator and the direction of this beam on the surface of the first of a series of lead, tantalum or other metal plates. In said series arrangement, there is a ultra-high vacuum between the plates, which are brought to extremely low temperatures. The positrons produced between the plates are then separated from the electrons with suitable magnetic fields and carried to suitable magnetic containers with magnetic guides, using mirror, toroidal or other type of magnetic field. The electrons produced are carried with a suitable magnetic guide to be used as a source for the accelerator beam in the procedure.

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Procedure for transforming electrical energy to anti-matter with positron storage

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This invention involves a new procedure for transforming electrical energy to anti-matter with positron storage, so as to facilitate storage and transport. There is currently no method involving transformation to anti-matter among the known procedures for energy storage.

The aim of the present invention is to achieve a high yield in the storage of differentiated quantities of already produced electrical energy.

This aim is achieved with a procedure for transforming the energy into anti-matter, in particular into anti-electrons or positrons, using the physical phenomenon of "cascade showers", currently verified with could chambers.

This phenomenon consists of the fact that, whenever a charged particle (for example an electron or positron) passes through several horizontal lead plates in succession, it may undergo a very slight deflection in the field of one of atoms in the plates. Said deflection

consists of an accelerated motion, and so electromagnetic radiation is emitted in the form of a gamma ray. This is the physical phenomenon of braking radiation (or bremsstrahlung).

Of course, the particle may be deflected by several atoms in a single plate, in which case several gamma quanta will be emitted.

The gamma rays produced in this way may create electron-positron pairs in the fields of the atoms encountered when they pass through the plates. This is the physical phenomenon of pairs production.

These charged particles in turn give rise to other gamma rays when they are deflected in the plates, and the new gamma rays generate new pairs, and so on.

One individual electron can produce a cascade of gamma rays, electrons and positrons.

The charged particles leave visible tracks in the could chamber, while the gamma rays are photographically invisible.

Naturally, a cascade shower is stopped when the initial

electron energy is distributed among such a large number of electrons, positrons and photons that none of them has sufficient energy to create supplementary pairs. The low energy particles are then absorbed by the lead plates.

The energy of the electron which initiates the shower determines the number of secondary charged particles produced.

The procedure according to this invention consists of the production of a beam of charged particles(electrons) with a suitable accelerator and the direction of this beam on the surface of the first of a series of several lead, tantalum or other metal plates. In said series arrangement, there is an ultra-high vacuum between the plates,which are brought to extremely low temperatures. The positrons produced between the plates are then separated from the electrons with suitable magnetic fields and carried to suitable magnetic containers with magnetic guides, using mirror, toroidal or other valid type of magnetic field.

With regard to the storage of said positrons, a recent literature report from C.E.R.N. (June 1979) described the development of a magnetic container for anti-protons. Analogous technology, with suitable modifications, may be applied to the storage of positrons, thus preventing

their annihilation with ordinary matter.

Energetic electrons from the accelerator produce in the above-mentioned arrangement a quantity of positrons approximately equal to that of the electrons.

The number of positrons and electrons produced with this method is proportional to the energy of the energetic electrons and to the intensity of the accelerator beam. The electrons produced and present between the metal plates are carried away with magnetic guides to be used as a source beam for the electron accelerator used in the procedure.

One exemplifying but non-limiting variant of the invention may be described as follow. Electrical energy generated by a power plant but not used by the consumer is used as a source for suitable electron accelerator. The charged energy beam is transformed to positrons using the above procedure, and the positrons stored in a suitable fashion form the energy reservoir of the plant. At the same time, the electrons produced are used as a source for the accelerator.

Thus, when stored energy must be drawn, the energy of the 0.5 Mev gamma quanta produced by annihilation of the positron-electron pairs is converted to electrical energy

to be placed in the electrical distribution network.

The advantages offered by this system seem evident considering that 0.5 grams of positrons annihilating the same quantity of electrons release $1.0x0^{20}$ ergs of energy, that is, an amount equal to that from the combustion of more than 200 metrics tons of gasoline.

The invention involves a completely new system for energy transport: the energy produced at the power plant may be stored as positrons, and these, in suitable magnetic containers, may be transported to the areas where they will be used.

Obviously, the mass and the dimensions of the positrons transported are practically infinitesimal, while that of the energy transported is extremely high.

For example, nuclear power plants which adopt this pro - cedure for transforming energy produced into positrons suitably contained in their magnetic containers, could be constructed in areas of extremely low population density. The containers would then be transported from the power plant to large cities or industries where the positrons in them would be transformed in a suitable non polluting installation into electrical and/or thermal energy.

Analogously, even for other energy sources like oil, coal, solar energy, or any other type, transport from the production sites to the use areas is more economical, less polluting and easier when the energy is transformed into anti-matter as in this invention directly at the source. This then involves only modest costs and encumbrances in distibuting the positron containers.

In one application variant, the present invention allows the realization of energetically autonomous ground, marittime and air transport means with negligible fuel weights involved. The only weight of the propulsion systems is that of the motor and the positron container, naturally considering that the electricity for magnetic field of the magnetic bottle containing the positrons can be supplied by suitable batteries, based on the energy autonomy of the vehicle in question as well as the particular type of positron motor. Also, said electrical battery must be charged using the energy produced by the annihilation of the positrons in the magnetic bottle, with a suitable installation for transformation into electrical energy.

Another important application of the present invention is that of the annihilation of suitable quantities of positrons produced in the cascade showers into initiate

nuclear fusion reactions.

This may be achieved with two processes, one indirect and one direct.

With the indirect method, once the desired quantity of positrons is produced and stored in suitable magnetic containers, according to the invention, this quantity is taken from the positron container and annihilated with the nuclear fuel to supply energy to it. The annihilation power must be arbitrarily controlled, that is, the number of positrons annihilated in an unit of time. In this case, the magnetic containers for the positrons must be developed.

In inertial confinement, with the direct method, a special paste is prepared so that the energetic electrons of the accelerator beam, passing through a layer of a suitable metal, generate positron-electron pairs which, with suitable technology, are used to induce the fusion of the nuclear fuel, suitably contained in the special paste.

With the indirect method and inertial confinement, the positrons are taken from the positron container.

power of annihilation, which depends on the rythm of positron production of the accelerator-metal layer system. In the indirect method, however, this limitation does not exist, because of the possibility of positron storage.

Thus the above procedure allows for a new method for initiating nuclear fusion reactions.

Moreover, one can imagine, through the use of a desired quantity of positrons, initiating nuclear fusion reactions which require a higher initiating temperature than the fusion reactions currently under study.

Thermal energy may be produced from the positrons as follows. Positrons taken from their magnetic containers are, in arbitrarily controlled quantities and with suitable technology, directed against a special metal structure. In this way the positrons annihilate with the electrons of the metal, which in turn is heated by the resulting annihilation radiation. This thermal energy produced, spread to other bodies, may be used in technologies requiring such energy, such as industrial, metallurgical and chemical processes as well as domestic or industrial space heating. This thermal energy produced by the positrons may also be converted to mechanical energy through heat engines .

may be used to produce, with suitable technology, positron beams of arbitrarily controlled power which, under vacuum (for example, above the earth's atmospher) could be used for various operations like metal working and nuclear transmutations.

Moreover, suitable technology could be used to produce radiation consisting of 0.511 Mev by annihilating electrons with positrons, the latter being drawn from their magnetic bottles.

The above radiation beams may be used to initiate controlled nuclear fusion reactions of the nuclear fuel both in magnetic confinement and inertial.

With suitable technology, these radiation beams are used to heat the magnetically confined nuclear fuel or to induce nuclear fusion of the fuel confined in special pastes.

The above radiation finds other applications in metal working, in nuclear transmutations and as a useful source of very hard x-rays.

The positrons drawn from their magnetic containers may also be used to produce lasers, through suitable technology. Positron-source lasers are easily transportable together with the magnetic containers with their rich energy content.

Another application of the invention is that of using the charged particles of cosmic and solar radiations for the direct production of positrons, through an artificial satellite, designed for this end and places in orbit where the charged particles are denser.

Claims:

1. Procedure for the transformation of electrical energy into anti-matter, with storage of positrons in magnetic containers able to prevent their annihilation with ordinary matter.

2. Procedure for transformation of electrical energy into anti-matter as claimed in claim 1, wherein a beam of energetic charged particles (electrons) is produced with a suitable accelerator and directed on the surface of the first of a series of several plates of lead, tantalum or other metal; in said series arrangement, there is a ultra-high vacuum between the plates, wich are brought to extremely low temperatures; the positrons produced between the plates are then separated from the electrons with suitable magnetic fields and carried to suitable magnetic containers with magnetic guides, using mirror, toroidal or other valid type of magnetic field.

3. Procedure for the transformation of electrical energy into anti-matter as claimed in the preceding claims wherein it is used to initiate nuclear fusion reactions, by annihilating the desired quantity of positrons drawn from the container with the nuclear fuel in order to transfer energy.

4. Procedure for transformation of electrical

anti-matter as claimed in the preceding claims wherein the energetic electrons of the accelerator beam, passing through a layer of suitable metal, generate positron-electron pairs which, with suitable technology, are used to induce the fusion of the nuclear fuel, suitably contained in this special paste.

5. Procedure for the transformation of electrical energy into anti-matter as claimed in preceding claims wherein thermal energy may be produced from the positrons as follows: positrons taken from their magnetic containers are, in arbitrarily controlled quantities and with suitable technology, directed against a special metal structure; in this way the positrons annihilate with the electrons of the metal,which in turn is heated by the resulting annihilation radiation; this thermal energy produced, spread to other bodies, may be used in technologies requiring such energy, such as industrial, metallurgical and chemical processes as well as domestic or industrial space heating; as well as transforming it to mechanical energy using heat engines.

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EUROPEAN SEARCH REPORT

0050596
Application number
EP 81 83 0201

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	SCIENCE PROGRES DECOUVERTE, September 1970, Paris, FR P. MARIN "L'anneau de collisions d'Orsay: électrons contre positrons" pages 5-15. * Page 6, column 3, line 6 to page 7, column 2, line 6; figure 1 *	1,2
A	JAPANESE JOURNAL OF APPLIED PHYSICS, Supplement 2, part 1,1974 - Tokio, JP Ch. FALLAND et al "The ultra-high-vacuum system for the Desy electron-positron double storage ring "DORIS"", pages 209-215. * Abstract *	1,2
A	JOURNAL OF APPLIED PHYSICS, vol. 51, no 8, August 1980 New York, US S. ROBERTSON et al. "Plasma heating by an electron beam from a foilless diode", pages 4094-4096 * Abstract *	3

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

H 05 H 7/06
G 21 K 1/00

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

H 05 H 7/06
G 21 B 1/00
1/02
H 05 H 1/22
G 21 K 1/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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O: non-written disclosure
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T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

x The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25-01-1982	GALANTI

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