# On a Magnetic Self-Propulsion and a Physics as a Possible Theorem

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**Abstract**

It has been experimentally verified that a superconductor nozzle connected at its narrow end with a permanent magnet can create propulsion without any external energy source. A first explanation might be given by using the notion of ether or zero point energy or quantum vacuum etc. The purpose of this paper is to show that physics can be regarded as consequence of the principles of the real logical communication system which includes the classical logic, the sufficient reason principle and the axiom stating the existence of anterior and posterior (one letter after another, one word after another etc.); such a system by means of a Theorem appears to be contradictory and this imposes the silence. Silence can be broken "logically" by insisting in logic, even-though it is contradictory, through the claim for minimum contradictions. Such a Physics can be regarded as consequence of principles of thought i.e. as a Theorem; it is compatible, under certain simplifications, with Newtonian mechanics, relativity theory and QM. Finally this Physics is a Space-Time Quantum Mechanics which describes Minimum Contradictions Everything; quantum space time is the matter itself. On this basis, new explanations for various questions of physics can be given as the quantum gravity, the fractal behavior of matter systems and the interaction of the electromagnetic with the gravitational field; the latter can explain the experiment mentioned.

## 1. Logic Analysis

Theories of physics are logical consequences - theorems of the principles on which they are based. The principles of physics constitute primarily an axiomatization of the experience being revealed. The fall of the apple, the Michelson-Morley experiment and the analysis of the radiation of the black body led to the formulation of the principles of the basic theories of physics. The question is: until when, the methodology of axiomatization of the gained experience will be applied ? This could happen if there were undoubted statements-principles. Undoubted principles are not known if they exist, but there are principles that we use in an obligatory way and these are the principles of logical communication through which any theory is formulated.

The necessary-obligatory principles of logical communication are classical logic [1], the principle of sufficient reason (the principle of causality) [1, 2] and a hidden principle that states that everywhere in logical communication there is anterior – posterior [3] (one letter after another, one word after another etc.).

If we denote by $\Lambda$ a logic consisting of the Classical Logic denoted as $P_I$ and the Sufficient Reason Principle regarded as a Complete Proof Principle denoted as $P_{II}$, we will have [3]:

$\Lambda \equiv P_I \cdot P_{II}$

where $P_{II}$ is defined as [4]:

*Complete Proof Principle - $P_{II}$ : "No statement is valid if there is not a complete logical proof of the statement through valid statements different from it."*

On this basis the following can be proved [3]:

*Theorem I: "Any system that includes logic $\Lambda$ and a statement that is not theorem of logic $\Lambda$ leads to contradiction."*

We name '0' the state before our communication and '1', '2', '3', … the sequent states of this communication. '0' corresponds to the non-existence of any communication symbol while '1' to some symbol existence. From the non-existence of something can not derive logically its existence. Working in the same way we have that a "posterior" does not derive logically from its "anterior". Therefore *the Anterior – Posterior Axiom is not theorem of* $\Lambda$ . Applying Theorem I we obtain Statement I.

*Statement I: "Any system that includes logic $\Lambda$ and the anterior-posterior axiom leads to contradiction."*

where the anterior – posterior axiom is stated as follows:

*Anterior – Posterior Axiom* (A-P Axiom)*: "There is anterior-posterior everywhere in communication."*

Gödel and Rosser theorems [5, 6] could lead to same results as theorem I [3, 4]; however as H. Putnam [7] in his critic to R. Penrose's *Shadows of the Mind* [8] has noticed, they are restricted to computational processes, not to logical communication in general.

Kantian 3rd antinomy has similarities with statement I [9]; however third antinomy's thesis does not constitute the negation of its antithesis and vice versa. Thus, this antinomy does not imply the existence of a complete contradiction which can lead to silence.

Based on Theorem I and Statement I, we conclude that a system including the principles of logical communication leads to contradiction. This leads to the silence, and therefore when communicating logically it means that we decide to break the silence by avoiding contradictions on purpose [10, 11]. On this basis we have that logical communication is based on its principles, its consequences that lead to silence and the principle of logical breaking the silence. Without these principles, it is not possible to communicate logically and therefore they could be called as the principles of real logical communication.

Therefore "Real Logical Communication" through which we communicate includes:

1. logic $\Lambda$ (classical logic + sufficient reason principle)
2. A-P principle (anterior-posterior)

3. consequences of Λ and A-P (theorem I, statement I, silence)
4. principle of logical breaking the silence.

Any theory based on axioms that are not theorems of logic L includes both the principles of "Real Logical Communication" and the additional axioms that characterize it and lead to further contradictions.

Therefore the physics that is a logical consequence-Theorem of the principles of "Real Logical Communication" through which we communicate is:

*Physics of Minimum Principles* or *Physics of Minimum Contradictions.*

Since the physics of minimum contradictions is a theorem of the principles of logical communication, this means that any other physics is based on principles that cause further contradictions. Such contradictions are revealed in the evolution of physics from Newtonian mechanics to relativity theory and quantum mechanics and from there to chaos theory. Thus we would have a measure of the reliability of the minimum contradiction physics if it were able to interpret new requirements such as quantum gravity and at the same time be able, under certain simplifications, to be the source of the hitherto developed theories such as the relativity theory and the quantum mechanics [3].

Notices:
When we try to describe reality through a theory we cannot do it simultaneously but in anterior-posterior terms. Even anterior-posterior, in physical reality, itself is not known but only when it is described. Therefore, the anterior-posterior axiom includes every anterior-posterior described; not only the indicating the order of communication elements (letters, words, phrases, etc.).

Despite statement I, we do communicate in a way we consider logical avoiding contradictions on purpose. Since contradictions are never vanished, we try to understand things through minimum possible contradictions. On this basis we can state [3, 10]:

*Statement II - The Claim for Minimum Contradictions: "What includes the minimum possible contradictions is accepted as valid."*

According to this claim we obtain a logical and an illogical dimension. In fact, through this claim we try to approach logic (minimum possible contradictions), but at the same time we expect something illogical since the contradictions cannot be vanished.

All axioms mentioned, the claim for minimum contradictions included, constitute the principles of the active logical language; when we speak we persist in logic despite of the existing contradictions.

On this basis, a *minimum contradictions physics* can derive where *the physical laws are the principles of the active logical language;* this physics is a stochastic matter-space-time QM implying a quantum gravity and under certain simplifications the relativity theory [3].

# 2. Minimum Contradictions Physics

## 2.1 General

According to theorem I, further axioms beyond the ones of logical communication must be avoided since they can cause further contradictions. The systems of axioms we use in physics include the logical communication and, therefore, their contradictions are minimized when they are reduced to the logical communication itself. Therefore we can state [3, 4]:

*We have minimum contradictions in physics when it is based only on the logical communication system, i.e. on logic* $\Lambda$ *and on the "anterior-posterior axiom".*

## 2.2 Common Roots of Relativity Theory and QM

### 2.2.1 General

In order that a minimum contradictions physics can be valid, a unifying principle is required, since everything, *i.e.* matter, field, and space-time, needs to be described in anterior-posterior terms.

*At first sight*, for a minimum contradictions physics we can make the following statement [3]:

*Statement III: In a minimum contradictions physics everything is described in anterior–posterior terms.*

If there is space-time then there is anterior posterior so that space-time can be measured and denoted through the communication (language). Inversely, if there is anterior-posterior in communication then there is space-time. In fact, in order to write something we need space; also we need time since we cannot write in a simultaneous way. Thus, because of Statement III we can state the following [3]:

*Statement IV: In a minimum contradictions physics everything is described in space-time terms.*

Since everywhere there is space-time and not something else, space-time can be regarded as the matter itself. A matter system, in general, has differences within its various areas. This means that a matter system, in general, is characterized by different rates of anterior - posterior (space-time) within its various points. This means that time can be regarded as a $4^{th}$ dimension which is compatible to Lorentz' transformations and in extension to a relativistic theory [3].

### 2.2.2. Hypothetical Measuring Field

Basic tool of this work is the Hypothetical Measuring Field (HMF) [3].

*As reference space time we define a Euclidean space-time to which, through transformations of deformity, any field can correspond.*

This reference space time is not only a geometrical notion because, according to the present hypothesis, it is also matter. Any magnitude of it will be denoted by the subscript $_0$. A point $A_0$ of the reference space-time occupies by the action of the field a position $A \neq A_0$

*As Hypothetical Measuring Field (HMF) is defined a hypothetical field, which consists of a Euclidean reference space-time, in which at each point $A_0$ the real characteristics of the corresponding, through the transformations of deformity, point $A$ of the real field exist.*

In the HMF, it is defined as a relative space time of magnitude $sr$, the ratio of the real infinitesimal space time magnitude $ds$ to the corresponding, through the deformity transformations, infinitesimal magnitude $ds_0$ of the reference space- time, i.e. $sr = ds / ds_0$. This can apply to relative time $tr = dt / dt_0$, to relative length in a direction $\mathbf{n}$ $lr_n = dl_n / dl_{n0}$ and to a relative volume $vr = dv / dv_0$.

### 2.2.3 Equivalence of Energy and Time

In a space-time description we don't know a priori what energy is; we define energy *dE* of an infinitesimal space-time element its 'ability to exist'. We may notice that an infinitesimal space-time element with energy *dE* exists on condition that some corresponding 'anterior-posterior' exist too. With respect to the HMF a space-time element is observed during a time *dt* that is different from the time $dt_0$ of the corresponding reference space-time element. Various space-time elements in the HMF have different *dt* for the same $dt_0$. Thus, *dt* measures the duration *i.e.* the ability of a space-time element to exist; this ability, by definition is energy; when $dt = dt_0$, this ability is $dE_0$. Thus, we can write [3]:

$$dE \sim dt \quad \text{and} \quad dE / dE_0 = dt / dt_0 \qquad (1)$$

which is a relativistic relation.

*Relations (1) show the equivalence of a space-time element energy to the time flow rate within this element.*

Eq. (1) can be viewed in two ways:

a) When $dt_0$ is a unit of time, Eq. (1) describes the duration *dt*, with respect to an observer and, as was mentioned, it leads to the relativity theory.

b) When *dt* is a constant period of time in the HMF, then Eq. (1) can be written in the form:

$$dE/dE_0 = dt/dt_0 = (f/v)/(f/v_0) = v_0/v \quad (2)$$

where $v$ is the frequency of a periodic phenomenon of comparison and $f$ an arbitrarily constant factor through which we can change the scale of time. If $v=1$, $v_0$ must be different in various points $(\mathbf{r},t)$ of the HMF. If this is the case Eq. (2) can be written in the form:

$$dE/dE_0 = v_0(\mathbf{r},t) \quad (3)$$

Thus, for the same equation we have the following versions [3]:

$dE/dE_0 = dt/dt_0$ observation (relativity theory) (4)

$dE/dE_0 = v_0(\mathbf{r},t)$ action (quantum mechanics) (5)

*Thus, at a first sight relativity theory and QM have common roots* [3].

On this basis, we can reach the basic De Broglie's principle for a particle energy; in fact for $E_0 = h$ we have (arithmetically) that:

$$E = hv \quad (6)$$

## 2.3 Stochastic Space Time

### 2.3.1.General

*At second sight*, taking into account the above mentioned and applying the claim of the minimum contradictions, we conclude that matter-space-time has logical and contradictory behavior at the same time; this can be valid when space time exists and not exists at the same time (illogical behavior) while it implies the existence of logic. This can be approached by the aid of a hypothetical measuring field HMF. If this is the case we can say that space-time has a probability to exist and to correspond to an infinitesimal area around a point $(\mathbf{r},t)$ of the HMF. When the probability integral equals to 1 the following statement is valid [3]:

*"there is space-time"*

which is a non contradictory i.e. it is a logical statement. Thus we can state the following:

*Statement V: Minimum Contradictions Physics can be described by Stochastic Space-Time.*

However physics describes any matter system i.e. matter, anti-matter, mass and charge. On this basis statement V has sense if there are various kinds of space time corresponding to the various forms of matter. This will be clear in the chapters following by using signs which declare the kind of stochastic space time through

which matter states are described. Thus we can use signs +1, -1, +i, -i for various states. This has similarities with Wittgenstein's point of view related to language games.
According to Wittgenstein signs +1, -1, +i, -i, can correspond to different states of reality (Philosophical Investigations) [12]. *"From the existence or non-existence of one state of affairs it is impossible to infer the existence or non-existence of another"* (Tractatus) [13].

It is noted that sign (+i) is incomprehensible with respect to sign (+1); it does not constitute a further contradiction related to anterior – posterior axiom. By definition the anterior – posterior axiom refers to physical states which can be either states related to $(\pm 1)$ or states related to $(\pm i)$. Wittgenstein's point of view can be also regarded as compatible with the notion of a contradictory space-time. In fact he had said: *"Whereof we cannot speak, we must pass over in silence"* (Tractatus) [13].

### 2.3.2 Hypothetical Measuring Field (HMF) – Extension

For the purposes of stochastic space-time description, the following definitions are made:
iii. *In a* HMF, *we define as mean relative space time magnitude* $\overline{sr}$ *the ratio of the mean real infinitesimal space time magnitude* $\overline{ds}$ *to the corresponding infinitesimal magnitude* $ds_0$ *of the reference space- time* i.e. $\overline{sr} = \overline{ds} / ds_0$
This can apply to any magnitude as follows :
*α) Mean relative time:* $\overline{tr} = \overline{dt} / dt_0$
where *dt* is an infinitesimal time of comparison at a given position of the HMF.
b*) Mean relative length in a direction* $\boldsymbol{n}$: $\overline{lr}_n = \overline{dl}_n / dl_{n0}$
where $dl_n$ is an infinitesimal length of comparison in a direction $\boldsymbol{n}$ and at a given time of the HMF.
c) *Mean relative volume:* $\overline{vr} = \overline{dv} / dv_0$
where $dv$ is an infinitesimal volume of comparison at a given time of the HMF. The relative space-time magnitudes mentioned above, are denoted by $SR,TR,VR,LR_n$ when they refer to mean values of a particle space-time field.

### 2.3.3. General properties

Because of Statement V, Eq. (1) can be extended to non relativistic forms. Thus, for a stochastic space-time we can write:

$$\frac{\overline{dE}}{dE_0} = \frac{\bar{\tau}}{\tau_0} = \bar{tr} = \overline{(\frac{1}{vr})} \neq \frac{1}{\bar{vr}} \qquad (7)$$

where the superscript ( $^-$ ) denotes the local mean value. We notice that $\overline{dE} / dE_0 = \overline{dt} / dt_0$, is compatible to the relativity theory while $\overline{tr} \neq 1/\overline{vr}$ , is non compatible.

Since Matter Space-Time is stochastic, we have that its energy, momentum and geometry are distributed according to the same density probability function. In fact the existence of this function reveals the logical structure of a stochastic space-time, while it implies its contradictory nature. If we say that probability density function $P(\boldsymbol{r},t)$ such that $\int P(\boldsymbol{r},t)dr^3 = 1$ exists, we accept that something can exist and not exist at the same space and time, at a point $(\boldsymbol{r},t)$, while we accept that it exists in general within the area in which is $P(\boldsymbol{r},t)$ defined.

In the HMF, for a relative space-time magnitude $\overline{sr}$ by definition it is valid that:

$$\left\langle \overline{sr} \right\rangle = \frac{1}{V_{0T}} \int \overline{sr}(\boldsymbol{r},t)dr^3 \qquad (8)$$

where $V_{0T}$ is the volume of the reference space-time to which the whole space-time matter system corresponds. According to this work, a flat space-time has energy. Note that if its energy density is non zero, it holds that for a finite energy the volume of the reference space-time cannot be infinite.

Since space-time is matter itself, a space-time magnitude has a probability to exist on condition that there exists energy, i.e. matter. In the HMF, by definition, the energy distribution refers to real magnitudes of energy. Therefore, the probability density of a matter field describes the probability density of energy and of any space-time magnitude to exist in the HMF.

For the probability density it is valid that

$$\int P(\boldsymbol{r},t)dr^3 = 1 \qquad (9)$$

Thus, because of Eqs (8, 9) we will have that [3]:

$$\int P(\boldsymbol{r},t) \left\langle \overline{sr} \right\rangle dr^3 = \frac{1}{V_{0T}} \int \overline{sr}(\boldsymbol{r},t)dr^3 \ ,$$

$$\overline{sr}(\boldsymbol{r},t) = \left\langle \overline{sr} \right\rangle V_{0T} P(\boldsymbol{r},t) \qquad (10)$$

On the basis of Eq. (10) the property of self-similarity can be derived which is compatible to fractal geometry [3, 14]

## 2.4 Equations of Minimum Contradictions Physics

The minimum contradictions equations are here mentioned in order that a general idea on the results of the minimum contradictions physics might be introduced.

The electromagnetic (*em*) space-time is a space-time whose all magnitudes are considered imaginary and behave exactly like the gravitational (*g*). Electromagnetic (*em*) space-time is described by means of space-time wave functions such that [3]:

$$\Psi_{em}(\mathbf{r}_{em},t_{em})=\Psi^{g}_{em}(\mathbf{r},t) \tag{11}$$

where Eq. (7) has meaning due to the coexistence of (*g*) and (*em*) space-time under a scale which appears to be equal to the fine structure constant $\alpha$ [3].

According to the spirit of this paper *there is not potential acting at a distance* since space time is matter itself. By the aid of Fourier analysis and *without any other physical principles* the following can be obtained [3,15]:

*a. Relative Space-Time Operators* (*Relative Time, Volume, Length in a direction* $\mathbf{n}$)

$$\hat{TR}=\frac{i}{2\pi}\frac{\partial}{\partial t},\quad \hat{VR}=-2\pi i\frac{1}{\partial/\partial t},\quad \hat{LR}_n=\left(1-c^2\frac{\partial^2/\partial x_n^{\,2}}{\partial^2/\partial t^2}\right)^{1/2}\frac{h}{m_0c^2} \tag{12}$$

*b. Particle Schrödinger's Relativistic Equation (Klein–Gordon) for (g) and for (em) Space-Time:*

$$\frac{\partial^2\Psi}{\partial t^2}(\mathbf{r},t)-c^2\nabla^2\Psi(\mathbf{r},t)=-(m_0c/\hbar)^2\Psi(\mathbf{r},t) \tag{13}$$

*c. Many body Schrödinger's Relativistic Equations for (g) and for (em) space time:*

$$\frac{\partial}{\partial x_j}\frac{\Box\Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)}=0 \qquad (j=1,2,3,4) \tag{14}$$

$$\frac{\partial}{\partial x_j}\frac{\Box\Psi^{g}_{em}(\mathbf{r},t)}{\Psi^{g}_{em}(\mathbf{r},t)}=0 \qquad (j=1,2,3,4) \tag{15}$$

*d. Energy Conservation:*

$$\partial_t\left(\frac{\partial_t\Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)}+\frac{\partial_t\Psi^{g}_{em}(\mathbf{r},t)}{\Psi^{g}_{em}(\mathbf{r},t)}\right)=0 \tag{16}$$

*e. Momentum Conservation:*

$$\partial_t\left(\frac{\nabla\Psi_g(\mathbf{r},t)}{\Psi_g(\mathbf{r},t)}+\alpha\frac{\nabla\Psi^{g}_{em}(\mathbf{r},t)}{\Psi^{g}_{em}(\mathbf{r},t)}\right)=0 \tag{17}$$

f. *Geometry of (g) or (em) Space-Time i.e. Mean Relative Time and Mean Relative Length in a Direction* $\mathbf{n}$ *at a Point* $(\mathbf{r},t)$:

$$\overline{tr}(\mathbf{r},t)=\frac{ic}{2h}\frac{\partial_t\Psi}{(\Psi\Box\Psi)^{1/2}}\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right) \tag{18}$$

$$\overline{lr}_n(\mathbf{r},t)=-\frac{ih}{2}\frac{\Psi}{\Box\Psi}\left(1-c^2\frac{\partial^2\Psi/\partial x_n^{\,2}}{\partial\Psi/\partial t^2}\right)^{1/2}\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right) \tag{19}$$

According to the Claim for Minimum Contradictions in order that further contradictions are avoided, a matter system in general should be described through the same principles as a particle field. This can be valid when a matter-space-time field locally behaves as a space-time-particle field and obeys equations (12 to 19) which express a basic law that matter-space-time obeys. These equations imply a statistical interpretation and a distribution of matter space-time according to *Schrödinger Relativistic Equation* probability density

$$P(\mathbf{r},t)=(i\hbar/2m_0c^2)\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right) \tag{20}$$

Eq. (20) does not imply always positive values of $P(\boldsymbol{r},t)$; this is illogical but compatible to the claim for minimum contradictions. Eq. (20) is valid only on conditions that the space-time particle field described is extended to infinity [3]. In this case, $\Psi$ function locally is described by an equivalent local space-time particle field wave function $\Psi i$, where this field is regarded as extended to infinity. This can occur when $\Psi$ is derivable everywhere but its derivatives are not continuous, which means that equations (14 to 17) have constant values of $m_{0g}$ or $m_{0em}$ only in the vicinity of various $(\mathbf{r},t)$.

A basic property of stochastic space-time is described by the equation [3]:

$$\overline{sr}(\mathbf{r},t)=\left\langle\overline{sr}\right\rangle_i V_0 P_i(\mathbf{r},t)=\left\langle\overline{sr}\right\rangle V_{0T}P(\mathbf{r},t) \tag{21}$$

where $\overline{sr}(\mathbf{r},t)$ is the mean value of any space-time relative magnitude and where $V_0$, $\left\langle\overline{sr}\right\rangle_i$, $P_i(\mathbf{r},t)$ refer to local particle fields while $V_{0T}, \left\langle\overline{sr}\right\rangle$, $P(\mathbf{r},t)$ refer to the whole matter system.

## 2.5 Quantum Gravity

The gravitational acceleration $\mathbf{g}(\mathbf{r},t)$ represents the force that must be applied to a unit of mass at every point $(\mathbf{r},t)$ in order that energy will be distributed according to the probability density function $P(\mathbf{r},t)$. It can be proven that [3, 16, 17]:

$$\mathbf{g}(\mathbf{r},t)=\frac{c^2}{P(\mathbf{r},t)}\nabla P(\mathbf{r},t)=\frac{c^2}{\overline{tr}(\mathbf{r},t)}\nabla\overline{tr}(\mathbf{r},t) \tag{22}$$

From equation (22) for a particle field, because of equation (20) it holds:

$$\mathbf{g}(\mathbf{r},t)=\frac{c^2\nabla\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right)}{\left(\Psi^*\partial_t\Psi-\Psi\partial_t\Psi^*\right)} \tag{23}$$

Equations (22, 23) describe a unified relationship which is valid everywhere. Under certain simplifications it can be proven that equation (22) is compatible to Newton and to Coulomb law as well as to the relativistic formula for gravity [3].

# 3. Possibility to Verification of (g) and (em) Interaction

## 3.1. General

There have been made many devices to produce energy or to create propulsion through the vacuum [18-27]. The operation principle of these devices might be related to the interaction of the gravitational with the electromagnetic field.
In the present paper the devices we use to possibly verify the (g) and (em) interaction are the following:

1. the device of the U.S. Patent No. 8,952,773 [23] as illustrated in fig. 1; this device consists of a superconducting nozzle connected at its narrow end with a permanent magnet, which can create propulsion without any external energy source but only in the direction South to North and as it will be mentioned, it has been experimentally verified.

2. the device of the GR 20190100373 patent application [24] as illustrated in fig. 2 and fig.3 which consist of a U shaped soft iron core which is surrounded by a REBCO tape coil producing magnetic field and a magnetic shield which does not permit the magnetic field to penetrate it; this device can create a propulsive force upwards.

## 3.2. Operation principle

Based on classical magnetic field theory [30] we have that the force exerted on a closed surface *S*, such as the surface enclosing the device of the present invention such as illustrated in figure 1, will be:

$$\mathbf{F} = \frac{1}{2}\oiint_S [\mathbf{H}(\mathbf{n}\cdot\mathbf{B}) + \mathbf{B}(\mathbf{n}\cdot\mathbf{H}) - \mathbf{n}(\mathbf{H}\cdot\mathbf{B})]ds \qquad (1)$$

where **H** is the intensity of the magnetic field, **B** is the density of the magnetic flux and **n** is the vertical vector on the surface *S* under consideration which is directed outward. Equation (1) shows the force *d***F** exerted on a surface *dS* perpendicular to the magnetic field **H**, and on condition that:

$\mathbf{n}\cdot\mathbf{B} = \mathrm{B}$ και $\mathbf{n}\cdot\mathbf{H} = \mathrm{H}$
or
$\mathbf{n}\cdot\mathbf{B} = -\mathrm{B}$ και $\mathbf{n}\cdot\mathbf{H} = -\mathrm{H}$

we have that the force *d***F** is equal to:

$$d\mathbf{F} = \frac{1}{2}\mathbf{n}(\mathbf{H}\cdot\mathbf{B})dS = \mathbf{n}\frac{\mathrm{B}^2}{2\mu_0}dS \qquad (2)$$

where $\mu_0$ is the magnetic permeability of the vacuum. From equation (2) we conclude that forces $\mathbf{F}_\alpha$ and $\mathbf{F}_\beta$, exerted on the cross-sections at the ends (α) and (β) have the same direction with the unit vectors $\mathbf{n}_\alpha$ and $\mathbf{n}_\beta$ respectively as illustrated in fig.1, fig.2. and fig.3. Based on equations (1) and (2) and with reference to fig.1, fig.2 and fig.3 on the surface of reference *S* enclosing the apparatus of the present invention the following force **F** will be exerted:

$$\mathbf{F} = \mathbf{F}_\alpha + \mathbf{F}_\beta = \frac{\mathbf{n}_\alpha}{2\mu_0} A_\alpha B_\alpha^2 + \frac{\mathbf{n}_\beta}{2\mu_0} A_\beta B_\beta^2 \qquad (3)$$

where $A_\alpha$ the cross section at the end (α), $\mathbf{A}_\beta$ the cross section at the end (β), $\mathbf{B}_\alpha$ the magnetic flux density at the end (α) and $\mathbf{B}_\beta$ the magnetic flux density at the end (β).

More particularly in the arrangement of figure 1 for:

$$A_\alpha \neq A_\beta, \quad \mathbf{n}_\alpha = -\mathbf{n}_\beta$$

and taking into account the conservation of the magnetic flux (due to the existence of a superconducting magnetic shield, which prevents the magnetic field from penetrating it) we have:

$$\mathbf{F} = \mathbf{F}_\alpha + \mathbf{F}_\beta = \frac{\mathbf{n}_\alpha}{2\mu_0} A_\alpha B_\alpha^2 (1 - B_\beta / B_\alpha) \qquad (4)$$

This corresponds to device of fig. 1

For:

$$A_\alpha = A_\beta, \quad \mathbf{n}_\alpha = \mathbf{n}_\beta$$

we have:

$$\mathbf{F} = \mathbf{F}_\alpha + \mathbf{F}_\beta = \frac{\mathbf{n}_\alpha}{\mu_0} A_\alpha B_\alpha^2 \qquad (5)$$

This corresponds to device of fig. 3

A more accurate value of the force due to equation (5) is a function of the magnetic flux density $\mathbf{B}_\alpha$ that can be obtained through finite element analysis but also experimentally for more efficient theory-result convergence.

It should be noted that for superconductors we don't have a unified formula throughout, and any deviation from the principles of classical physics should be understood within this context.

It is further noted that a unified theory has not yet been formulated as a completely

accepted theory; for the purposes of the inventions mentioned it is approached through the minimum contradictions physics.

According to this, stochastic quantum space-time constitutes matter itself, which may facilitate the interpretation of the divergence from the principles of classical physics. In particular, the electromagnetic field behaves as a material gravitational field with imaginary (i) mass. The exchange of energy and momentum of the gravitational (g) field with the electromagnetic (em) field is done by photons which are the only ones that can be transformed from a particle space-time formation (g) to a particle space-time formation (em). This seems, as a first approach, to be derived from the equations:

$$\mathrm{E}^2 = c^2 P^2, \quad (i\mathrm{E})^2 = c^2 (iP)^2 \qquad (6)$$

that connect the energy and momentum of a photon and apply to both the real space (gravitational space) and the imaginary space (i-electromagnetic space).

*The above mentioned can be found in details in the equations of the minimum contradictions quantum space time and more specifically in the equations (14, 15, 16, 17).*

From the magnetostatic analysis and the incompressible fluid mechanics we have:

$$\Delta\psi = 0, \quad \nabla\psi = \mathbf{B}, \quad \Delta\varphi = 0, \quad \nabla\varphi = \mathbf{V} \qquad (7)$$

where $\psi$ and $\varphi$ are the magnetic and fluid mechanics potential functions and **B** and **V** are the magnetic flux density vectors in the magnetostatics and the fluid velocity in fluid mechanics, respectively.

From equations (7) it follows that the magnetostatic field is similar to the fluid mechanics field where the vector of magnetic flux density **B** behaves like the velocity vector **V**.

From equation (5) and the corresponding fluid mechanics equation for a similar device we will have:

$$\mathbf{F} = \frac{\mathbf{n}}{\mu_0} AB^2 \qquad (8)$$

$$\mathbf{F} = -\mathbf{n} 2\rho A V^2 \qquad (9)$$

where ρ is the density of fluid that is simulated. Equations (8) and (9) show that:

$$B = \pm \mathrm{i}\sqrt{2\mu_0 \rho} V \qquad (10)$$

Equation (10) shows that magnitude **B** cannot be simulated with something real (mechanical-gravitational) but through an imaginary magnitude referring to the electromagnetic space such as equations (6). It is emphasized that in the experiment

carried out to verify the aforementioned U.S. Patent No. 8,952,773 it was observed that the developed force was opposite to the expected in a hydrodynamically similar device which is compatible with equations (6), (8), (9) and (10).

The experiment mentioned was carried out both at the Technological Institute of Thessaly (now the University of Thessaly) in the Laboratory of Renewable Energy and in the Solid State Physics Laboratory of the National Kapodistrian University of Athens.

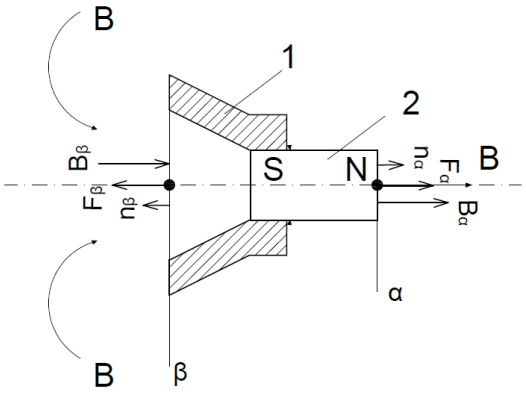


Figure1

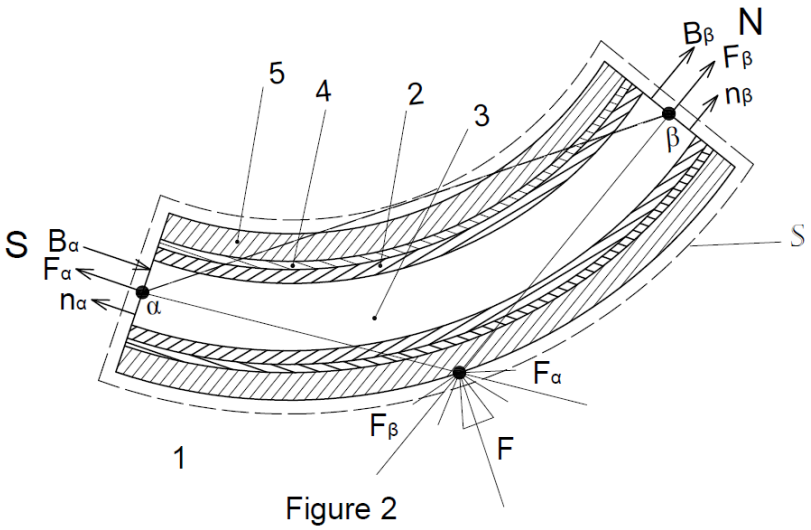


Figure 2

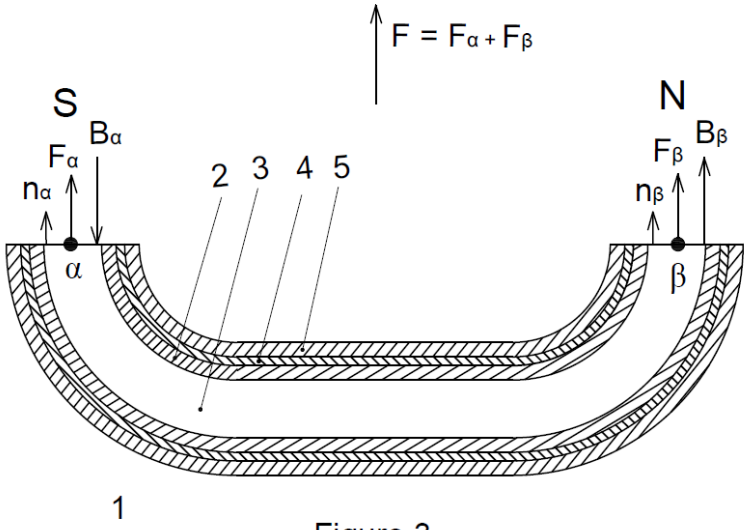


Figure 3

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