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(54) **SYSTEMS AND METHODS FOR PROVIDING BOTH ELECTRIC POWER AND MECHANICAL POWER, USING MAGNETICS, IN ACCORDANCE WITH ECE-THEORY**

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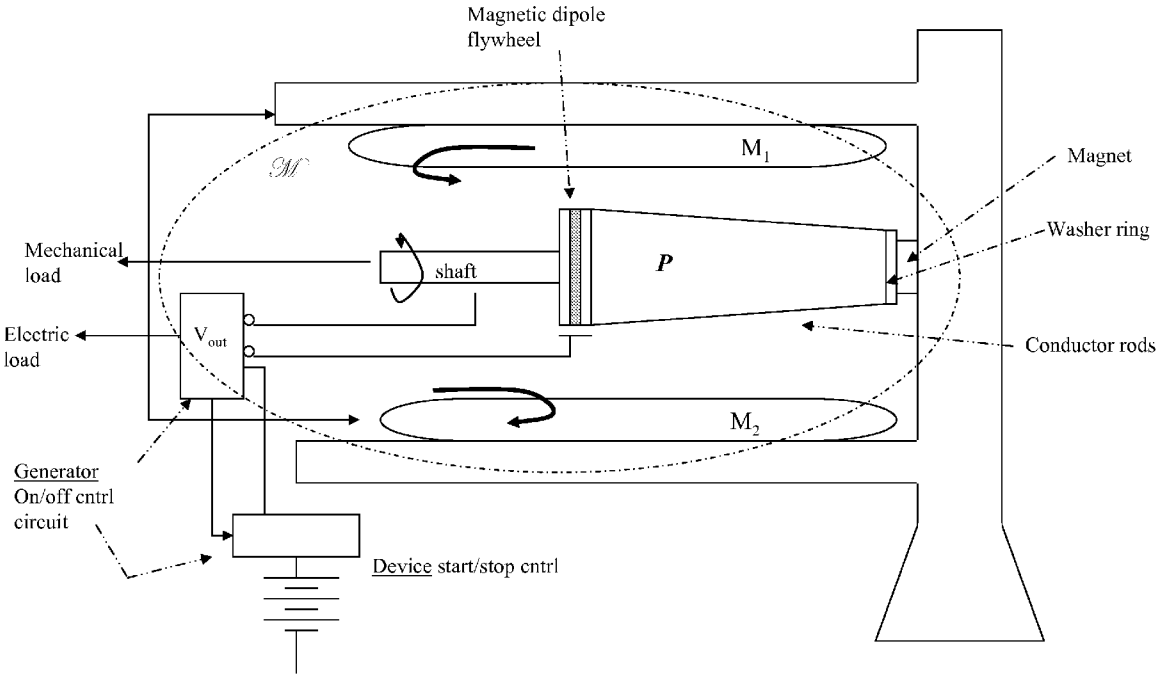
(57) **ABSTRACT**

Methods and systems for generating electric energy and mechanical power using principles of ECE-Theory are presented. The electric energy function uses an old Faraday Disk generator type system. Uniquely, it is embedded in a crossfield device (CFD). The CFD is based on ECE-Theory, and provides the external magnetic field (and a reduced gravity environment) for the generator portion of the crossfield-homopolar device. The device functions as both a generator and a motor. This anti-gravity effect is in accordance with the new ECE (Einstein-Cartan-Evans)-Theory of physics. ECE-Theory shows gravitation and electromagnetism are both defined as manifestations of the curvature of spacetime.



Crossfield Enhanced Homopolar Motor-Generator (with control components)

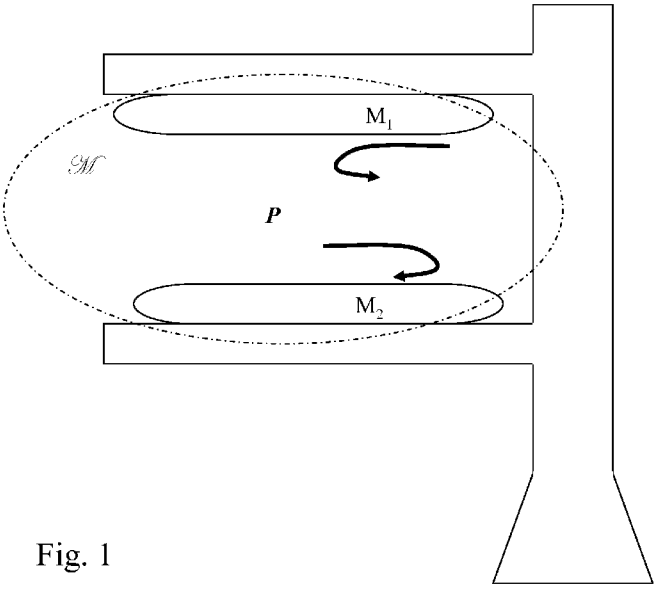


Fig. 1

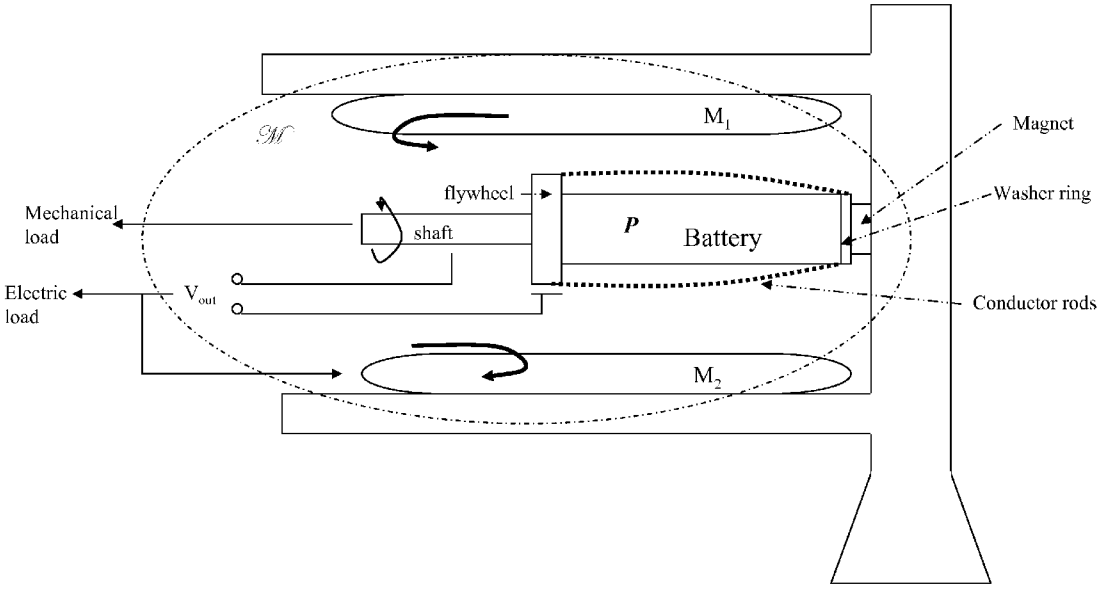


Fig. 2 *Crossfield Enhanced* Homopolar Motor-Generator

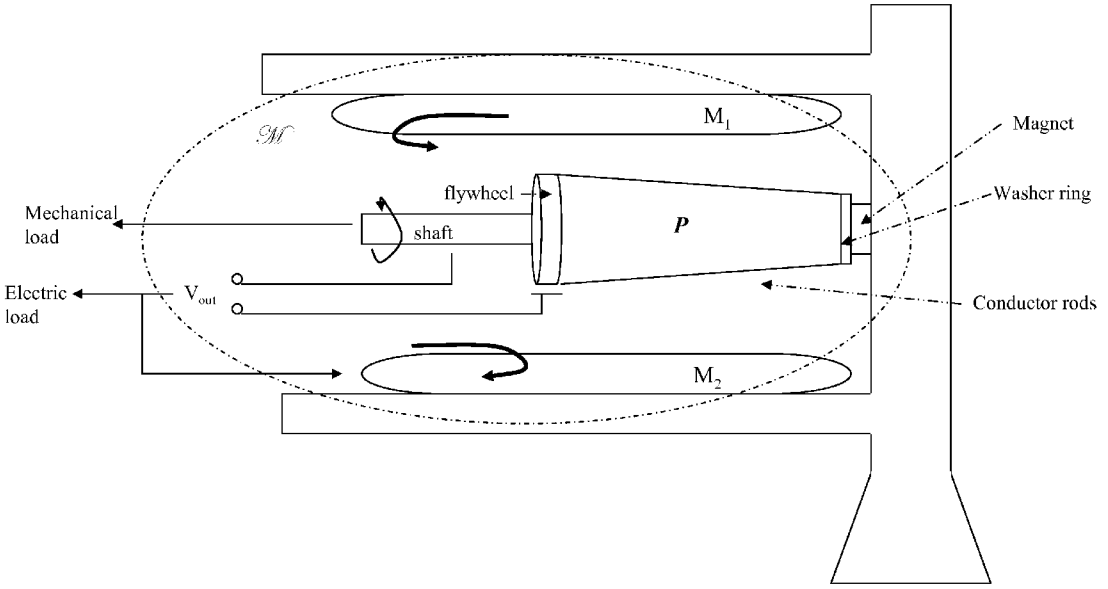


Fig. 2A *Crossfield Enhanced* Homopolar Motor-Generator
(*Generic flywheel –conductor assembly*)

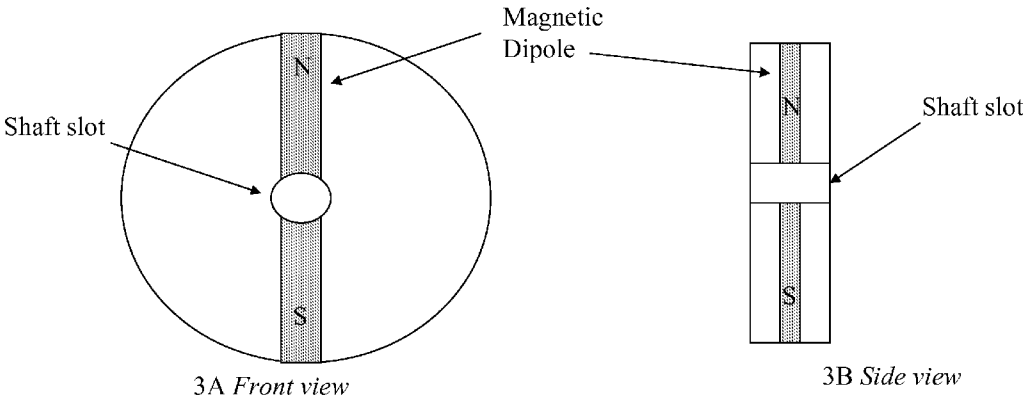


Fig. 3 Advanced flywheel –conductor assembly
(using magnetic-dipole)

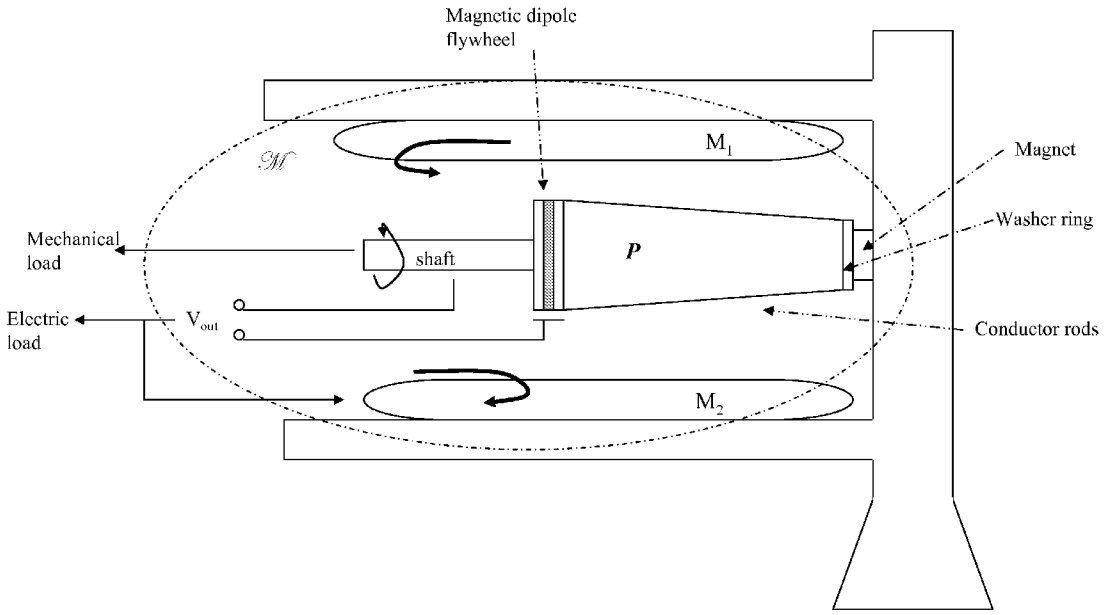


Fig. 4 *Crossfield Enhanced* Homopolar Motor-Generator

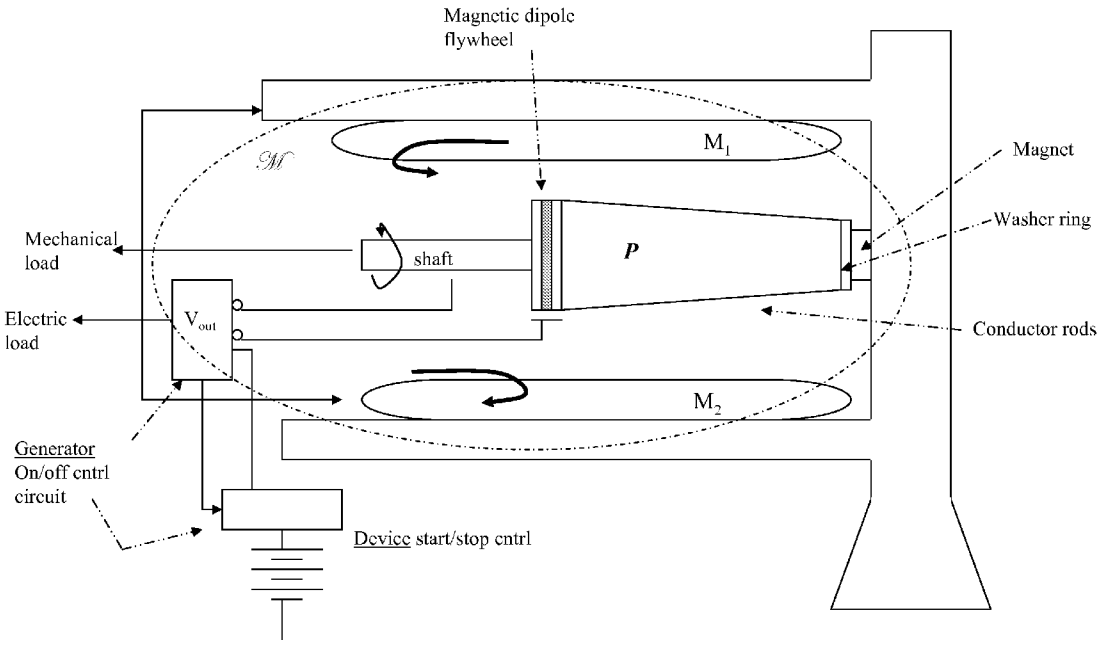


Fig. 5 *Crossfield Enhanced* Homopolar Motor-Generator
(with control components)

SYSTEMS AND METHODS FOR PROVIDING BOTH ELECTRIC POWER AND MECHANICAL POWER, USING MAGNETICS, IN ACCORDANCE WITH ECE-THEORY

1. BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This invention relates to systems for generating an anti-gravity region between magnetic fields. This application is a continuation-in-part of;

[0002] SYSTEMS FOR PRODUCING GRAVITY-NEUTRAL REGIONS BETWEEN MAGNETIC FIELDS, IN ACCORDANCE WITH ECE-THEORY

[0003] by Charles Kellum

the entire teachings of which are contained herein by reference.

[0004] Electromagnetic forces are created, configured, and aligned so as to generate an anti-gravity effect, and provide a suitable operations environment for electrical energy generation, using a Faraday Disk type device. The device presented herein can function both as an electric power generator and as a motor.

[0005] Such an anti-gravity effect is caused by the change in curvature of spacetime. Gravitation is the curvature of spacetime. Electromagnetism is the spinning (or torsion) of spacetime. By properly amplifying the interaction between these forces, anti-gravity effects can be produced. Obviously, the magnetic sources can be viewed as magnetized matter. Their interaction is used to induce spacetime curvature, thus creating an anti-gravity effect. This process can have applications ranging from electric power generation, to vehicular propulsion. A primary application of the invention is a demonstration of Einstein-Cartan-Evans (ECE)-Theory principles. ECE-Theory principles include anti-gravitation via interaction between forces.

1.1 Introduction

[0006] Electromagnetic radiation is the basis by which we perceive and measure phenomena. All of our human experiences and observations rely on electromagnetic radiation. Observing experiments and phenomena perturb electromagnetic radiation. Our observations and measurements sense the resulting perturbations in electromagnetic fields. This realization has far reaching ramifications, ranging from our basic perceptions of the universe, to our concepts of space, time, and reality.

[0007] As a starting point, the Special Theory of Relativity postulates that the speed-of-light (c), is the maximum velocity achievable in our spacetime continuum. A more correct statement, of this result of Einstein's ingenious theory, is that c is the greatest observable velocity (i.e. the maximum velocity that can be observed) in our spacetime. This is because c (the natural propagation speed of electromagnetic radiation) is our basis of observation. Phenomena moving at speeds $\geqq c$ cannot be normally observed using electromagnetic radiation. Objects/matter moving at trans-light or super-light velocities will appear distorted or be unobservable, respectively. A brief analytical discussion of these factors is given below, in following sections. This is the first, of the two primary principles, exploited in this document.

[0008] The second principle is that electromagnetism and gravitation are both expressions of spacetime curvature. Stated from the analytical perspective, electromagnetism and gravitation are respectively the antisymetric and symmetric parts of the gravitational Ricci Tensor. Since both the electromagnetic field and the gravitational field are obtained from the Riemann Curvature Tensor, both fields can be viewed as manifestations/expressions of spacetime curvature. This principle is proven in several works, some of which are listed in section 1.1.1 below.

1.1.1 Applicable Documents

[0009] [1] "Gravitation and Cosmology"
[0010] Principles & Applications of the General Theory of Relativity
[0011] By: Steven Weinberg, MIT
[0012] John Wiley & Sons, Inc, 1972
[0013] [2] "Gravitation"
[0014] By: C. Misner, K. Thorne, J. Wheeler
[0015] W. H. Freeman & Co., 1973
[0016] [3] "Why There is Nothing Rather Than Something"
[0017] (A Theory of the Cosmological Constant)
[0018] By: Sidney Coleman
[0019] Harvard University, 1988
[0020] [4] "Superstring Theory"
[0021] Vols. 1 & 2
[0022] By: M. Green, J. Schwarz, E. Witten
[0023] Cambridge University Press, 1987
[0024] [5] "Chronology Protection Conjecture"
[0025] By: Steven W. Hawking
[0026] University of Cambridge, UK **1992**
[0027] [6] "The Enigmatic Photon"
[0028] Vol. 1: The Field $B^{(3)}$
[0029] Vol. 2: Non-Abelion Electrodynamics
[0030] Vol. 3: Theory & Practice of the $B^{(3)}$ Field
[0031] By: M. Evans, J. Vigier
[0032] Kluwer Academic Publishers, 1994-1996
[0033] [7] "The $B^{(3)}$ Field as a Link Between Gravitation & Electromagnetism in the Vacuum"
[0034] By: M. Evans
[0035] York University, Canada 1996
[0036] [8] "String Theory Dynamics in Various Dimensions"
[0037] By: Edward Witten
[0038] Institute for Adv. Study; Princeton, N.J. 1995
[0039] [9] "Can the Universe Create Itself?"
[0040] By: J. Richard Gott III, Li-Xin Li
[0041] Princeton University, 1998
[0042] [10] "Concepts and Ramifications of a Gauge Interpretation of Relativity"
[0043] By: C. Kellum; The Galactican Group, USA
[0044] AIAS posting; April 2008
[0045] [11] "Physical Theory of the Levitron"
[0046] By; H. Eckardt, C. Kellum
[0047] AIAS posting; 17 Sep. '10
[0048] [12] "The Levitron™ A Counter-Gravitation Device for ECE-Theory Demonstration" Revision 1
[0049] By: Charles W. Kellum
[0050] The Galactican Group July 2010
[0051] [13] "Generally Covariant Unified Field Theory"
[0052] By; M. W. Evans
[0053] Abramis, Suffolk, (2005 onwards)
[0054] [14] "The Spinning and Curving of Spacetime; The Electromagnetic & Gravitational Field in the Evans Unified Field Theory"
[0055] By; M. W. Evans

[0056] AIAS 2005
[0057] [15] "Spacetime and Geometry; An Introduction to General Relativity"
[0058] By; Sean M. Carroll
[0059] Addison Wesley, 2004 ISBN 0-8053-8732-3
[0060] [16] "Spin Connected Resonances in Gravitational General Relativity"
[0061] By; M. W. Evans
[0062] Aeta. Phys. Pol. B, vol. 38, No. 6, June 2007
[0063] AIAS (UFT posting [64])
[0064] [17] "Spin Connected Resonance in Counter-Gravitation"
[0065] By; H. Eckardt, M. W. Evans
[0066] AIAS (UFT posting [68])
[0067] [18] "Devices for Space-Time Resonance Based on ECE-Theory"
[0068] By; H. Eckardt
[0069] AIAS posting 2008
[0070] [19] "ECE Engineering Model, version 2.4, 18 May'09"
[0071] By; H. Eckardt
[0072] AIAS posting 2009
[0073] [20] "The Resonant Coulomb Law of ECE-Theory"
[0074] By; M. W. Evans, H. Eckardt
[0075] AIAS (UFT posting [63])
[0076] [21] "Theoretical Discussions of the Inverse Faraday Effect, Raman Scattering, and Related Phenomena"
[0077] By; P. Pershan, J. van der Ziel, L. Malmstrom (Harvard Univ.)
[0078] Physical Review vol. 143, No. 2, March 1965
[0079] [22] "Description of the Faraday Effect and Inverse Faraday Effect in Terms of the ECE Spin Field"
[0080] By; M. W. Evans
[0081] AIAS (UFT posting [81]) **2007**
[0082] [23] "Curvature-Based Vehicular Propulsion"; (Rev. 2)
[0083] By; Charles Kellum
[0084] The Galactican Group; USA (WP06) May 2011
[0085] [24] "Anti-Grvity Device Demonstration Video"
[0086] (Crossfield-Device (CFD) Working Model)
[0087] By: C. W. Kellum; W. Stewart
[0088] The Galactican Group, USA 13 May 2010
[0089] [25] "Electric Power Generation from Spacetime Background Potential Energy"; (Rev. 2)
[0090] By; Charles Kellum
[0091] The Galactican Group; USA (WP07) May 2011

1.1.2 Overview

[0092] The above cited (and related) works also raise fundamental issues as to the origin, dynamics, and structure of our spacetime continuum. Our universe appears to be dynamic in several parameters. It is suggested that the results arrived at in this document might shed some small light on a few of said fundamental issues. Please note that boldface type indicates a vector quantity, in the remainder of this document; example (v implies the vector quantity $\vec{v}$).

[0093] The objective here is to describe/present a new method of, and system for, propulsion. This method is based on utilizing the equivalence of electromagnetism and gravity by inducing local spacetime curvature. The induced curvature results in a geodesic curve. The "propulsion phase" involves a "fall" along said geodesic curve. The basic definition for a geodesic is (in the context of gravitational physics), from [2]:

[0094] a curve that is straight and uniformly parameterized as measured in each local Lorentz frame (coordinate system at a point of the curve) along its way. (where a "curve" is a parameterized sequence of points)

[0095] as a general definition, a geodesic is a free-fall trajectory, which is the shortest path between two points, wherein said points are on some metric-space.

[0096] The process is called "geodesic-fall". The "geodesic-fall vector" is denoted as $\mathscr{F}$. The "geodesic-fall" process requires the generation of a proper electromagnetic field to induce local spacetime curvature and, fall along the resulting geodesic curve. The vehicle/particle under "geodesic-fall" moves along the geodesic curve at a velocity dependant on the degree of induced curvature. Theoretically, the maximum achievable velocity is determined by curvature. The maximum achievable velocity is not limited by c (the speed-of-light) in normal/unperturbed spacetime. Under The "geodesic-fall" process, the primary constraints on velocity are due to the degree of induced curvature, and to the structure of the vehicle.

1.2 Basic Concepts

[0097] Trans-light and super-light speeds have long been the domain of the science fiction community. In recent years, serious cosmologists and theoreticians have examined this arena. Below is presented a generalized view of the Special Relativity Theory. One starts with a regional structure of spacetime.

1.2.1 Regions of Spacetime

[0098] It has been suggested (for example in [9], by some string-theorists, etc.) that the "Big Bang" was a local phenomena, and that other "Big Bang" type phenomena events might be observable in distant reaches of our known universe. Additionally, many of the theoretical problems with the "Big Bang theory" (primary among which is causality), can be solved by considering a regional structure of spacetime. Depending on the size of the regions, a "Big Bang" event could be viewed as a local phenomenon.

[0099] Below in this document, an arbitrary region of spacetime is examined and equations-of-motion (based on a generalized parameter of said region) are derived, so as to develop a generalized view of Special Relativity.

A regional view of spacetime can offer several analytical advantages and some ramifications. For this work, one can consider our known spacetime as a "region" of the universe. Under this framework, certain phenomena encountered by astro-physicists and cosmologists might be accounted for through boundary conditions of our spacetime region. Black holes, and the possible variance of c, are examples of such phenomena.

[0100] Further, if the "Big Bang" is a local phenomenon, this reality would suggest that the universe has always existed. Coupled with aspects of M-Theory, a regional structure of the universe makes it not unreasonable to consider the universe without a specific origin, as one contemplates the definition of origin in this context. It is possible that the universe has always existed. Additionally, observed background radiation could be accounted for as inter-regional energy exchange.

1.2.2 Velocity

[0101] To examine constraints on velocity, using geodesic-fall ( ), it is useful to begin by deriving a generalized view of Special Relativity. An arbitrary region λ of spacetime will be examined. This could conceivably be our region/sub-universe/brane of existence. A generalized parameter of this region will also be used. Let this generalized parameter ϕ be defined as the maximum natural velocity (i.e. energy speed of propagation) in this region. Then one can derive the concepts of Special Relativity, based on parameter ϕ_λ in region λ.

[0102] For the purpose of this document (and to attempt leeward bearing to other naming conventions) the generalized derivation [10] is referred to as the Light Gauge Theory (LGT). In this context "gauge" is defined as a standard of measurement, or a standard of observation. Additionally, the speed-of-light c, will also denote the velocity (vector) c. Thus, both the speed & velocity-of-light are denoted by c, for notational simplicity in this document.

[0103] The term "neighborhood" should be understood as the immediate volume of spacetime surrounding (and containing) the point, particle, or vehicle under discussion, in the context of this document.

1.2.2.1 The Light Gauge

Given:

[0104] Two observers a distance x apart in a region λ of spacetime. An event happens at observer A's position, at time t, (x_1, x_2, x_3, t). The observer B, at position (x'_1, x'_2, x'_3, t') also observes the event that happens at A's position.

Let:

[0105] v_λ define the maximum propagation speed of signals in region λ

[0106] $v_\lambda > c$, $v_\lambda > c_\lambda$

[0107] This is a counter assumption that c is not necessarily universal, and that c_λ is not the maximum speed a signal can propagate in spacetime region λ. Two viewpoints/arguments are considered:

[0108] 1. The maximum signal velocity, in a spacetime region, is unbounded (i.e. ∞)

[0109] 2. The maximum signal velocity, in a spacetime region, cannot exceed some ϕ in that spacetime region, (e.g. ϕ_λ, for the spacetime region λ). One states that $\phi_\lambda \neq c_\lambda$, can be viewed as the general case.

Argument 1;

[0110] This 1st viewpoint would imply instantaneous synchronization, and the observable simultaneity of diverse events. Instantaneous propagation is an oxymoron. It does not follow observable (or analytical) analysis.

Argument 2;

[0111] This 2nd viewpoint involves deriving a Lorentz transformation for a spacetime region. One then defines an inter-region transformation for observers in different spacetime regions, where the regions are sub-manifolds on the general Riemann Manifold of spacetime.

1.2.2.1.1 Modified Lorentz Transformation

[0112] For the remainder of this document, I consider the set of spacetime regions that are definable as sub-manifolds on the Riemann Manifold of spacetime. The Theory of General Relativity describes physical space (i.e. our spacetime region) as a manifold.

[0113] One considers, in spacetime region/(sub-manifold) λ, two observers moving relative to each other, at velocity v. For notational simplicity, one observer will be in an unprimed coordinate system, (x_i, t_i). The other observer is in a primed coordinate system, (x'_i, t'_i). One "assumes" (as in Special Relativity) that, at the origin of each reference frame, x=0, t=0.

[0114] Let:

$$x' = \alpha x + v(\beta v \cdot x + \kappa t)$$

$$t' = \zeta v \cdot x + \eta t$$

[0115] α, β, κ, ζ, η fall from the pre-relativistic equations x'=x+vt, and t'=t Thus, α, κ, η approximate 1, and β,ζ approximate 0, when $v < \phi_\lambda$. One defines c_λ as the speed of light in spacetime region λ. Let $c_\lambda < \phi_\lambda$. If one assumes (according to Relativity) that the speed of light is constant, one has $c_\lambda = c < \phi_\lambda$.

[0116] If the primed coordinate system has a velocity v, in the unprimed coordinate system, and the unprimed coordinate system has velocity v in the primed coordinate system, one has the following;

$$\text{If } x' = 0, \text{ then } x = -vt \text{ and if } x = 0, \text{ then } x' = vt'$$

$$0 = -\alpha vt + v(\beta v \cdot vt + \kappa t)$$

$$= -\alpha vt + \kappa vt - \beta v^2 \cdot vt^2$$

$$\alpha = \S - \beta v^2$$

$$t' = \zeta v \cdot x + \eta t$$

$$t' = -\zeta v \cdot vt + \eta t$$

$$\eta t = \zeta v^2 t, \text{ (where } \eta = \zeta \text{ for proper values of } v^2)$$

One can now discuss the maximum signal velocity (ϕ_λ), possible in the λ region of spacetime. Assume that this maximum is universal, in the λ region of spacetime. In other words, (ϕ_λ) is the maximum attainable signal velocity in the λ region of spacetime, irrespective of the observer's coordinate system. Note;

[0117] 1. Here, the λ region of spacetime is defined as a sub-manifold on the (general spacetime) Riemann Manifold.

[0118] 2. Assume that ϕ_λ is a function of the curvature of spacetime region A.

1.2.2.1.1.1 Length Contraction

[0119]

$$x'_2 - x'_1 = (x_2 - x_1)/(1-\beta^2)^{1/2}$$

thus, an object measures shorter in coordinate system ξ', when observed from coordinate system ξ, if ξ' is in motion relative to ξ.

1.2.2.1.1.2 Time Dilation

[0120]

$$t_2 - t_1 = (t'_2 - t'_1)/(1-\beta^2)^{1/2}$$

1.2.2.1.2 Conclusions

[0121] By the above transformations, where $\beta=v/\phi_\lambda$, a particle moving at velocity $v \cong \phi_\lambda$ drives the transformation equations to infinity. Thus, in any given spacetime region λ, $v \cong \phi_\lambda$ implies the particle is not observable in region λ, when measured by signals propagating (in region λ) at velocities $v_\lambda < \phi_\lambda$.

1.2.3 ϕ_A and Curvature

[0122] Einstein intuitively chose c (the natural speed of electromagnetic wave propagation in our spacetime region) to be the ϕ_λ of his derivations. This was apparently an intuitive choice, since the speed of light is the highest "natural velocity" observed in our spacetime region. One can state that c is a special case of the general case ϕ_λ. Also, for the generalized case, ϕ_λ can be greater than c.

[0123] For this work, the "natural speed" is defined as the velocity of propagation of electromagnetic energy along a geodesic. Since a geodesic curve is the result of spacetime curvature, the "natural speed" is arguably dependent on the curvature of spacetime. Thus, given a regional structure of spacetime, the curvature θ_λ of region λ determines ϕ_λ. Then

$$\theta_\lambda \Rightarrow \phi_\lambda$$

[0124] (θ_λ) is a function of curvature.

This implies that the "generalized natural speed" is dependant on the curvature. For any spacetime region i, $\phi_i(\theta_i)$; where θ_i is the curvature of region i.

1.3 Spacetime Regions (Some Possible Ramifications)

[0125] If (as a brief aside) one examines a regional structure of spacetime, several factors might follow.

[0126] The regions of spacetime, if dynamic (in size and/or other properties), could account for several phenomena (both observed and predicted). Considering the curvature parameter, if one examines regional curvature, as the regions become smaller;

Let: W_i = volume of the i^{th} region of spacetime

λ_i = curvature of the i^{th} region of spacetime

$= f(W_i, \ldots)$

$$\frac{\partial \lambda_i}{\partial W_i} = \frac{\partial f(W_i, \ldots) dq_i}{\partial W_i},$$

where q_i is a generalized coordinate

Then:

$$\lim_{Wi \to 0} f(W_i, \ldots) = \lim_{Wi \to 0} \lambda_i \approx K$$

[0127] Where K is an approximation of curvature/gravity in a quantum framework?

It is interesting to note that, where W_i approaches the Planck-Scale, neither Relativity nor Quantum Theory accurately predicts the behavior of matter.

[0128] By the Theory of General Relativity, all of space is a manifold. Therefore one can consider regions as submanifolds of spacetime. A region of spacetime is a set of points. If one considers regional curvature (i.e. curvature of a given region of spacetime) as a "relation or operation" on the set of points defining a region, then the curvature operation arguably has transitivity, identity (i.e. flat/zero-curvature), and an inverse (i.e. negative curvature) on the points of said region. The region can then be called a group. Since the region is a manifold, the region is also a lie-group. Generalizing, one can view spacetime as a set of lie-groups.

[0129] Regions containing singularities (e.g. black holes) could be analyzed using the orbitfold-based arguments of M-Theory. This might also be useful in analysis of regional boundary conditions. A "regional structure" of spacetime would mean that a given region is bounded by a set of other regions. Thus, obviously, the boundary conditions of a given region would be a summation of its sub-boundaries with members of its set of bounding/connecting regions. An orbitfold-based approach might be useful in analyzing such boundary conditions, as well as regional singularities (e.g. black holes). The main suggestion here is, given region size, the same analysis methods might hold, whether micro or macro regions are considered. Conceptually, macro-regions could be described using the "brane" structure of M-Theory. Micro-regions could be used to describe quantum behavior/properties of curvature. As region size "theoretically" approaches zero, regional size encounters the Planck-Scale. Below the Planck-Scale, present knowledge prevents accurate prediction of behavior.

[0130] Descriptions of curvature/gravity (under a regional structure) might therefore offer a way to incorporate a quantum framework that includes gravity, when micro-regions are considered.

1.4 Summary

[0131] The cursory discussion of this section 1, establishes the conceptual background of the invention. A second objective of this background section is to suggest a possible approach to the problem of incorporating gravity into a quantum framework. Some additional considerations might be useful. They are as follows;

[0132] (1) Photon behavior is described, as to the "view of an observer", in a local coordinate-system (i.e. reference-frame). If spacetime consists of regions, then a region around a black hole has its own preferred reference frame.

[0133] (2) A Postulate: Regions of spacetime might have different properties. Thus, they might have preferred local frames-of-reference (i.e. coordinate systems). If so, a particular region, depending on its curvature (and size) might accommodate Relativity or Quantum Theory. This could form the basis for a Quantum Theory of Gravity/(spacetime-curvature).

The focus of the remainder of this document is our spacetime region, its curvature, its torsion, and resulting applications such as geodesic-fall ( ), in our region of spacetime.

2. SUMMARY OF INVENTION

[0134] The invention is an electric power generator and motor device. It is based on the new ECE-Theory of cosmology. The ECE (Einstein-Cartan-Evans)-Theory [13-15] is a generally covariant unified field theory, developed by Prof. Myron W. Evans in 2003. A major principle of the ECE-Theory is that electromagnetism and gravitation are both manifestations of spacetime curvature. More specifically, electromagnetism is the torsion of spacetime, and gravitation is the curvature of spacetime. Since torsion can be viewed as spin, one concludes that spacetime has both curvature and spin. The spinning/torsion of spacetime was neglected in Einstein's Theory of Relativity. Einstein also arbitrarily (and

incorrectly) assumed c (the speed of light) could not be exceeded. The ECE-Theory also shows that coupling between the background potential of spacetime can be established by appropriate electrical and/or mechanical devices. This coupling manifests as amplification of the potential (in volts) of such devices, as said devices resonate with the background potential energy of spacetime. This phenomenon is called spin-connection-resonance (SCR), [16, 17]. Some engineering principles, for such devices, are discussed in [18]. The invention is a device that employs some of the engineering concepts discussed in [18]. One purpose of the invention is to demonstrate SCR and other principles of ECE-Theory. Fundamentally, ECE-Theory is a combination of Einstein's geometric approach and Cartan Geometry to describe the nature & structure of spacetime. Cartan Geometry [15] adds torsion to the Riemann Geometry used by Einstein in his Theory of Relativity. Thru ECE-Theory, electromagnetism can be expressed as the torsion of spacetime. The basic set of ECE-Theory equations describes both gravitation and electromagnetism.

2.1 Basic Concepts

[0135] In general, to counter the gravitational field of spacetime (i.e. at a given point in spacetime), the potential energy (ϕ) of spacetime, must be increased. Using ECE-Theory, the background potential energy of spacetime (i.e. the scalar potential ϕ) is considered.

Background Potential Energy of Spacetime ϕ

[0136] Conventionally, gravitational potential energy is related to the gravitational force. Gravitational potential energy (K), of an object is;

$$K=mgh$$

[0137] Where; ➔

[0138] m=mass of object

[0139] g=gravitational acceleration

[0140] h=altitude above earth

If an object's altitude above the earth decreases its, K decreases. If an object's altitude above the earth increases its, K increases.

[0141] From ECE-Theory, considering that gravitation & electromagnetism are both expressions of spacetime curvature (where gravitation is the curvature of spacetime and electromagnetism is the torsion/twisting of spacetime), $K\equiv\phi$ can be viewed as related to spacetime curvature. Thus, the gravitational potential energy (at any point in spacetime), can be regarded as the potential energy experienced by an object at that point. The curvature (i.e. gravitational field) of spacetime at any point, determines the geodesic-path and velocity an object (at that point) would experience. If curvature was induced at a point in spacetime, an object at that point could fall along the resulting geodesic, at a velocity dependant on the degree of said induced curvature. This induced geodesic-fall vector would be different from the natural geodesic-fall vector (e.g. normal gravity, in the earth realm). In the earth realm, raising the altitude of an object opposes gravity (i.e. induces spacetime curvature) and increases the object's potential energy. Therefore, by increasing ϕ, anti-gravity effects can be induced.

[0142] The ECE-Theory shows [16, 17] that coupling between the background potential energy (ϕ) of spacetime, can be established with appropriate electrical and/or mechanical devices. This coupling can cause a significant increase in ϕ (in the neighborhood of such a device). Thus, gravitation is countered in that device neighborhood. The field equations of ECE-Theory are used below, to show (analytically) how this coupling works.

Spin-Connection Resonance (SCR)

[0143] ECE-Theory shows that properly designed electric and/or mechanical devices can resonate with ϕ. The ECE field equations can be used to define an engineering framework for the design & implementation of devices suitable for coupling with the background potential energy (ϕ) of spacetime (i.e. achieving SCR).

Engineering Framework (for an SCR Capable Device Technology)

[0144] From the form of a general resonance equation (i.e. differential equation) for generalized item $q_i(x)$, where f(x) is the driving function, we have:

$$\partial^2 q_i(x)/\partial x^2+\zeta_1\partial q_i(x)/\partial x+\zeta_2 q_i(x)=f(x)$$

From the ECE-Theory field equations (where boldface denotes a vector quantity, ∇ is the gradient vector), the following relations are used;

$$E=-\frac{\partial A}{\partial t}-\nabla\phi-\omega_0 A+\phi\omega$$

$$B=\nabla\times A=\omega\times A$$

where; → A = vector potential of spacetime; ϕ = scalar " "; ω_0 = " spin connection; ω = vector " "

Considering the electrical case, from [18] we let A=0, which gives the following:

$$E=-\nabla\phi+\phi\omega$$

Using Coulomb Law ($\nabla\cdot E=\rho/\in_0$), we have:

$$\begin{aligned}\nabla\cdot E&=\rho/\varepsilon_0\\&=\nabla\cdot(-\nabla\phi+\phi\omega)\\&=-\nabla\cdot\nabla\phi+\omega\cdot\nabla\phi+\phi\nabla\cdot\omega\\&=-\nabla^2\phi+\omega\cdot(\nabla\phi)+(\nabla\cdot\omega)\phi\end{aligned}$$

Multiplying by (-1), we have;

$$\begin{aligned}&=\nabla^2\phi-\omega\cdot(\nabla\phi)-(\nabla\cdot\omega)\phi\\&=-\rho/\varepsilon_0\end{aligned}$$

The ECE Coulomb Law thus gives the expression:

$$\nabla^2\phi-\omega\cdot(\nabla\phi)-(\nabla\cdot\omega)\phi=-\rho/\in_0$$

This is a resonance equation for ϕ, the scalar potential. The resonant frequency is $(\nabla\cdot\omega)$, the divergence of the spin connection [18]. Thus the term spin-connection-resonance (SCR), is used. If ϕ is the spacetime scalar potential, then at SCR, ϕ should be maximized. The effect is to induce spacetime curvature in the maximized potential field ϕ. The degree of induced curvature, and the resulting geodesic path are determined by the driving function $(-\rho/\in_0)$. The induced

curvature & resulting geodesic path would be different from the natural curvature & geodesic path. Thus, natural gravity is opposed. Fundamentally, by increasing (e.g. maximizing) spacetime gravitational potential energy ϕ, anti-gravity effects are generated.

Driving Function Principles for SCR Capable Devices & Systems

[0145] From [18], and observation an engineering approach to a device family for coupling with ϕ is suggested. Given, that the resonance frequency from eq. (7) is $(\nabla\cdot\omega)$, and ω is a rotation vector of a magnetic field, it is reasonable to consider devices based on rotating magnetic fields. A rotating magnetic field (or two counter-rotating magnetic fields [18]) can be used to achieve resonance, SCR in this case. At SCR, ϕ is amplified in the neighborhood of the rotating magnetic fields. Gravitation is countered, and electric energy is available ([18]. The remaining focus of this document will be counter-gravitation devices, based on counter-rotating magnetic fields. Such devices can be referred to as cross-field devices.

2.2 Spin Connection Resonance (SCR) Effects

[0146] The ECE-Theory allows the interaction of the electromagnetic field and the gravitational field. A generally covariant unified field theory, such as ECE-Theory, allows such interaction. This field interaction is defined in [17]. The significance of ECE-Theory is illustrated by considering two charged masses interacting. There is an electrostatic interaction between the charges, and a gravitational interaction between the masses. On the laboratory scale, the electrostatic interaction is orders-of-magnitude greater than the gravitational interaction. Thus, gravitational interaction has not been measured, on the laboratory scale. In ECE-Theory, the interaction between the electrostatic field and the gravitational field can be controlled by the homogeneous current (of ECE-Theory), which is given in [17]. The homogeneous equation (in tensor form) of ECE-Theory is;

$$\partial_\mu F^{\mu\nu}=j^\nu/\in_0$$

[0147] Where;

[0148] F→electromagnetic field tensor

[0149] j→homogeneous current density

[0150] μv→spacetime indices $\in_0$→vacuum permeability

given in [19]. It is shown in [17], that for a given initial driving voltage, the effect of the interaction of the electromagnetic field with the gravitational field is significantly amplified (as is the effect of the electromagnetic field on the Newtonian force), in a direction opposite to the gravitational field. As shown in [17], the inhomogeneous current is derived from the covariant Coulomb Law. When the potential energy of the interaction resonates with the background potential energy of spacetime, SCR is achieved. At SCR, amplification of the potential of the interaction term occurs in a direction opposite to gravitation. This produces a counter-gravitation effect.

2.2.1 Power Generation with SCR

[0151] The application of crossfield technology, presented in this white-paper, is the generation of power by transferring background electric potential energy of spacetime to power electric devices & systems. The transfer of electrical energy (in volts) from the background potential energy of spacetime is accomplished by using the principles of ECE-Theory to tap this background potential energy. It is shown in [18] that (once SCR is achieved) the spin connection diverges (i.e. $\nabla\cdot\omega\neq 0$) in a region between two counter-rotating magnetic fields. This is shown in FIGS. 13 &14 of [18]. This divergence acts as a source of electric energy/voltage. As is also shown in [18], inserting a dielectric material at the divergence point, permits the resulting voltage to be transferred to power an electric load. Thus, FIG. 13, of [18] is a generic power source configuration (i.e. crossfield generator).

2.3 Generic Principles

2.3.1 Basic Physical Laws (Under ECE-Theory)

[0152] Considering the Coulomb Law under ECE-Theory, from [19] we have;

$$\nabla\cdot E=\rho/\in_0$$

[0153] Where: $E=-\partial A/\partial t-\nabla\phi-\omega_0 A+\omega\phi$

$$\nabla\cdot(-\partial A/\partial t-\nabla\phi-\omega_0 A+\omega\phi)=\rho/\in_0$$

In spherical coordinates we have the resonance equation 14.32 of [17]

$$d^2\phi/dr^2+(1/r-\omega_{int})d\phi/dr-(1/r^2+\omega_{int}/r)\phi=-\rho/\in_0$$

[0154] Where; ω_{int}→the interaction spin connection Considering the Poisson equation $\{\nabla^2\phi=-\rho/\in_0\}$ of the Standard Model, and introducing the vector spin connection ω of the ECE-Theory, one has the following:

$$\nabla\cdot(-\nabla\phi+\omega\phi)=-\rho/\in_0 \qquad \text{The ECE Poisson equation}$$

$$\nabla^2\phi-\omega\cdot\nabla\phi-(\nabla\cdot\omega)\phi=-\rho/\in_0 \qquad \text{9.6 of [20]}$$

This equation, 9.6 of [20], has resonance solutions. From the ECE-Theory and [15], it is shown that the gravitational field curves spacetime. It is also shown that the electromagnetic field curves spacetime, but by spinning spacetime.

2.3.1.1 Magnetic Levitation (Mag-Lev)

[0155] The equivalence of gravity and electromagnetism has been established in references [6] and [7]. The process of magnetic levitation (mag-lev) is described in ([11]-[12]). This mag-lev process, where;

[0156] M_B=>strength of base magnet

[0157] M_L=>strength of levitation magnet

[0158] (usually attached to a vehicle, such as a mag-lev train)

is equivalent to the counter-gravitation process presented in this document. The force between the base (M_B) and the vehicle (M_L) is referred to as the heave-force h, in mag-lev applications. The heave-force neutralizes gravity locally. This is a manifestation of spacetime curvature, and one has the following;

$$h=h(M_B,M_L)$$

[0159] Let: $\mathscr{H}=\mathscr{H}(M_B, M_L)$ be a velocity along a geodesic

Before deriving an elementary set of equations-of-motion for $\mathscr{H}$, it is useful to summarize the invention. In a generalized mag-lev application, the base-magnet M_B and the lev-magnet M_L are both used to levitate matter in an anti-gravity region (between M_L and M_B) resulting from the interaction of the magnetic fields of M_L and M_B.

[0160] The heave-force h is now used to derive an expression for $\mathscr{H}(M_B, M_L)$.

2.3.1.1.1 Equations of Motion

[0161] The Ricci Tensor (in terms of M_L and M_B) can define the heave-force/induced-curvature of the mag-lev effect resulting from M_L and M_B. From document [10], (noting that a vector is a tensor of rank **1**), one has the expression

$$h=\mu_0 I^2 \beta/2\lambda z=F_h$$

[0162] where:

[0163] β=coil length

[0164] I=current

[0165] μ_0=a magnetic constant

$$F_h=\mu_0 I^2 f(D/\phi)$$

[0166] is the heave force description

[0167] where:

[0168] D=a magnet dimension (electric flux density)

[0169] ϕ=separation of M_B (base) and M_L (lev-vehicle)

$$F_g=qE+(qv\times B)$$

[0170] is the EM/gravity description for (Δq) at velocity V.

$$F_h \equiv F_g, \mu_0 I^2 f(D/\phi)=qE+(qv\times\mu H)$$

[0171] where:

[0172] H=B/μ

[0173] qE+(qv×μH) is the Lorentz Force law

Again from document [10], F is defined as follows;

$$F=M_L M_B/r^2$$

[0174] (where r is the distance between magnets M_L and M_B)

If F and $R_{\mu\nu}$ are both expressions of spacetime curvature, one has the following;

$$M_L M_B \int dt/r^2 = h_v = \mathscr{H}$$

With an expression for $\mathscr{H}$ in terms of M_L and M_B, it is possible to define a set of "equations-of-motion".

DEFINITIONS

[0175] $\mathscr{H}$ =the (M_L and M_B induced curvature) geodesic path velocity of a vehicle

[0176] $\mathscr{H}$ —position (along the induced curvature) geodesic path

[0177] $d\mathscr{H}/dt$—acceleration (along the induced curvature) geodesic path

The curvature induced by M_L and M_B is equivalent to the heave-force h (i.e. mag-lev effect) induced by M_L and M_B. This defines a simple set of equations-of-motion for geodesic-fall.

2.3.1.1.1.1 Equations-of-Motion Conclusions

[0178] Gravitation and Electromagnetism are respectively the symmetric and antisymetric parts of the Ricci Tensor, within a proportionality factor. Gravitation and electromagnetism are both expressions of spacetime curvature. Thus the mag-lev heave-force is also an expression of spacetime curvature, and h and $\mathscr{H}$ are arguably equivalent.

[0179] Obviously, a more rigorous derivation can lead to a fully comprehensive set of equations-of-motion. These equations-of-motion can be the basis for a propulsion system, based on the induced curvature of spacetime. It is expected that the above derivation and many of its attendant ramifications will be understood from the forgoing, and it will be apparent that various changes may be made in rigor and detail of the derivation, without departing from the spirit and scope of the derivation or sacrificing all of its advantages, the above derivation merely being an example thereof.

2.3.1.1.2.1 A Note on Counter-Rotation

[0180] We note once again that, for the Levitron, M_1 is attached to the top (s), M_2 is the base. Device operation shows the top must spin to levitate stably above the base. More correctly, M_1 is required to spin.

Let:

[0181] v_{M1}, v_{M2}→rotational velocities of the magnets

[0182] for counter-rotation ($v_{M1}+v_{M2}$)→v_r relative velocity.

If $v_{M2}=0$, then we have the Levitron case. For levitation, v_r must be positive. Thus, one argues the Levitron top must spin. However, it is M_1 that is required to spin.

[0183] It is useful to note that the explanations of the Faraday disk generator [24], are similar to those of this section. The explanations of the Faraday disk (homopolar) generator incorporate ECE-Theory. It has been fully explained by ECE-Theory.

2.3.1.1.2.2 The Spin/Rotation Requirement

[0184] For the Levitron, a spin component is needed to couple with spacetime torsion, to achieve spin-connection-resonance (SCR). This spin component must exceed some β to maintain SCR and stability. Stated more precisely, from the above discussion;

[0185] $v_r \geqq \beta$→stability of top above the base

[0186] $v_r < \beta$→instability of top, causing it to fall

If the Levitron's v_{M1} spin/rotation component is less than β, the top falls away along a geodesic path induced by the anti-gravity condition caused by the interaction of the Levitron's ring magnet (M_1), and magnetic base (M_2). This factor is exploited as a propulsion system concept in [23].

2.3.1.1.2.2.1 Quantitative Analysis Using ECE-Theory

[0187] Starting with the ECE Poisson equation:

$$\nabla\cdot(-\nabla\phi+\omega\phi)=-\rho/\in_0$$

$$\nabla^2\phi-\omega\cdot\nabla\phi-(\nabla\cdot\omega)\phi=-\rho/\in_0 \qquad \text{9.6 of [20]}$$

From section 4.3 of [25], we have the following;

$$(\nabla\mu_1(t)\cdot B_1(r)+\nabla\mu_2(t)\cdot B_2(r))=\phi_\lambda$$

From [6] we have the following resonance equation;

$$d^2\phi/dr^2+(1/r-\omega_{int})d\phi/dr-(1/r^2+\omega_{int}/r)\phi=-\rho/\in_0 \qquad \text{14.32 of [17]}$$

[0188] Where; ω_{int}→the interaction spin connection

From Coulombs Law $\nabla\cdot E=\rho/\in_0$, one also has $E=-\nabla\phi$. Using ϕ_λ one has the following;

$$\nabla^2\phi_\lambda=\mu/\in_0$$

[0189] (where ϕ_λ is the driving function)

The driving function ϕ_λ determines the degree of induced curvature $F(\mu_t, B_t)$. Let;

$$(\nabla\mu_1(t)\cdot B_1(r)+\nabla\mu_2(t)\cdot B_2(r))=\phi_\lambda \quad (1)$$

$$\nabla(\mu_1(t)\cdot B_1(r)+\nabla\mu_2(t)\cdot B_2(r))=$$
$$M_1(r)+M_2(r)=$$
$$\cdots$$

$$\frac{d\phi_\lambda}{dr}=\frac{dM_1}{dr}+\frac{dM_2}{dr} \quad (2)$$

$$\frac{d^2\phi_\lambda}{dr^2}=\frac{d^2M_1}{dr^2}+\frac{d^2M_2}{dr^2} \quad (3)$$

substituting in 14.32 of [17], one has the following;

$$-\rho/\in_0=(d^2M_1/dr^2+d^2M_2/dr^2)+(1/r-\omega_{int})(dM_1/dr+dM_2/dr)-(1/r^2-\omega_{int}/r)(M_1(r)+M_2(r)) \quad (4)$$

$$-\rho/\in_0=d^2M_1/dr^2+d^2M_2/dr^2+dM_1/rdr-\omega_{int}dM_1/dr+dM_2/rdr-\omega_{int}dM_2/dr-M_1/r^2-M_1\omega_{int}/r-M_2/r^2-\omega_{int}M_2/r \quad (5)$$

From section 4.1 of [25], we use the expression derived for H, the geodesic-fall path velocity of a vehicle;

$$M_1M_2/r^2\approx -KT_{\mu\nu}=H$$

We then have the following;

$$\left.\begin{aligned} M_1&\approx -r^2KT_{\mu\nu}/M_2\\ \frac{dM_1}{dr}&\approx -rKT_{\mu\nu}/2M_2\\ \frac{d^2M_1}{dr^2}&\approx -rKT_{\mu\nu}/2M_2\end{aligned}\right\}\text{ substituting into eq. (5)}$$

after some algebraic simplification, one has the following;

$$d^2M_2/dr^2+(1/r-\omega_{int})dM_2/dr+\omega_{int}\rightarrow T(r+2)/2M_2-(M_2+rM_2\omega_{int})/r^2=-\rho/\in_0$$

$$d^2M_2/dr^2+(1/r-\omega_{int})dM_2/dr-(1+r\omega_{int})M_2/r^2=-\rho/\in_0+\text{Constant} \quad (6)$$

[0190] Equation (6) is a resonance equation in M_2 An expression for a resonance equation in M_1, can also be derived in a similar manner. Considering the ECE Poisson equation;

$$\nabla^2\phi-\omega\cdot\nabla\phi-(\nabla\cdot\omega)\phi=-\rho/\in_0$$

Arguably, SCR can be achieved relative to M_1, M_2, or ϕ. The counter-rotation of M_1 and M_2 is needed to amplify ϕ via SCR. This provides the counter-gravitation effect, and is thus the reason why the magnet (M_1), must spin, if counter-gravitation is to be maintained. This is a direct consequence of ECE-Theory.

2.3.1.1.3 Generalized (Alternative Counter-Rotation) Case

[0191] Here we take the special Levitron case and generalize to the generic CFD. For the generic case, M_1 is attached to the top (s), M_2 is the base. A generalization of this concept is an object (e.g. a top) spinning between the M_1 and M_2 magnetic sources. If the object is magnetized (i.e. M_3), one has M_3 rotating relative to M_1, and M_3 rotating relative to M_2 simultaneously. Thus, counter-rotation of M_3 and M_1, and of M_3 and M_2 is realized. This results in levitation of the object. Analytically, from section 2.3.1.1.3.1 above, where;

[0192] v_{M1}, $v_{M2}\rightarrow$rotational velocities of the magnetic sources

[0193] $v_{M3}\rightarrow$rotational velocity of the object

If $v_{M1}=v_{M2}=0$, and $v_{M3}>0$, anti-gravity sub-regions are produced between (counter-rotating) M_3 and M_1, and between (counter-rotating) M_3 and M_2 causing the object to levitate. This is a basic initial configuration of the invention.

2.3.1.1.3.1 Control of Object Dynamics

[0194] Advanced application of the crossfield-device [23, 25] could require a means to control the dynamics of the levitated object, for example; if the levitated object was a vehicle of some type. The anti-gravity sub-regions would control the dynamics of the levitated object, in the same "conceptual" manner that aerodynamic lift is used to control the dynamics of an aircraft. As an example; the intensity of the sub-region between M_3 and M_2 could be used to control the degree of levitation.

2.4 Invention Structure & Configuration

[0195] The basic structure of the invention is two counter-rotating magnetic sources mounted on a stand, which separates the magnetic sources by a given space, such that a counter-gravitational region is induced in said space. Matter in this induced counter-gravitational region levitates, or in other words behaves as matter in a zero-gravity environment, such as outer-space. The matter in this invention is a generic homopolar type device, including a conducting flywheel, a shaft attached at the flywheel's center, and consisting of the same conducting material as the flywheel. In these applications (usually large type applications), the matter inside the induced counter-gravitational region can serve as the stand, for the magnetic sources. More precisely, the magnetic sources are attached to the levitated matter.

2.4.1 The Magnetic Sources

[0196] It is important to note that the invention's magnetic sources do not have to be permanent magnets. The magnetic sources can range from electromagnets to electromagnetic-arrays, to IFE (Inverse Faraday Effect) [21, 22] induced type magnetic sources.

2.4.2 Operational Considerations

[0197] Considering the structure of the invention, the expressions for the torque forces due to the M_1 and M_2 magnetic sources in tangent space β,

$$\mathcal{T}_1=\mu_1(t)\times B_1(r),\ \mathcal{T}_2=\mu_2(t)\times B_2(r)$$

Given base vectors e_{m1}, e_{m2} defining a tangent space to β

[0198] where; $\beta\rightarrow$"bubble", an arbitrary base manifold

$$e'_{m1}=\check{V}_{m1}{}^{m2}e_{m2}$$

coordinate system of M_1 rotates relative to coordinate system of M_2

$$e^{ik}q^{m1}=\check{V}_{m1}{}^{m2}q^{m2}$$

from ECE-Theory

$$A_{m1}{}^{m2}=A^0\check{V}_{m1}{}^{m2}$$

Interpreting the anti-gravity effect at β, as a field of force (characterized by the coordinate system of $\mathcal{T}_1$ rotating with respect to $\mathcal{T}_2$), and another field of force (characterized by the coordinate system of $\mathcal{T}_2$ rotating with respect to $\mathcal{T}_1$). These forces are additive if the magnetic sources M_1 and M_2

are counter-rotating. This is a cursory (but more fundamental) argument for counter-rotation of M_1 and M_2 magnetic sources.

2.4.3 Ramifications of Video Demonstration

[0199] By the process defined in [12, 17, 18, 24], an SCR condition was established by the counter-rotation between the spinning top M_3 and the stationary magnetic fields M_1 and M_2. The potential energy ϕ was amplified [eq.14.32, of [17]]. Anti-gravity regions were established above and below the spinning top. This caused the magnetized top to levitate, as shown in [24]. As the rotation (spin vector) of the top degrades below the equilibrium value, the top falls away along the geodesic path induced by the counter-rotating magnetic fields M_1, M_2, and M_3. This fall-away is the conceptual basis for the Geodesic-Fall/Curvature-Drive propulsion system concept.

[0200] It is important to note that the demonstration video [24] was conducted with simple, readily available commercial components. The demonstration was conducted on a desktop, in a non-laboratory environment. These factors further attest to the validity and strength of the concepts, and reproducibility of the demonstration.

2.5 Conclusions

[0201] Several concepts are presented in this application, which will appear alien to those not versed in, or unable to grasp ECE-Theory, which requires an understanding of the fundamentals of Einstein's Theory of Relativity, and Cartan Geometry. However, the discussions in this document should be comprehendible to any "competent" undergraduate physics student. Sections 1 and 2 of this application include introductions to basic scientific concepts involved with the invention. An elementary introduction to ECE-Theory is also provided. As an example, the Light Gauge Theory of section 1.2.2.1 is a generalized derivation of Special Relativity, wherein Einstein's assumption that the speed-of-light (c) is the maximum achievable velocity, is removed. The Light Gauge Theory should not be foolishly interpreted as a play on mathematics with no scientific basis.

2.5.1 Electromagnetism and Gravitation

[0202] Spacetime curves and spins. This has been shown in several scientific works, such as [7] and [15]. The spin of spacetime is referred to as torsion. Electromagnetism is the torsion of spacetime. Gravitation is the curvature of spacetime. Einstein neglected torsion in his Theory of Relativity. Thus, the Theory of Relativity is incomplete. Einstein spent his later years, unsuccessfully trying to expand Relativity into a unified field theory. ECE-Theory successfully accomplishes this. Torsion can be viewed as a form of curvature. Thus, in the generic sense, one can state that both electromagnetism and gravitation are manifestations of spacetime curvature. This leads to the obvious conclusion that the speed-of-light (c) is a function of spacetime curvature. This, however, would be alien to anyone intellectually constrained by the old Relativity Theory.

2.6 Prior Art

[0203] Previous endeavors in electromagnetic based propulsion were focused on mag-lev technology. High-speed trains are principal applications. The train/vehicle contains the magnet (referred to in this document as) M_L. The track/guideway generally contains the base magnet M_B. The heave-force is generated by mutual repulsion of M_L and M_B. This reduces friction and provides dynamic characteristics similar to air-cushioned hovercraft type vehicles. Propulsion of mag-lev trains is generally achieved by creating a traveling magnetic wave in the guideway/base. This traveling wave pulls M_L along in the horizontal plane, thus providing propulsion. The process presented in this document uses only an equivalent heave-force, for both propulsion and control.

[0204] The LEVITRON device is a toy top that can be made to spin while levitated above a magnetic base. Some West Coast toy companies market the toy. Physical principles governing the LEVITRON are similar to those exploited by the geodesic-fall process. The LEVITRON device is arguably a "miniaturized" example of a mag-lev like process. Aspects of the LEVITRON device behavior are used herein to illustrate the geodesic-fall process dynamics, on the laboratory scale.

3. BRIEF DESCRIPTION OF DRAWINGS

[0205] FIG. **1** Crossfield-Device device basic configuration

[0206] FIG. **2** A Generic homopolar/Crossfield-Device configuration

[0207] FIG. **2**A A crossfield enhanced homopolar motor-generator with generic flywheel-conductor assembly

[0208] FIG. **3** Homopolar device flywheel with magnetic dipole

[0209] FIG. **4** Advanced Homopolar-Crossfield-Device Configuration: (using dipole-flywheel)

[0210] FIG. **5** Advanced Homopolar-Crossfield-Device Configuration: (with on/off control component)

4. DETAILED DESCRIPTION OF INVENTION

[0211] The invention has several fundamental embodiments which are described in the following sections. Other embodiments are derived from these fundamental embodiments.

In FIG. **1**, a device configuration (suitable for laboratory-scale usage, or full size applications) is illustrated. The purposes of this device are production of electric energy and production of anti-gravity conditions. The device can be used to demonstrate SCR, to refine methods of attaining SCR, and to examine SCR related conditions. The device can be implemented on the laboratory-scale, or up-scaled for real applications. The device consists of two magnetic fields (M_1 and M_2), counter-rotating to produce anti-gravity region (M) between them. At point (P), the spin connection divergence is non-zero

(i.e. $\nabla\cdot\omega\neq 0$), and SCR is achieved, amplifying the background electric potential energy of spacetime. At SCR the effect of the electric field on gravitation is maximized in a direction opposite to the gravitational field. This creates an anti-gravity effect.

[0212] Sources for these boundary magnetic fields can be implemented as magnetic disks or as arrays of electromagnetic elements. Control mechanisms, are used to control each of the magnetic sources. If a magnetic source is implemented as a simple magnetic disk, its control mechanism can be a simple rotary motor.

[0213] In FIG. **2**, a homopolar motor is inserted at (P). The flywheel-conductor assembly rotates in a reduced gravitational field, and an amplified electric potential energy field, due to (SCR) at (P). Thus, the efficiency of rotation is enhanced for the motor aspect of the device. V_{out} exploits the

Faraday Disk generator aspect of the device. V_{out} can power an electric load plus the counter-rotating magnets (M_1 & M_2), as shown. FIG. **2**A is the flywheel-conductor rotating component. The flywheel also consists of conducting material, to enable the Faraday Disk aspect. The homopolar device plus the crossfield device is both a motor and a generator.

[0214] A homopolar generator (or Faraday Disk) type device operates in an externally provided magnetic field. Its rotation is started by an external mechanism. A crossfield device is use to provide these functions. Fundamentally, a Faraday Disk/homopolar device operates by creating a potential difference between the rim and the center of the conducting flywheel. As the flywheel begins to rotate, voltage becomes available to drive an electric load. The rotating shaft is also available for a mechanical load.

[0215] In FIG. **3** the dielectric slab of a crossfield-generator is replaced by a homopolar generator. The crossfield device (hereafter referred to as CFD) provides the external magnetic field for the homopolar portion of the device. When the flywheel rotates, voltage is available via the electric potential difference between the rim and the shaft of the conducting flywheel. A magnetic dipole is placed is placed in the flywheel. It equals the diameter of the flywheel in length. The purpose of the dipole is to facilitate control of the rotation of the conducting flywheel.

[0216] In FIG. **4** the conducting flywheel (of a homopolar generator device) contains a magnetic dipole. The purpose of the dipole is the control of the on/off state of the homopolar generator. Its on-state is defined as when the flywheel is rotating. The flywheel rotates in a reduced gravity environment provided by its CFD, in accordance with ECE-Theory. The CFD also provides an amplified background electric potential energy field due to SCR at point P. Thus, at a proper frequency, the output voltage from the flywheel could resonate with the amplified electric potential of spacetime, provided by the CFD. This should greatly increase the output electric energy from the homopolar component of the device.

[0217] Operationally, when either of the counter-rotating magnets M_1 or M_2 is sequentially activated, the dipole of the flywheel is attracted or repulsed, and rotation begins. As rotation begins, the N and S poles of the dipole each react opposite (i.e. repulsion, attraction) to the field of M_1 or M_2, causing rotation to continue. This function ceases when either M_1 or M_2 is deactivated.

[0218] In FIG. **5**, a simple on/off mechanism is attached to the crossfield-homopolar device invention. This on/off circuit controls the overall device on/off state. This control circuit was designed by the Galactican Group, and described in [23, 25].

[0219] It is expected that the present invention and many of its attendant advantages will be understood from the forgoing description and it will be apparent that various changes may be made in form, implementation, and arrangement of the components, systems, and subsystems thereof without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the forms hereinbefore described being merely preferred or exemplary embodiments thereof.

[0220] The foregoing description of a preferred laboratory-scale embodiment of the invention has been presented to illustrate the principles of the invention and not to limit the particular embodiment illustrated. It is intended that the scope of the invention be defined by all of the embodiments encompassed within the following claims and their equivalents.

What is claimed:

1. A method for providing the external magnetic field for a homopolar device, by operating said homopolar device between two counter-rotating magnetic fields, which produce an anti-gravity region between said counter-rotating magnetic fields, such that the spin connection ω divergence is non-zero (i.e. $\nabla\cdot\omega\neq 0$), and spin-connection-resonance (SCR) is achieved, thereby amplifying the background electric potential energy field of spacetime (in the anti-gravity region between said counter-rotating magnetic fields) wherein said homopolar device reacts with said amplified electric potential energy field, thus increasing the operational and rotational efficiency of said homopolar device;

2. The method of claim **1**, wherein said homopolar device (consisting of a conducting flywheel with a magnetic dipole component, (and a conducting shaft attached at its center)) operates by said flywheel rotating inside said amplified background potential energy field, (wherein said rotation of said conducting flywheel is controlled via interaction between said dipole and said counter-rotating magnetic fields), such that said rotation causes a shaft (attached to the center of said conducting flywheel-dipole) to rotate with said conducting flywheel-dipole, wherein said connected shaft can drive a mechanical load (in the manner of a rotary motor);

3. The method of claim **2**, wherein said flywheel also consists of conducting material, wherein electric leads from said rotating shaft, and the rim of said rotating flywheel embody a homopolar generator type device (similar to a Faraday Disk generator), wherein the voltage from the homopolar generator type device can be used to power an electric load, whereby said crossfield-homopolar device operates as both a motor and a generator;

4. A method for controlling a crossfield-device CFD, wherein the counter-rotating magnets of said CDF are turned on or off by said control method, wherein said control method can determine the on/off state of the crossfield-homopolar device it is attached to, whereby this capability enhances the control granularity of the crossfield-homopolar device;

5. A system for providing the external magnetic field for a homopolar device, by operating said homopolar device between two counter-rotating magnetic fields, which produce an anti-gravity region between said counter-rotating magnetic fields, such that the spin connection ω divergence is non-zero (i.e. $\nabla\cdot\omega\neq 0$), and spin-connection-resonance (SCR) is achieved, thereby amplifying the background electric potential energy field of spacetime (in the anti-gravity region between said counter-rotating magnetic fields) wherein said homopolar device reacts with said amplified electric potential energy field, thus increasing the operational and rotational efficiency of said homopolar device;

6. The system of claim **5**, wherein said homopolar device (consisting of a conducting flywheel with a magnetic dipole component, (and a conducting shaft attached at its center)) operates by said flywheel rotating inside said amplified background potential energy field, (wherein said rotation of said conducting flywheel is controlled via interaction between said dipole and said counter-rotating magnetic fields), such that said rotation causes a shaft (attached to the center of said conducting flywheel-dipole) to rotate with said conducting flywheel-dipole, wherein said connected shaft can drive a mechanical load (in the manner of a rotary motor);

7. The system of claim **6**, wherein said flywheel also consists of conducting material, wherein electric leads from said rotating shaft, and the rim of said rotating flywheel embody a

homopolar generator type device (similar to a Faraday Disk generator), wherein the voltage from the homopolar generator type device can be used to power an electric load, whereby said crossfield-homopolar device operates as both a motor and a generator;

8. A system for controlling a crossfield-device CFD, wherein the counter-rotating magnets of said CDF are turned on or off by said control method, wherein said control method can determine the on/off state of the crossfield-homopolar device it is attached to, whereby this capability enhances the control granularity of the crossfield-homopolar device;

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