IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Utility Patent Application (Provisional)

TITLE: Relativistic Electromagnetic Propulsion

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FIELD OF THE INVENTION

The present invention relates to propulsion, generating driving force in order to move objects, vehicles, ships, etc. . in any environment.

BACKGROUND

All propulsion systems in use today are propellant dependent and work in accordance with Newton's third law of motion. To move any object, vehicle. ship etc. a reaction mass is needed (propellant) together with energy (fuel) in order to generate force needed for propulsion. In some cases fuel contains both, energy and propellant.

Among proposed alternatives to classical Newtonian bound propulsion systems are solar sails that use photons which are capable of generating force (radiation pressure) needed for propulsion, meaning no mass emission required in electromagnetic domain.

Next level of proposed theoretical exotic propulsion systems is based on various quantum effects within quantum mechanics theories. Unfortunately none of them are tested outside theoretical realm because technology needed to build them does not exist yet.

There is a common problem with all propulsion systems in use today ; they depend on emission of matter making efficient use in space travel impossible.

BRIEF SUMMARY OF THE INVENTION

Present invention, named Relativistic Electromagnetic Propulsion (REM Propulsion), is about generating force needed for propulsion purely in electromagnetic domain. Only electromagnetic field and electric current are used without the need for reaction mass. In exemplary embodiment two electromagnets, one to generate electromagnetic field other to generate electromagnetic force are used.

Present invention exploits the fact that all Newton's laws break down at relativistic conditions and, for our invention, it is crucial to break Newton's third law in the way it has never been done before. In order to do so we shall take advantage of the fact that unlike mechanical interaction, as described in Newton's third law, electromagnetic interaction between force and opposite force is not instantaneous giving us enough time to interfere with the balance between them. That particular property combined with ability to switch electromagnets on and off at will, as described in exemplary embodiment, gives us powerful tool to completely and independently control electromagnetic force and reaction force in order to use one for propulsion and switch off another.

It is obvious something like that is not possible in Newtonian setup where any force is instantly paired with reaction force giving us no time to do anything about it. Luckily Newton was right only if mechanical interaction is concerned and wrong if non-contact non-instantaneous force action is concerned.

Invention uses novel process as follows; streams of independent but synchronized current pulses passing through two electromagnets in the way first electromagnet is always carrying current when magnetic field generated by second electromagnet reaches it therefore generating Laplace force - propulsion force, while, second electromagnet is never carrying current (open circuit) when magnetic field generated by first electromagnet reaches it, meaning, no Laplace reaction force on second electromagnet.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 - Figure 1 shows basic hardware described in exemplary embodiment, two coils-electromagnets **100**, **102** on common tube **104** with distance between them *d* and both connected to programmable-switchable **108**, **112** current sources **106**, **110**.

FIG. 2 - Figure 2 shows timing diagram of two cycles of current impulses applied to each electromagnet **100 (EM 1)** and **102 (EM 2)** as well as electromagnetic forces acting on them, **F1** on **100** and reaction force **F2** on **102,** all synchronized to a common clock *$T_d = d/c$* **.**

DETAILED DESCRIPTION

Science behind this invention is based on definition of electromagnetic force field as a **non-contact** force acting on a charged particle placed anywhere in a field. Electromagnetic force field can also be viewed as quantum field with photons as force carriers which is important for this invention because photons travel at speed of light meaning electromagnetic interaction is not instantaneous and it is underlying property that makes this invention possible.

Theoretical idea of how this invention works is to initiate electromagnetic force interaction between minimum of two distinctly separated controllable-switchable electromagnetic field sources attached to a common frame and interfere with their electromagnetic force interaction by switching individual electromagnetic fields on and off in the way that electromagnetic force on one source is preserved while electromagnetic reaction force on other, disabled.

Exemplary embodiment of the invention (see FIG. 1) comprises two distinctly separated electromagnets **100** and **102** mechanically coupled to a common frame **104** and axially aligned in order to enable maximum electromagnetic force interaction between them. Each electromagnet is connected to a its current source **106**, **110** through programmable electrical switches **108**, **112**. Both switches are controlled independently by common programmable control unit (not shown).
Distance d between the two coils tells us how much time electromagnetic wave needs to travel between the two electromagnets $T_d=d/c$ (c is speed of light). That time enables us to use electrical switches to control current pulses through two electromagnets in the way first electromagnet **100** is always carrying current when magnetic field generated by second electromagnet **102** reaches it therefore generating Laplace force (propulsion), while, second electromagnet **102** is never carrying current (open circuit) when magnetic field generated by first electromagnet **100** reaches it, meaning, no reaction Laplace force on second electromagnet **102**.
Process can be reversed if we want propulsion force on second electromagnet **102.**

Transient phenomena which occur at moments when switches turn on and off are related to physical dimensions, geometry and inductance of the coils which are part of used electromagnets and electrical properties of current sources and switches . Only after transient time T_t stable magnetic field is formed and effect must be taken into consideration to prevent overlapping with the time management of the current pulses. Therefore, it is important to keep $T_t < T_d$. It is advisable to keep T_t as short as possible by keeping inductance low using parallel connection of multiple short coils. For the sake of clarity of this presentation we shall consider $T_t < < T_d$ and ignore T_t entirely.

Detailed timing diagram of electric pulses through both electromagnets synchronized to master clock is shown in FIG. 2 including forces acting on electromagnets. Before detailed description of impulse management I would like to point out that same time interval T_d is needed for both; for electromagnetic field to travel between the two electromagnets when current is switched on as well as to extinguish after the current is switched off.

Timing process looks like this;

Phase 1: (from time *0* to T_d)
Before start both switches **108**, **112** were off and no residual electromagnetic field. At start (t = 0) current switches on **112** through second electromagnet **102** while first electromagnet **100** stays off, **108** open circuit. After period of time T_d magnetic field generated by current in second electromagnet **102** reaches first electromagnet **100**.

Phase 2: (from time T_d to *2T$_d$*)
At time T_d , the moment when magnetic field reaches first electromagnet **100**, current through first electromagnet also **switches on 108 generating Laplace propulsion force F1 on first electromagnet 100** because magnetic field and electric current coexist. This state (both electromagnets active) lasts until magnetic field from active first electromagnet reaches second electromagnet (time point *2T$_d$*).

Phase 3: (from time *2T$_d$* to *3T$_d$*)
At time point *2T$_d$* , because magnetic field from active first electromagnet reaches second electromagnet, in order to prevent magnetic reaction force **F2** on second electromagnet **102**, electrical switch **112** on second electromagnet **turns off = open circuit, meaning no Laplace reaction force on second electromagnet 102**. After that it will take another time interval T_d (from *2T$_d$* to *3T$_d$*) for magnetic field from second electromagnet to extinguish at the location of the first electromagnet (still active) disabling Laplace force **F1** on the first electromagnet in the process.

Phase 4: (from time= *3T$_d$* to *4T$_d$*)
Because, after time point *3T$_d$* , there is no more magnetic field generated by second electromagnet at the location of the first electromagnet and consequently no more magnetic force acting on the first electromagnet, current through first electromagnet is no longer needed meaning, first switch **108** switches off at *3T$_d$* . After that magnetic field generated by first electromagnet needs another T_d interval, until time point *4T$_d$* , to extinguish at the place of second electromagnet making all currents and magnetic fields disabled. It is required state for another cycle Phase 1 to Phase 4 to start and repeat as long as propulsion force F1 on first electromagnet is wanted.

In second embodiment, second electromagnet is passive meaning, coil is simply short circuited or closed with resistor. Any change in magnetic field generated by first electromagnet reaching short circuited coil will automatically generate current in it and consequently Laplace force - propulsion force. First electromagnet needs to be in switched off phase when induced magnetic impulse from short circuited coil returns back to it, preventing reaction force on first electromagnet.

In third embodiment, instead of second electromagnet ferromagnetic core can be used as it will be polarized in magnetic field generated by first electromagnet and respond with electromagnetic force acting on ferromagnetic core serving as propulsion force. It is imperative to switch off first electromagnet before magnetic field from ferromagnetic core reaches it disabling reactive magnetic force on electromagnet.

Furthermore, this invention is not limited to any specific embodiment which can use various types and shapes of electromagnets or electromagnetic field sources in general active or passive, from simple current carrying parallel wires or axial aligned coils (with or without magnetic core) to potentially more exotic current carriers or electromagnetic field generators, additionally, more than two electromagnetic field sources can be used in order to optimize and enhance propulsion force generation, also, various embodiments will require different timing procedures, however, the basic principle how this invention works always remains the same;

To exploit non-instantaneous action electromagnetic force property by separating electromagnetic action force from reaction force in time by mechanically separating minimum of two electromagnets by distance d causing $T_d=d/c$ and further adding additional electronic time delay (if applicable) T_e to current pulses of only one electromagnet of the two, causing destructive interference to reaction force (disabling it) at the same time leaving action force intact acting as propulsion force. For the maximum effect it is required that mechanical time delay and electronic time delay are the same $T_d = T_e$ exactly as in exemplary embodiment.

In different embodiments electromagnets can be active (having its own power source) or passive (not having its own power source) as described in second and third embodiment.

In any scenario of invention's embodiment we are required to do the following:
- use switchable electromagnetic sources (on-off)
- separate electromagnetic sources and measure distance d
- cause interference by switching individual sources on-off at similar frequency to
    $f=1/4T_d$ ($T_d=d/c$).
- if more than one active electromagnetic sources used, for example two, add time
  delay $T_e = T_d$ on the second source.

What is claimed is:

1. Relativistic Electromagnetic Propulsion (REM Propulsion) system comprising following hardware;
    a) at least two electromagnetic field sources fixed to a common frame
    b) electromagnetic field sources placing and orientation optimized for maximum electromagnetic force interaction between them
    c) spacing between electromagnetic field sources larger than the effective electromagnetic size signature of the individual electromagnetic field sources fulfilling timing requirement $T_d > T_t$
    d) power supply unit with programmable - switchable current sources powering electromagnetic field sources
2. REM Propulsion of claim 1 wherein electromagnetic field source is electromagnet.
3. REM Propulsion of claim 1 wherein electromagnetic field source is closed circuited coil - electromagnet.
4. REM Propulsion of claim 1 wherein electromagnetic field source is electric conductor of any kind and shape.
5. REM Propulsion of claim 1 wherein electromagnetic field source is core made of ferromagnetic material.
6. REM Propulsion of claim 1 wherein electromagnetic field source is well, electromagnetic field source of any kind technology can provide.
7. Relativistic Electromagnetic Propulsion (REM Propulsion) system comprising software for programmable current sources powering electromagnetic field sources (electromagnets) to ensure that current waveforms are as shown in FIG. 2 for exemplary embodiment, but not limited to it.
8. REM Propulsion of claim 7 wherein **software contains time management** as shown in FIG. 2 ; minimum of two independent but synchronized switchable electromagnets are managed in the way that first electromagnet is always carrying current impulse when magnetic field generated by second electromagnet reaches it therefore generating propulsion (action) force, while, second electromagnet is never carrying current (open circuit) when magnetic field generated by first electromagnet reaches it, meaning, no reaction force on second electromagnet.
9. REM Propulsion of claim 7 wherein other embodiments require different **time managements** but all **serving same purpose**; to keep electromagnetic action force and disable electromagnetic reaction force with the help of physical and if applicable electronic time delay between them.
10. REM Propulsion of claim 7 wherein minimum of one electromagnet and one passive (short-circuited coil or ferromagnetic core) electromagnetic field source are used, **managed in the way** that current impulse in electromagnet is on when initiating magnetic force in passive source and always switched off before induced magnetic field from passive source returns back to electromagnet.

ABSTRACT

The present invention, named Relativistic Electromagnetic Propulsion (REM Propulsion), is about generating force needed for propulsion purely in electromagnetic domain, without use of classic propellant - reaction mass. Only electromagnetic field and electric current are used to generate propulsion force (Laplace force).
It is well known that Newton's laws of motion and gravitation break down at relativistic conditions but novelty of this invention is to use proprietary high speed process to break down Newton's third law of motion in order to separate electromagnetic force from electromagnetic reaction force and use only one for propulsion while disabling another. Separation is possible thanks to the fact that electromagnetic interaction, unlike mechanical interaction described in Newton's laws, is not instantaneous giving us enough time to switch on and off electromagnets as described in exemplary embodiment of the invention in order to keep magnetic action force active while disabling magnetic reaction force.
Two switchable electromagnets are used. One to generate electromagnetic field other to generate electromagnetic Laplace force, acting as a propulsion force.
Because emission of matter is not needed it is ideal propulsion for use in free-outer space for space travel. Electric current is the only power source needed.
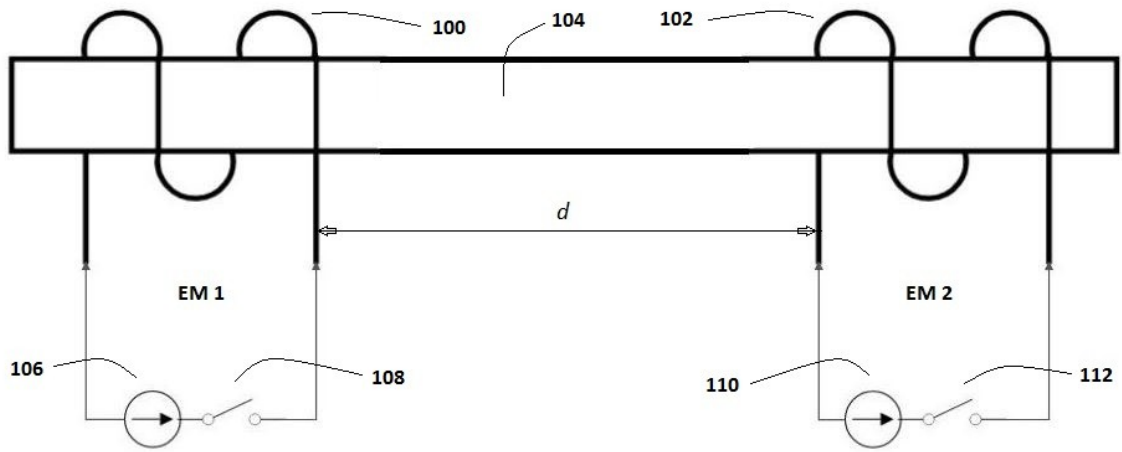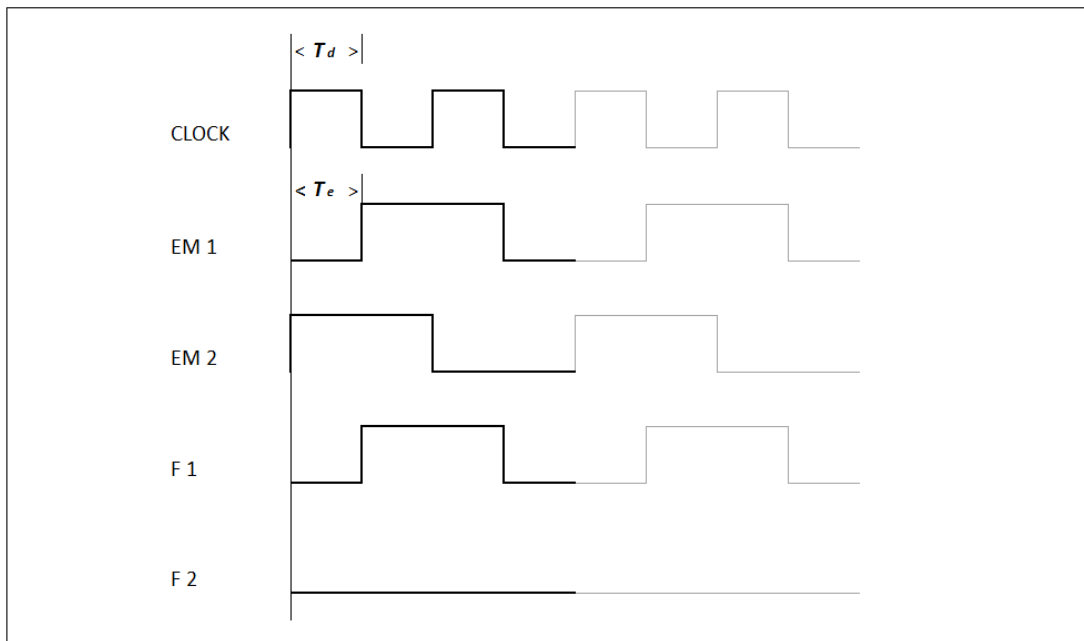
FIG. 1

FIG. 2