A Novel Technology of Electric Propulsion

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Abstract

We proposed a new technology that generates propulsion force via electromagnetic interaction between a toroidal solenoid and a parallel plate capacitor. It is shown that the charge on the capacitor experience none-zero Coulomb force in the electric field induced by the alternating current in the solenoid, while the capacitor exert zero force to the solenoid. This technology can be used as electric propulsion in aerospace engineering.

Key words: electric propulsion, toroidal solenoid, parallel plate capacitor, Coulomb force

Introduction

In 1901, Henri Poincaré pointed out that the Newton's third law is violated if the displacement current does exist and it does not experience Lorentz force [1]. This conjecture implies that, according to Maxwell's equations, a net propulsion force can be generated from electromagnetic interaction. We have presented some designing of electric propulsion based on the principle of null Lorentz force on the displacement current [2-4]. In this work, we designed a new kind of electric propulsion utilizing Coulomb force instead of Lorentz force in our previous studies. It is amazing to note that such a device also violate the law of energy conservation [5-7].

Methods

The device is composed of a toroidal solenoid and an inner connected parallel plate capacitor. The transverse cross section of this device is shown in figure 1. The capacitor is placed in the middle of the toroid. One of the plates is placed in the central plane A of the toroid and the other plate is placed in plane B above the central plane. The solenoid and the capacitor compose a LC circuit when they are connected. There is oscillating current through the solenoid and the capacitor.

The capacitor has equal but opposite charge distributed on the plates. The Coulomb field of the charge on the capacitor has no effect on the solenoid because the solenoid has no

charge on it. Neglecting the fringe field, the inner connected capacitor produces no magnetic field outside the region between the plates so that the capacitor exerts no Lorentz force on the solenoid. The magnetic field produced by the current in the solenoid is enclosed within the solenoid, while it induces electric field oscillating around the solenoid. Since the electric field has different strength at the plane A and B, the Coulomb force on the plates have different magnitude and opposite direction. The net Coulomb force is the propulsion force.
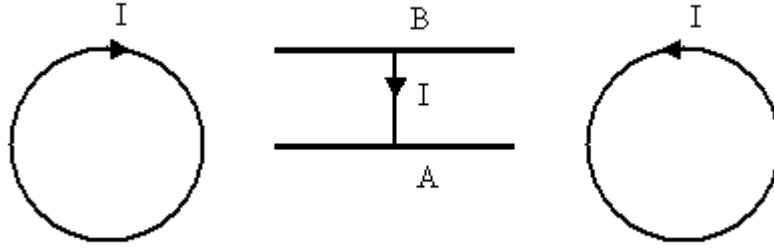

Fig. 1: The transverse cross section of toroidal solenoid and parallel plate capacitor. The oscillating current through the solenoid and the capacitor is I.

The propulsion force is proportional to the charge on plates and the induced electric field around the solenoid:

$$F = \eta C U^2 / 2N$$

Where C and U are the capacity and voltage of the capacitor respectively, N is the turn number of the solenoid, and η is the configuration coefficient depending on the geometry of the device.

Discussion

Verification of the principle can be performed on a balance. A remote oscillating source is used to pump wirelessly the resonant current in this device, which is a typical LC resonant circuit. The propulsion force can be measured directly from the balance.

Conclusion

A designing of electric propulsion is proposed using a toroidal solenoid and an inner connected parallel plate capacitor. The net Coulomb force between the solenoid and the capacitor supplies the propulsion force. This device does not need chemical fuel. It can be used in satellites, where the electric power is supplied by the solar panel.

Acknowledgements

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