Generate Electricity Without fuel or any raw material (Another Approach)

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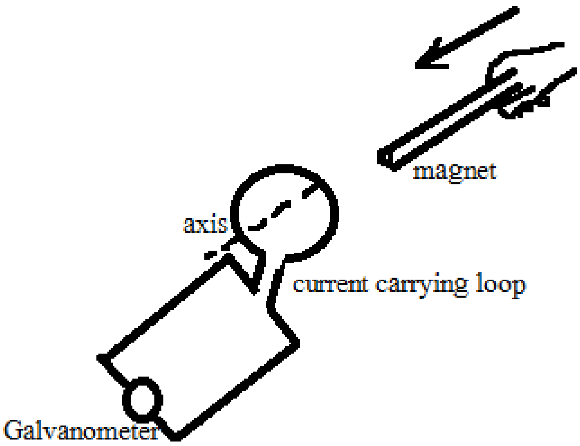
Abstract— **Electricity generation without any fuel or raw material. A magnetic material or a magnet is placed in the ceiling of a room and floor is nothing but earth. Now if a magnet is placed in the air it will wither go to the ceiling or it will fall to earth whichever is greater force : magnetic pull or gravitation of earth accordingly. Now if we set the distance between magnetic material of the ceiling and magnet in such a manner that the magnetic force between ceiling and gravitation cancels out. Then the magnet will float in the air. This is how we can make a room gravitation free. Now a magnet is attached to ground and it is named magnet 1. Magnet 2 is free to roam around a horizontal plane as there is no gravity. If the distance between the two magnets is r and mass of the magnet 2 is m then if we give a velocity of v so that magnetic force between the two magnets is mv^2/r then the magnet 2 will rotate around magnet 1 in circular motion. Now if we put conducting current carrying wires around the circular path then the magnet 2 will induce electric current in the loop as per faraday's law of induction. Hence electricity is generated.**

Index Terms—**Electricity, Magnet, Gravity, Induction.**

I. Electricity Generation Methods



A bar magnet is placed along the axis of a conducting loop containing a galvanometer. There is no current in the loop. If we move the magnet towards the loop there is a deflection in the galvanoleter showing that there is an electric current in the loop. If the magnet is moved away from the loop again there is a current but in opposite direction. The current exists as long as the magnet is moving.

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Faraday studied the behavior in detail by persorming a number if experiments and discovered the following law of nature :

Faraday's Law : Whenever the flux of magnetic field through the area bounded by a closed conducting loop changes, an emf is produced in a loop. The emf is given by E = -dΦ/dt where Φ = ∫B.dS is the flux of the magnetic field through the area.

Direction of Induced Current (Lenz's Law) : The direction of the induced current is such that it opposes the change that has induced it.

The Origin of Induced EMF : The flux ∫B.dS can be changed by

(a) *Keeping the magnetic field constant as time passes and moving whole or part of the loop.*

(b) *Keeping the loop at rest and changing the magnetic field.*

(c) *Combination of (a) and (b), that is, by moving the loop(partly or wholely) as well as by changing the field.*

We will adopt method (b) here which is called INDUCED ELECTRIC FIELD.

Induced Electric Field : Consider a conducting loop placed at rest in a magnetic field B. Suppose, the field is constant till t = 0 and then changes with time. An induced current starts in the loop at t=0.

The free electrons were at rest till t=0 (we are not interested in the random motion of the electrons). The magnetic field cannot exert force on electrons at rest, Thus, the magnetic force cannot start the induced current. The electrons may be forced to move only by an electric field and hence we conclude that an electric field appears at t=0. This electric field produced by the charging magnetic field is nonelectrostatic and nonconservative in nature. We cannot define a potential corresponding to this field. We call it INDUCED ELECTRIC FIELD. The lines of induced electric field are closed curves. There are no starting and terminating points of the field lines.

If E be the induced electric field, the force on a charge q placed in the field is qE. The work done per unit charge as the charge moves through dl is E.dl. The emf developed in the loop is, therefore,

$$E = \int E.dl.$$

Using Faraday's law of induction.

$$E = -d\Phi/dt$$

Or, $$\int E.dl = -d\Phi/dt.$$

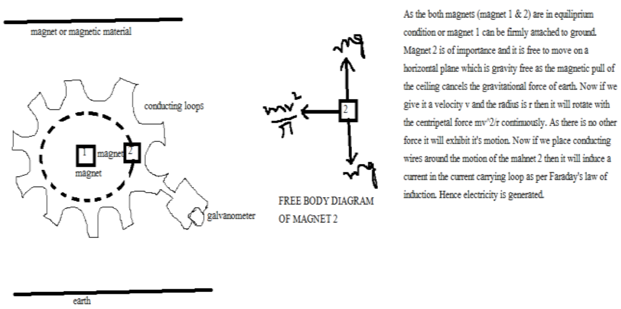
The presence of a conducting loop is not necessary to have an induced electric field. As long as B keeps changing, the induced electric field is present. If a loop is there, the free electrons start drifting and consequently an induced current results.

II. System Description

The system will consist of two magnets, ceiling of a room with magnetic material or magnet and conducting wires. In picture the free body diagram of magnet 2 also shown. If m is mass of the magnet 2 and g is gravitational constant then mg is the pull by earth and it is balanced by upward pull of ceiling. If r is the distance between magnet 1 & 2 and v is the velocity of the magnet 2 and if the magnetic pull between the magnets is such that it is mv^2/r then the magnet 2 will rotate continuously in a circular path around magnet 1.

The Galvanometer shown will read the current when the magnet 2 starts rotating. The current carrying loops are made of copper wire.

Please see the image below for system description :



GENERATE ELECTRICITY WITHOUT FUEL OR ANY OTHER RAW MATERIAL (BETTER APPROACH)

III. Property of Electricity

It is well known that one of the subatomic particles of an atom is the electron. Atoms can and usually do have a number of electrons circling its nucleus. The electrons carry a negative electrostatic charge and under certain conditions can move from atom to atom. The direction of movement between atoms is random unless a force causes the electrons to move in one direction. This directional movement of electrons due to some imbalance of force is what is known as electricity.

IV. Merits

1. It is without any external power.
2. It is free of cost.
3. It is based on fundamental law of generating electricity.
4. Mechanism is easy to understand.

V. Demerits

1. Eddy current loss will be there.

VI. Eddy Current

Consider a solid plate of metal which enters a region having a magnetic field. Consider a loop drawn on the plate, a par of which is in the field. As the plate moves, the magnetic flux through the area bounded by the loop changes and hence a current is induced, There may be a number of such loops on the plate and hence currents are induced on the surface along a variety of paths. Such currents are called EDDY CURRENTS. The basic idea is that we do not have a definite conducting loop to guide the induced current. The system itself looks for the loops on the surface along which eddy currents are induced. Because of the eddy currents in the metal plate, thermal energy is produced in it. This energy comes at the cost of the kinetic energy of the plae and the plate slows down. This is known as electromagnetic damping.

VII. Self-Induction

When a current is established in a closed conducting loop, it produces a magnetic field. This magnetic field has its flux through the area bounded by the loop. If the current changes with time, the flux through the loop changes and hence an emf is induced in the loop. This process is called SELF-INDUCTION. The name is so chosen because the emf is induced in the loop by changing the curent in the same loop.

The magnetic field at any point due to a current is proportional to the current. The magnetic flux through the area bounded by a current-carrying loop is, therefore proportional to the current. We can write

$$\Phi = Li$$

Where L is a constant depending on the geometrical construction of the loop. This constant is called SELF-INDUCTANCE of the loop. The induced emf E, when the current in the coil changes, is given by

$$E = -d\Phi/dt.$$

Or, $$E = -Ldi/dt. \text{ (from the above equaion)}$$

The SI unit of self-inductance L is webwe/ampere or volt-second/ampere from the above equations. It is given a special name henry and is abbreviated as H.

If we have a coil or a solenoid of N turns, the fluxthrough each turn is $\int B.dS$. If this flux changes, an emf is induced in each turn. The net emf induced between the ends of the coil is the sum of all these. Thus,

$$E = -Nd/dt\int B.dS.$$

VIII. Losses

1. Eddy current loss.

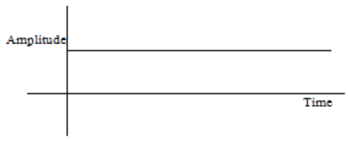
IX. How to Reduce Losses

1. To reduce electromagnetic damping one can cut slots in the plate. This reduces the possible paths of the eddy current considerably.

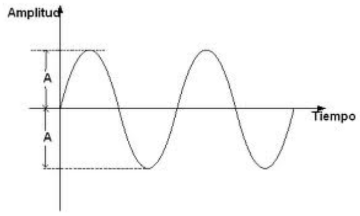
X. Types of Current

1) Alternating Current.
2) Direct Current.

Alternating Current : When a resistor is connected across the terminals of a batter, a current is established in the circuit. The current has a unique direction. It goes from the positive terminal to the negative terminal via the external resistor. The magnitude of the current also remains almost constant. This is called Direct current. If the direction of the current in a resistor or any other element changes alternatively, the current is called an alternating current.\(AC).



DIRECT CURRENT



ALTERNATING CURRENT

XI. MUTUAL INDUCTANCE

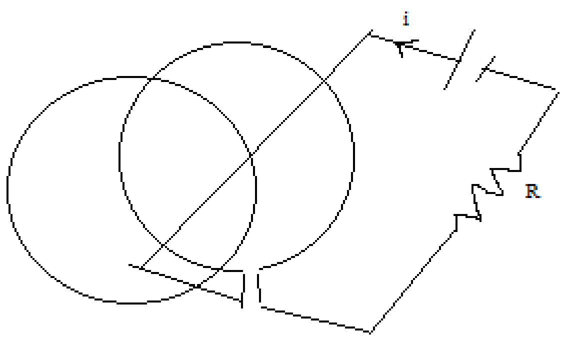
Suppose two closed circuits are placed close to each other and a current i is passed in one. It produces a magnetic field and this field has a flux Φ through the area bounded by the other circuit. As the magnetic field at a point is proportional to the current producing it, we can write,

$$\Phi = Mi$$

where M is a constant depending on the geometrical shapes of the two circuits and their placing. This constant is called mutual inductance of the given pair of circuits. If the same flux is calculated through the area bounded by the first circuit, the same proportionality constant M appears. If there are more than one turns in a circuit, one has to add the flux through each turn before applying equation $\Phi = Mi$.

If the current i in one circuit changes with time, the flux through the area bounded by the second circuit. This phenomenon is called mutual inductance. From the above equation the induced emf is

$$E = -d\Phi/dt$$
$$= -Mdi/dt$$



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