TO GET ELECTRICITY FROM THE PLAY TOOLS IN PARKS

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ABSTRACT

Many children are busy playing in the parks and game fields every day, and a lot of the movement energy of the children are wasted, while this energy can be used appropriately. The purpose of this project is to use the rules of electromagnetic induction, by placing the magnet and the coil together and changing the ap between them which causes changing the magnetic flux so the induction driving force reates a flow of electricity that turning it into a luminous energy and lighting the park lights will prevent waste of energy.

1 Introduction

The pollution crisis and the excessive use of fossil fuels as energy sources have brought up many problems, such as a variety of diseases, rising global temperature, melting of polar ice and so on.

Fossil fuels are the driving force behind technological progress. But the evacuation of fossil fuels and the disastrous effects of excessive consumption have forced humanity to rethink the use of fossil fuels as a source of energy. Fossil fuels are capable of supplying the energy of the whole world for several hundred years. The modern world owes most of its technological progress to these fuels. But unreasonable consumption of fossil fuels has caused many problems around the world.

Earth is the planet that has been the most important source of energy and fossil fuels for its inhabitants at the heart of the planet, but these resources are not infinite and end up, and at the same time they can be used only once, and for this reason, human beings have to think differently to supply their source of energy. The Mother Nature has the response to this human need.

Failure to produce air pollutants in the use of renewable energies compared to fossil fuels is a very important advantage to bring a variety of new energies.

That led to the idea for this project take shape in our minds, so that in addition to clean electricity generation and help to resolve environmental crisis, the energy loss of children is prevented.

2 Research literature

Michael Faraday, stated that the main factor in the creation of an electric flow is changes in flux, $\Delta\varphi$ (Eq.1).

$$\phi = ABCos\theta \qquad (1)$$

According to the electro-magnetic induction and Faraday's law , by the flux changes we can produce the induced current in a circuit .

Faraday summarized the results of his experiments as follows:

(a) An e.m.f is induced in a coil if the magnetic flux through the coil changes

(b) The magnitude of the induced e.m.f depends on

(I)the rate of change of flux

(ii) the number of turns on the coil, and

(iii) the cross- sectional area of the coil.

Points (ii) and (iii) simply refer to the amount of change of flux. The faster the flux is changed the greater is the e.m.f. produced.

The direction of the induced e.m.f. is explained by Lenz's law :

The direction of induced e.m.f. is such that it tends to oppose the change that produced it [1].

We have found all by the following experiment (Fig.1).

1. By inserting a magnet, the galvanometer hand was distorted.
2. By removing the magnet, the galvanometer was diverted in the opposite direction.
3. The direction of movement of the galvanometer in two poles N is similar to the exit of the polarity S and vice versa.
4. The faster you move the magnet, the more divergent the hand was.
5. When the magnet was not moving in the coil, the galvanometer did not deviate.
6. The more the number of wires in the coil, the more divergent handles are diverted .

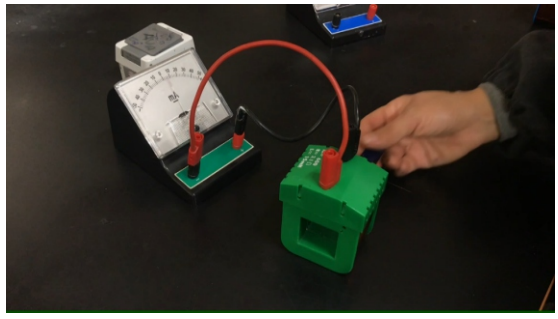

Fig. 1: Electricity production with coil, galvanometer and magnet

Results of the test of the difference in the electric current in terms of direction of movement and the direction of the magnet pole are shown in Table (1).

Table 1: Testing the difference in the amount of electric current produced in direction of movement and direction of the magnet pole

Flow (μA)	Magnet pole direction	Direction of magne movement	Number of turns of the coil
-10	N	in	300
10	N	out	300
12	S	in	300
-12	S	out	300

The results of the test of the difference in the electric current in terms of the change in the speed of the magnet entry and exit are shown in Table (2).

Table 2 : Testing the difference in the amount of electrical current produced in terms of the change in the speed of magnet entry and exit

number of turns in a Coil	Magnet pole flow	Direction to move	Speed	Flow (μA)
300	N	Exit	slow	10
300	N	Inter	fast	-15
300	S	exit	slow	-10
300	S	inter	fast	15

3 Research method and experiments

3-1 The Selection of Coil Materials

According to our research, wires that are good conductors and yet easy to find are copper wires.

The conductivity of gold and silver is greater than copper, but not used because of the very high cost for the consumer. The results of the wire test are shown in Table (3).

Table 3: The choice of coil type

Electric Resistance (Ohm-Meter)	Metals
1.59×10^{-8}	silver
1.68×10^{-8}	copper
2.82×10^{-8}	aluminum
10×10^{-8}	Iron

3-2 The Number of turns on the Coil

According to the experiments, the diagram of increasing the amount of electric current in terms of increasing the number of turns on the coil is a sinusoidal diagram and after 1000 turns, due to the high energy loss in form of heat, we will face reduction in the amount of generated electric current (table 4).

Table 4: The number of turns on the coil

Number of the coils	Magnet pole direction	Direction to move	Wire diameter (mm)	Electrical current (μA)
300	N	enter	0.3	4
500	N	enter	0.3	10
1000	N	enter	0.3	18
1200	N	enter	0.3	16

3-3 Magnetic Power Test

Test hypotheses of the determination of the magnet's power is as follows:

1. According to research, the strongest magnets in the market are neodymium magnets and are available at this time, which is why this type of magnet was used.

2. Because of the circular shape of the coil, pill shaped magnet are used that could easily be inserted into and out of the coil.

3. Due to the presence of two coils on two sides of the magnet, two magnets were used.

4. Because of the limitation in the size of the coil and force, the size of the magnet and the coil of magnets 1 cm (diameter) at 2 centimetres (height) was used.

The results of the test for determining the strength of the magnet are shown in Table (5).

Table 5: Testing the strength of the magnet

Type of magnet	Magnet shape	Magnet volume (cm^3)	Number of Magnets	Magnet Power (Gauss)	Number of lamps turned on
Neodymium	Pill shaped	2π	2	1000	2
Neodymium	Pill shaped	2π	2	2000	4
Neodymium	Pill shaped	2π	2	5000	8
Neodymium	Pill shaped	2π	2	5500	6

3-4 Type of the Lamps and the Numbers Required

SMD bulbs are famous for low electric consumption and high efficiency. As a result of our first research between SMD and LED bulbs, SMD lamps were much more successful at low consumption.

Assuming equal number of turns on the coil, type of the magnet, number of the magnets, the size and power of the magnet, experiment was conducted to determine the number of lamps required. The results of the test of the number of lamps needed are shown in Table (6).

Table 6: The number of light bulbs required

Number of the coil	Type of magnet	Number of Magnet	Volume (cm^3)	Magnet Size (cm)	Number of bulbs	Did all the lights turn on?
1000	neodymium	2	2π	5000	4	yes
1000	neodymium	2	2π	5000	6	yes
1000	neodymium	2	2π	5000	8	yes
1000	neodymium	2	2π	5000	10	no
1000	neodymium	2	2π	5000	9	no

3-5 Testing the Height of the Flip-Flop and the Number of wires Turn on the Coil

The height of the flip-flop and the amount of electric current are in direct relationship with each other and according to the experiments, the more height of the flip flop from the ground increased, due to the increase in the speed of coils at the moment of collision with the magnet, more currents are generated. But because of the limitations in the construction of the flip- flop in our experiment, the maximum altitude of utilization was eight centimetres. The results of the test for determining the flip-flop height and the number of turns on the coil are shown in table (7).

Table 7: Testing the height of the flap and the number of turns on the coil

Number of turns on the coil	Type of magnet	Number of Magnets	Volume (cm^3)	Magnet shape	Electrical current (μA)	Height (cm)
1000	Neodymium	2	2π	Pill shaped	4	2
1000	Neodymium	2	2π	Pill shaped	6	4
1000	Neodymium	2	2π	Pill shaped	8	6
1000	Neodymium	2	2π	Pill shaped	10	8

4 Results and How to Build a Replica (Moquette)

The procedure, requirements and test results are as follows:

1. Initially, in accordance with the tests carried out, the coil was selected for 1000 rounds, and two of them were made.
2. According to the research, it was concluded that the best type of lamp for this purpose is SMD lamps.
3. Then, the lamps were illuminated according to the tests, and the lamps were prepared and connected to the flip-flop.
4. According to research, the strongest available magnets are neodymium magnets with a diameter of one centimetre in diameter and two centimetres in height, which were used.
5. According to the experiments, the 5000 Gauss magnet = 0.5 Tesla has the best possible return.
6. According to the tests, the best possible height for the flip-flop is 8 cm.

As a result the replica was made using written gadgets (Fig.2).

Fig. 2: Experimental replica

5 Conclusions

According to the results of the experiments and research, two coils with 1000 rounds of copper wire with a diameter of 0.3 mm on each side of the flip-flop were used and with the up and down movement of the flip-flop each time, four SMD bulbs were lit with the use of 2 pill shaped neodymium magnet with one centimetre (diameter) at two centimetres (altitude) and a power of 5000 Gauss per side of the flip-flop.

We know if the magnetic flux through a coil is altered then an e.m.f. will be generated in the coil. According to the Faraday's laws and Lenz's law , either moving the coil or source of the flux relative to each other or changing the magnitude of the source of the flux in some way, e.m.f. could be generated and also faster the flux is changed , the e.m.f. is produced greater.

6 Future work

This research is trying to save energy and it can be used this energy source for playing music as well.

We are trying to assemble this kind of system on another play tools like, swings and carousels in future.

References

[1] Gibbs, K., (1994), "Advanced Physics". Second Edition, Cambridge.