MAGNETICALLY LEVITATED SOLAR MOTOR

[1]A.R Moin, [2]S.S Patrawale, [3]R.N Phakade, [4]A.T Nalawade. Dept. of Electrical Engg,
[5]Dr.N.N Ghuge Associate Prof, Department Of Electrical Engineering,
JSPM'S Bhivarabai Sawant Institute of Technology And Research Wagholi, Pune 412207

***Abstract*:** Magnetically levitated solar motor is a solar powered motor which is operate on the principle of levitation combining with the dc motor principle. This motor having a square body rotor having solar cell on each side, it also consist a two copper windings, and rotor shaft having two ring magnets on each side. The stator of MLSM motor having four magnets for levitation principle. When the cell is illuminated, current starts flowing through the windings and creates magnetic field around it. The magnets which is placed on the base of rotor creates another magnetic field, hence according to the principle of dc motor i.e. Whenever the current carrying conductor is placed in a magnetic field force is exerted on it.

***IndexTerms* – Magnetically Levitated Solar Motor (MLSM), Direct Current (DC)**

I. INTRODUCTION

The idea of a light-commutated motor, where solar cells power the individual coils of a motor, has been first described by Daryl Chapin in an experiment kit from 1962 about solar energy. The kit was distributed by Bell Labs, where Chapin together with his colleagues Calvin Fuller and Gerald Pearson had invented the modern solar cell eight years earlier, in 1954. Instead of using magnetic levitation, Chapin's version of the motor uses a glass cylinder on a needle point as a low-friction bearing.

II. CONSTRUCTION AND WORKING OF LIM

Magnetically levitated solar motor consist of a square rotor block on which solar plate are mounted at each side of block, the rating of solar plate is 6V 100mA,the pair of two solar plate connected in series with parallel combination of winding. The rotor block consists of shaft with a tip point on one end. In the MLSM we use seven set of magnet .four magnets are placed at the bottom for levitation which provide levitation force against the shaft magnet, and remaining three magnets are field magnets which provide magnetic field for rotor. At the one end of the shaft tip is placed for smooth rotation[2].

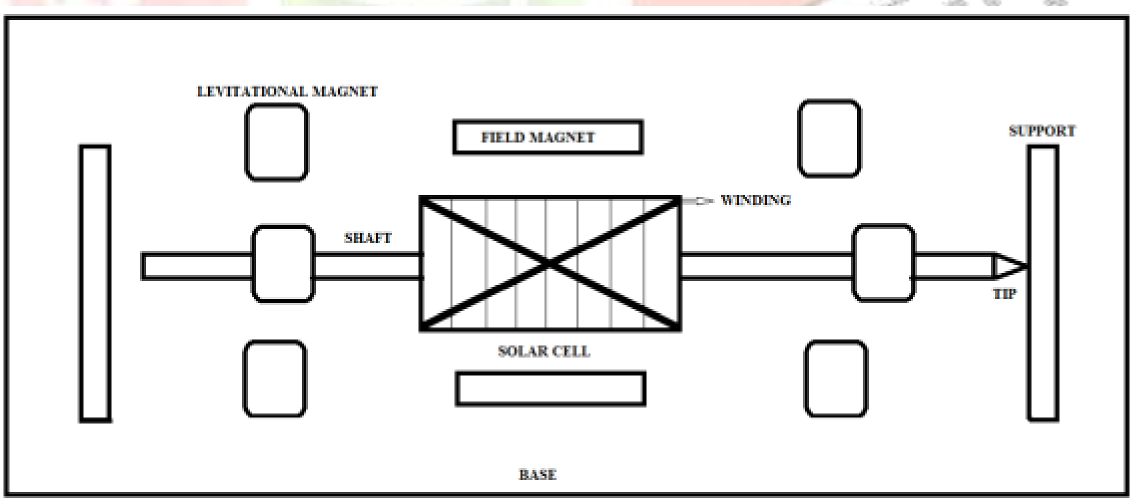

Figure 1-Block dig of MLSM

Magnetically levitated solar motor consists of

1] Super magnets
2] Solar cells
3] Rotor block
4] Winding

A] Super magnets arrangements

Neodymium magnets are the strongest magnets, because of their strength. These magnets are used for levitation Force and for the magnetic field [3]. The positions of magnets for levitation are shown in below figure 2

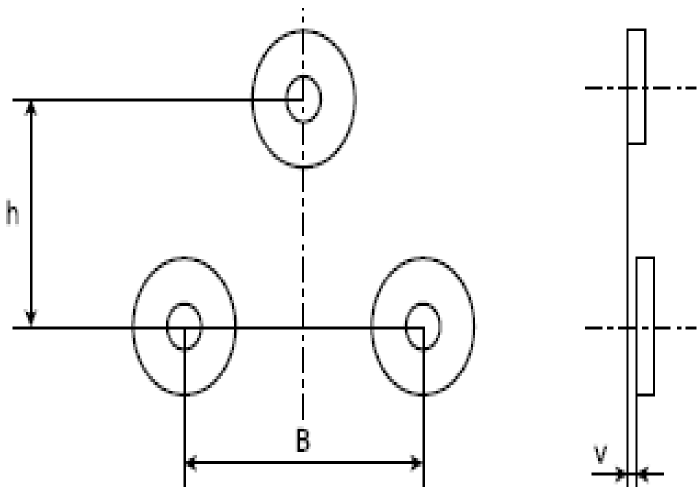

Figure 2-Magnets arrangements

B] Mechanism of motor

The solar cell 1 is illuminated; this drives the current through the coil. 1 and 2 are the two ends marked the winding. Light irradiation Isolate

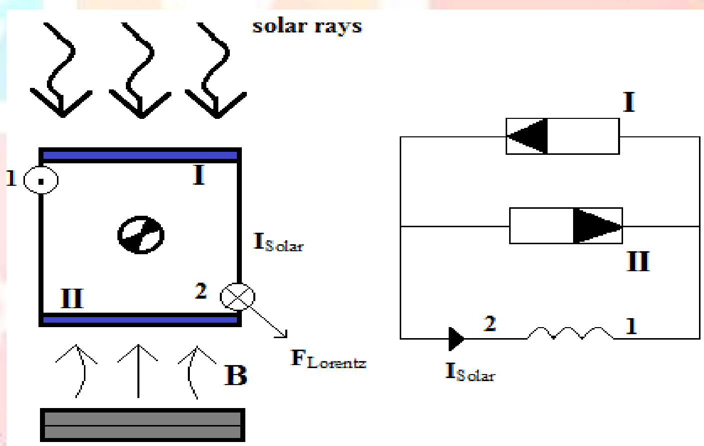

Figure 3-Current flow through coil due to vertical composed CELL

The rotor is rotated by 90 °. It solar cell is not illuminated. It no current flows.

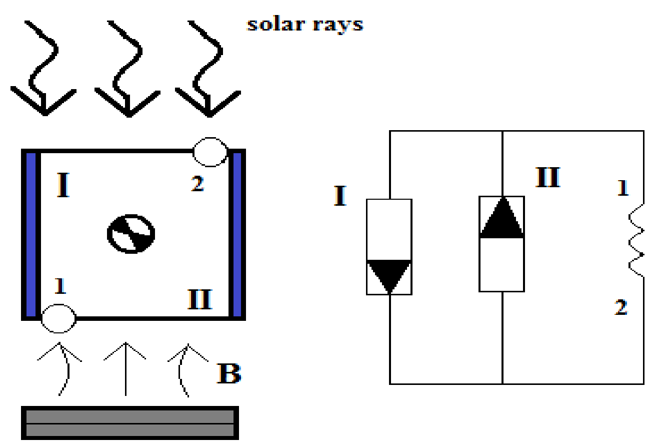

Figure 4-Current flow through coil due to horizontal composed CELL

The rotor is rotated by 90 °. The solar cell is illuminated II, this drives the current through the Winding. The current direction in one and 2 was reversed [1].

III. TECHNICAL ASPECTS

- Solar Motor Basics and Block diagram

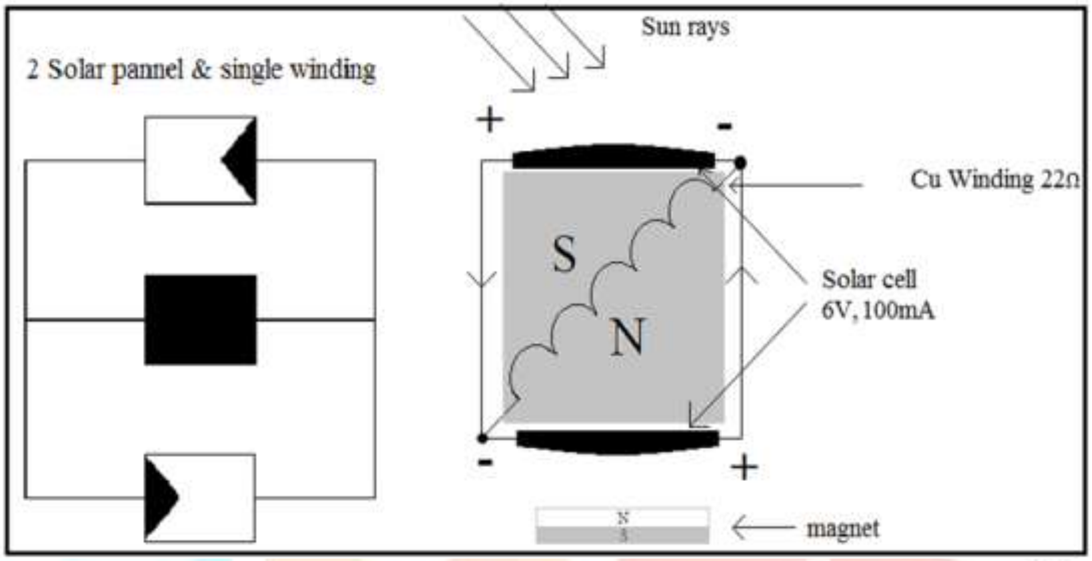

Figure 5- Winding & Solar plate connection

The schematics of the MLSM - Motors: Altogether we have four solar cells arranged in a square. The upper cell shows to the light and the opposite (downside) shows in the shadow. We have two cells connected in series. It looks like mysterious because there will be have a short circuit. Practice has shown that is functional. It´s always one of the both cells go into action and it build up a voltage. The cell in shadow site is closed and a current will flow over the rotor winding. We turn the rotor to the opposite (180°) and this coil have a reversed polarity. This produced magnetic field which interacts with the field of the magnet besides the rotor. This interaction causes the rotor to turn. As the rotor rotates, the next solar cell moves into the light and energizes the second winding. This process repeats as the motor spins. In our example we are using solar cells (10x50mm) with a 6 volt output and a current of 100mA. The strength of magnetic field (magneto motive force) is the product from the number of turns in the winding and the current in the wire. For a "high" electricity flows we need a "thicker" copper wire.

IV. CIRCUIT CONNECTIONS

The solar cells are not pre-wired. They are tricky to solder the wire onto them. I recommend searching the web for instructions. I used regular leaded solder with rosin core. I touched them ever-so-briefly (0.1 second) with the soldering iron to leave some solder behind, which I could then later quickly tack the 30mm2-gauge wire to.

Each winding having the 160 turns and two windings are used. The each winding resistance is 22Ω , As per the load matching characteristics we get the maximum output at 22Ω load. The circuit connection and total assembly is shown in fig 6 & 7 respectively.

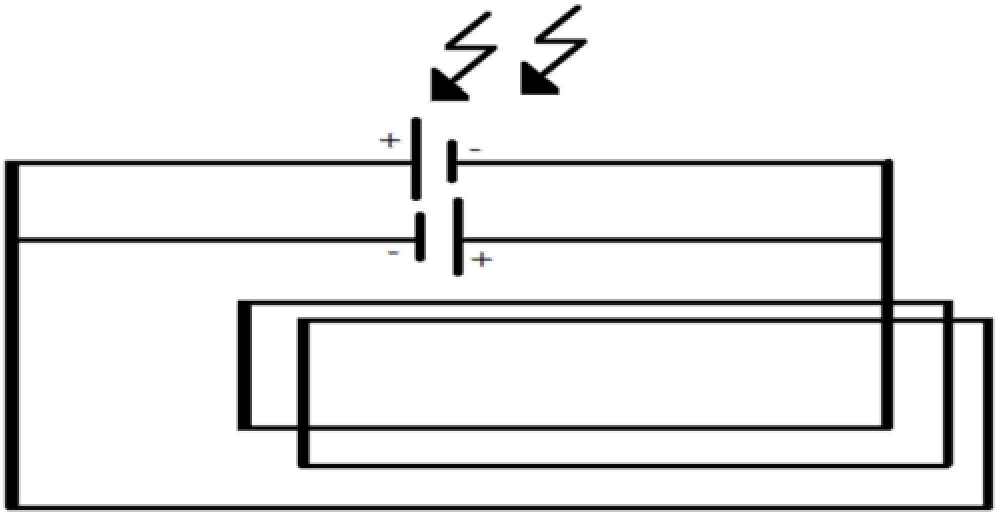

Figure 6-Winding connection with solar cell

V. CALCULATION

Length: As per the load matching characteristics of solar cell, we get the maximum voltage and maximum current on 22Ω.hence we select the winding of 22Ω resistance so for that we have formula.

$$R = \frac{\rho l}{a}$$

Where
ρ = Specific resistivity of the material.
l = Length of the wire.
a = Cross section area of the wire.

Therefore the resistance of one motor coil R=22Ω, specific resistivity of the material $\rho=1.72 * 10^{-8}$ and cross section area of the wire $33mm^2$. By using above equation we can calculate the length of the copper wire.

Actual model of MLSM:

Figure 7-Final Assembly of motor

VI. ADVANTAGES

- Full efficiency is obtained during high intensity duration of day.
- Easy to build and less cost in large production quantity.
- It is easy energy conversion from solar to mechanical energy then we can use it as prime mover.
- When the solar light is not present it can be run by providing the incandescent lamp light.
- It has a stator less performance.
- It can operate on the earth magnetism instead of magnet placed below.
- It don't need of use of any type of brushes to supply energy to rotor.
- As it has a magnetic bearing it has lesser or no friction losses.

VII. FUTURE SCOPE

1. With changing the size and the design aspect in proportion with this model reality of implementation can be achieved.
2. To increase the power of the motor we can use the large size magnet as possible.
3. Changing the shape of the rotor from square to pentagon, hexagon, octal etc. shape of the rotor will gives the increased no of operating cell at a time as well as output of the motor.
4. Changing the shape will give more balanced operation of rotor.
5. Use of magnet bearing will really give the lossless operation.
6. Using such motor with power injection and power absorption from rotor will give the proper speed and variable speed with minimum electricity use.
7. Energy crises at rural area can be cured.
8. With external electrical power use alteration will gives more wide area to application area.

VIII. CONCLUSION

We are using a coil with 160 turns and a thick from 0.33mm (lacquer-coated wire). The resistor is 22.7 Ohm. The current, a product of, voltage (V) and resistor (R): I=V/R = 1.8/22 = 81.81 mA and that is enough. That is what we need as a minimum for your solar cells. My cells have 100 mA at sunlight. Unfortunately, the power goes down with decreasing sunlight. For that reason we need any reserves for it.

REFERENCES

[1] Tejashri Rachcha., "Magnetically Levitated Solar Motor" ME Electrical Dept. student, GHRIET, Pune, INDIA

[2] A Text Book of ELECTRICAL TECHNILOGY, Volume II AC & DC Machines, B L Theraja

[3] www.supermagnete.fr/eng/project_terms.php

[4] www.Solar_Powered_Levitating_Mendocino_Motor.htm

[5] http://www.solarsystems.com.au/documents/SolarSystemsMediaRelease.pdf

[6] www.Justdial.com

[7] Principle and Preparation details of Solar powered Motor By Thomus C. Wavles

[8] www.supermagnete.fr/eng/project356