

Generation of Heat Using Permanent Magnets: A Review

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Abstract- Magnet heaters are a known alternative to electrical heating elements and fossil fuel burners. Permanent magnet heaters subject an electrical conductor to a changing magnetic field, thereby producing eddy currents, i.e., a circulating flow of electrons, within the conductor. Permanent The flow of the current through the conductor is resisted by the resistance of the conductor, which produces heat. Known magnetic heaters create eddy currents in a stationary conductor by moving permanent magnets relative to a fixed conductor. The heat generated by the eddy currents is then used to heat water. However, a problem exists in that known permanent magnet heaters are inefficient, complex, and cost-prohibitive. A heater includes a rotor rotatable mounted to a support structure, and a magnet attached to the rotor which is rotating high RPM which tends to cut magnetic flux and heat is generated which is transfer by convection to the copper tubes which is carrying water. Thus heating is done

Keywords- Permanent Magnet, Heat generation, Non-conventional energy, Water heater, Magnetic induction

I. INTRODUCTION

A. Research and background

Many thermal energy generators cause serious pollution or other serious hazards. Let's take radio-active thermal energy generators, they have the possibility of causing radio-active contamination. Fossil fuel system can cause serious pollution problems.

Permanent magnetic thermal generator is non-conventional type energy source. It avoids these problems and offer many advantages. Such permanent magnetic heat generators produce no flame and hence no pollution and no threat of fire and explosion which means they can be used in explosive or flammable environment. These generators have no problems related radiation and radioactive contamination.

Permanent magnetic heat generators are very compact and easy to handle. They can work on various inputs. The heat produced by these generated can be transferred to a working fluid.

B. Problem Statement

It is the purpose of the claimed invention to overcome these difficulties:

- Providing an improved apparatus and method for generating heat.
- Heating fluid without any consumption of fossil fuels.
- Heating is done by using input energy where rotational energy is wasted like treadmill.
- During heat generation there is no frictional losses, as change in magnetic field produces flux.
- During heating there is no generation of harmful gases or toxic byproducts.

C. Objectives

- To make an alternative which is freely available that can be used anytime and also it doesn't produce any harmful gases to the environment and it is easy to operate.
- Thus to generate heat from low grade energy (from permanent magnet) and magnet as a source to generate Heat Energy can be used.

D. Scope

- Use magnet as a source of energy which is freely available.
- An alternate to fossil fuels to generate heat energy.
- As magnetic energy is pollution free and also it doesn't produce any residuals and it can be easily available. Thus it has a good future scope as an energy producing source over polluting sources.

II. RESEARCH AND METHODOLOGY

Rotating Magnets Create Energy

It is one of the most useful principles in physics the connection between electricity and magnetism. Electrons feel the force exerted by a magnetic field. This is because electrons behave like tiny magnets, having north and south poles. So a magnetic field will have an effect on electrons in that

magnetic field. If the magnetic field moves, the electrons in it will try to move.

So if we have electrons in motion (electric current in a wire, for instance), these moving charges exert a magnetic force (because of their magnet-like property). So, if you attach a magnet onto an axle, and turn the axle, it creates a spinning magnetic field at a particular point. Place a wire around the spinning magnet, and an electric current will occur in the wire. This is called magnetic induction. If you wrap the wire multiple times around the rotating magnet, you increase the amount of current induced.

III. STUDIES AND FINDINGS

- The principle of operation is based on Faraday's Law and Lenz's Law. When we give input speed to the aluminum rotor shaft, the aluminum rotor rotates due to rotating magnetic field or change in magnetic field emf gets induced in the coil.
- The direction of these changes is given by Lenz's Law and Faraday's Law doesn't explain about the direction of current. Lenz's Law states that the direction of the current induced in a conductor by a changing magnetic field is such that the magnetic field created by the induced current opposes the initial change in magnetic field.
- So as the rotor rotates; there is change in magnetic field on the coil placed at circumference and face. So the current induced in the coil opposes these changes due to which there is generation of heat in the coil.
- The heating of coil in the circumference and face of coil will be different because of the magnetic field interaction with the coil. As the magnetic field lines moves from North Pole to South Pole, the coil which is placed in proper alignment with these magnetic line of force will get more heated.
- So the temperature rise in the coil will be accordingly and this change, in magnetic field causes the electron to align accordingly and due to, to and fro movement of electron the copper coil gets heated up and we get heat energy as output

IV. COMPONENTS

- Aluminum disk with magnets
- Copper Tube
- Chain drive
- Frame which holds all parts
- Electric parts, such as thermostat and on/off switch
- Bearings
- Pump and pipes
- Reservoir

- Temperature sensors

V. CONSTRUCTION

- It consists of a basic support stand like a structure which is fixed by two shafts parallel to each other at two ends.
- Fixed supports are provided to the left end shaft. The larger sprocket is placed on the left end of shaft. The input is given to the left end shaft, for which we can make use of foot operated or hand operated mechanism is placed according to our convenience. In our experiment we are going to use hand operated mechanism, from which we are going to give manual input which will rotate another shaft placed at right end.
- The right end shaft is connected to the left end shaft via chain drive mechanism. The right end shaft will rotate at higher speed than the left end shaft because it has smaller sprocket.
- Hence as per the speed ratio we can finalize the speed at right end.
- The rotor on which magnets are placed is rotated by this right end shaft and thus high speed of rotor is achieved.
- There are many possibilities of arrangement of magnets on the rotor out of these possibilities the one which is most optimal is North-South-North-South combination which is placed on periphery or circumference and on one end of the rotor.
- The coils are placed very close to the magnets, so that we get maximum heat. Further we have series and parallel combination of the coils which is used to find that which one will add more result.
- The rotor used is Aluminum because of its major advantages i.e., light in weight, low cost and good heat transfer co-efficient.

VI. WORKING

The working of Generation of Heat using Permanent Magnet is generally based on generation of EDDY Currents.

- When a rotating magnetic field moves through a conductor the movement includes an "Eddy Current" in the conductor (i.e., in our case is copper coils).
- The rotating magnetic field produces rapidly changing magnetic field of force, when the coils comes in contact with the magnetic field (i.e., by placing very close to the magnet). The flow of electron in the coil immediately creates an opposing magnetic field which results in damping of the magnet and produces heat inside the coil.
- We are using manual power so mechanical energy results in the formation, rapidly changing magnetic field which makes the electrons to move in the coil to and fro. But

because of rapid change in magnetic field, the high K.E. fluctuations in the coils results in the heating of coils.

- The rotor rotates due to which there is rapid change in magnetic field. Due to which the electron moves to and fro in the copper coil. Thus, these leads to generation of heat in the copper coil.
- Both the coils, one is placed on circumference and another one is placed on face, which are getting heated rapidly.
- The coils heated slowly by the time.
- The water present in the coil absorbs heat slowly by the time from the coil because of convection and thus convective heating takes place.

VII. CONCLUSION

- A new way of generating heat by permanent magnet can also be used in future. The heat generation from permanent magnet depends on number of factors like the pitch of the magnet, magnetic flux density, arrangement of magnet, position of magnet like face or circumference etc. The evaluation of these factors is only possible by experimentation as no standard results are present.
- Further more research is requiring on size of magnet whether large size magnet or small size magnet will yield more result has to be found out by experimentation.

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