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SOLAR HERO'S ENGINE

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Abstract: **The increased demand and high price for energy sources are driving efforts to convert more of solar energy into every day usable energy in every field of energy driven industry. Although much of the work and effort has focused on using renewable energy for countering the excessive use of fossil fuels, there are strong benefits to deriving energy from nature like wind energy, solar energy, hydroelectricity. Among all the non-renewable sources solar energy has the most dominant importance there are many facts supporting this? Solar energy does not emit toxic substances or contaminants into the air, which can be very damaging to the environment and to human beings. So using this energy for engines which is human's greatest invention to convert and transfer energy will be a big step towards a better future.**

I. INTRODUCTION

In Today's time where conventional energy resources are running out and are causing pollution at an alarming level, world is looking for better non-conventional source of energy which are environment friendly. Our research is towards finding such a resources which can at least reduce this problem to some level if not end it. We are trying to use a legacy engine which has not been in use for commercial and large scale energy production.

It has a simple working mechanism. It uses steam pressure generated in a container to release it through nozzles at around tangential angle and gain torque. This in turn produce rotation which we want to harness for electricity. The set up of our engine is built on very simple idea of using lens to concentrate rays from sun directly on the chamber containing water so that it can absorb energy at a faster rate and boil the water which in turn will raise the pressure inside. As this pressure builds up and the vapour comes out of the jet with force at an angle around 90 degrees to the setup it lead to rotation of the engine. This rotational energy can be used in a generator to produce electricity or can be utilized in any other operations which require rotational energy

II. BACKGROUND

"It is no secret that there is a high need of sustainable energy for a better world. So being from a engineering background we have to look into such problems and try to contribute towards a better and sustainable future." This mind set helped us to look into everything as a possible solution and we finally set our mind towards making a engine that could run on solar energy.

We are working on an **aeolipile**, **aeolipyle**, or **eolipile**, also known as a **Hero's engine.**

The Greek-Egyptian mathematician and engineer Hero of Alexandria described the device in the 1st century AD, and many sources give him the credit for its invention. However, Vitruvius was the first to describe this appliance in his De architecture.

The aeolipile is considered to be the first recorded steam engine or reaction steam turbine. Itis a simple, blade less radial spin turbine which spins when the central water container is heated and the torque is produced by steam jets exiting the turbine.

III. METHODOLOGY

The basic idea behind the working of our solar hero's engine is to use solar energy as a source of heat to boil liquid (mainly Water) inside the storage chamber of hero's engine in order to run it without using other conventional source of energy.

The design of our engine is very simple and include only few major components that are a Fresnel lens, an efficient and customized hero's engine and availability of liquids that readily converts into vapour when heated and are cheap and eco-friendly. In right condition water can be easily used to run the engine. Depending on the required output of energy we can change the size of lens, engine or can use better performing fluid.

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3.1 Hero's Engine

Also known as aeolipile, steam turbine invented in the 1st century AD by Heron of Alexandria and described in his Pneumatic. The aeolipile was a hollow sphere mounted so that it could turn on a pair of hollow tubes that provided steam to the sphere from a cauldron. The steam escaped from the sphere from one or more bent tubes projecting

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from its equator, causing the sphere to revolve. The aeolipile is the first known device to transform steam into rotary motion. Like many other machines of the time that demonstrated basic mechanical principles, it was simply regarded as a curiosity or a toy and was not used for any practical purpose.

3.2 Fresnel Lens

Fresnel lenses, invented by Augustin Jean Fresnel, have been in used since the 19th century when they played a vital role in focusing the beams in lighthouse lamps and were also used in theatre spotlights.

They are flat on one side, with the other shaped much like a dartboard made up of a number of concentric grooves acting as individual prisms, bending parallel light rays to a common focal length.

Fresnel lenses are thin yet have a common focal length equivalent to that of a traditional lens. Because the lens is so thin, only a small amount of light is lost to absorption. Used for a variety of applications including non-precision imaging, photography, illumination and light gathering, Fresnel lenses are incredibly versatile and can be customized by varying the density of the grooves.

3.2.1 Fresnel lens Design: There are various types of Fresnel lens, each suited to different types of application. **Cylindrical Fresnel lenses**, for example, are designed to focus light in one direction rather than to a point.

For solar concentration such as concentration photovoltaic (CPV) on the other hand, Fresnel lenses of reverse configuration are used.

Reverse configuration Fresnel lenses are designed so that the flat side faces the sun, and the grooved side faces the photovoltaic cell in order to focus the light. Regular Fresnel lenses work in reverse. Because image quality is of no concern in solar concentration applications, reverse configuration Fresnel lenses can be produced with a lower groove density to create a larger surface area, so boosting their efficiency.

3.2.2 Fresnel lens Types: There are two main types of Fresnel lens: imaging and non-imaging. Imaging Fresnel lenses use segments with curved cross-sections and produce sharp images, while non-imaging lenses have segments with flat cross-sections, and do not produce sharp images.[11] As the number of segments increases, the two types of lens become more similar to each other. In the abstract case of an infinite number of segments, the difference between curved and flat segments disappears.

Imaging Type

Spherical - A spherical Fresnel lens is equivalent to a simple spherical lens, using ring-shaped segments that are each a portion of a sphere, that all focus light on a single point. This type of lens produces a sharp image, although not quite as clear as the equivalent simple spherical lens due to diffraction at the edges of the ridges.

Cylindrical -A cylindrical Fresnel lens is equivalent to a simple cylindrical lens, using straight segments with circular cross-section, focusing light on a single line. This type produces a sharp image, although not quite as clear as the equivalent simple cylindrical lens due to diffraction at the edges of the ridges.

Non-imaging Type

Spot - A non-imaging spot Fresnel lens uses ring-shaped segments with cross sections that are straight lines rather than circular arcs. Such a lens can focus light on a small spot, but does not produce a sharp image. These lenses have application in solar power, such as focusing sunlight on a solar panel. Fresnel lenses may be used as components of Koehler illumination optics resulting in very effective no imaging optics Fresnel- Koehler (FK) solar concentrators.

Linear -A non-imaging linear Fresnel lens uses straight segments whose cross sections are straight lines rather than arcs. These lenses focus light into a narrow band. They do not produce a sharp image, but can be used in solar power, such as for focusing sunlight on a pipe, to heat the water within.

3.2.3 Advantages of Fresnel Lenses: Fresnel lenses consist of a series of concentric grooves etched into plastic. Their thin, lightweight construction, availability in small as well as large sizes, and excellent light gathering ability make them useful in a variety of applications. Fresnel lenses are most often used in light gathering applications, such as condenser systems or emitter/detector setups. They can also be used as magnifiers or projection lenses in illumination systems, and image formulation.

A Fresnel (pronounced fray-NEL) lens replaces the curved surface of a conventional optical lens with a series of concentric grooves. These contours act as individual refracting surfaces, bending parallel light rays to a common focal length (Figure 1). As a result, a Fresnel lens, while physically narrow in profile, is capable of focusing light similar to a conventional optical lens but has several advantages over its thicker counterpart

3.3 Solar Energy

Solar energy is the energy obtained by capturing heat and light from the Sun. Energy from the Sun is referred to as solar energy. Technology has provided a number of ways to utilize this abundant resource. It is considered a green technology because it does not emit greenhouse gases. Solar energy is abundantly available and has been utilized since long both as electricity and as a source of heat.

Solar technology can be broadly classified as −

Active Solar − Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy. Active solar is directly

consumed in activities such as drying clothes and warming of air.

Passive Solar − Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air.

IV. CONCLUSION

Considering the simple mechanism of our project we can conclude that it will be very efficient and useful in many situations. It can be constructed in wide range of size depending upon the power output requirement.

Its ability to use solar energy is the main focus of our invention since going ahead, in future we will need more and more such machinery and inventions that do not produce any pollution and also use renewable source of energy.

Its manufacturing and installation will also be simple and one can use it in range of works from power generation to be used in toys for kids amusement. It's very flexible in terms of using it. It can also use other source of energy to run which can produce heat like burning fuel of any kind without making any changes to its setup.

V. APPENDICES

If you have information that is too dense for the paper itself, include it in an appendix. Appendices are helpful when you want to include supplementary material that is relevant but not integral to the paper itself.

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