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Design and Fabrication of Power Generation in SwingMotion

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Abstract: *Energy need of the world is growing day by day because of consumption of energy at a larger extent with the population growth. This paper is about generating power by using a swing in such a way that when it swings the mechanical energy is generated and it is converted into electrical energy by a commutator and is stored in abattery. The construction is such a way that, the swinging action makes the horizontalbeam rotating through an angle. This shaft is connected to a sprocket to transfer the motion to the free wheel which rotates proportionally with respect to the angle of motion of the swing. The angular movement is converted into a complete rotation with the help of a chain drive connecting both sprocket and free wheel. The free wheel is connected to a shaft which in turn rotates the spur gear and dynamo arrangement to generate electricity*
Keywords: *Chain drive, Energy, Freewheel, Sprocket, Swing.*

I.INTRODUCTION

Energy is the driving force of modern societies, and generation and utilization of energy are essential for socio-economicdevelopment. Per-capita energy consumption levels are often considered a good measure of economic development. In recent years, energy scarcity has become a serious problem due to depletion of non-renewable energy sources, increasing population, globalization of energy intensive economic development, environmental pollution, and global warming. In recent years, there havebeen many interesting developments in the field of human power conversion. In the Present project, a method of harnessing the power of Children play in play grounds and public places, on device such as swing is proposed. When large number of children plays in a school playground, part of the power of their play can usefully be harnessed resulting in significant energy storage. This stored energy can then be converted to electricity for powering basic, low power appliances in the school such as lights, fans, communications equipment, and so on. The method provides a low cost , low resource means of generation of auxiliary electric power, especially for use in developing countries. This swing electricity project not only generates electricity but also can be a very useful tool to educate children to learn to conserve energy. This project utilizes energy that is given away while playing

II.MATERIAL AND METHODS

- Dynamo
- Spur gear
- Rectifier
- Filter
- Battery

Dynamo:

Dynamo is an electrical generator. This dynamo produces direct current with the use of a commutator. Dynamo were the first generator capable of the power industries.The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current. A dynamo machine consists of a stationary structure, called the stator, which provides a constant magnetic field, and a set of rotating windings called the armature which turn within that field. On small machines the constant magnetic field may be provided by one or more permanent magnets; larger machines have the constant magnetic field provided by one or more electromagnets, which are usually called field coils.

The commutator was needed to produce direct current. When a loop of wire rotates in a magnetic field, the potential induced in it reverses with each half turn, generating an alternating current. However, in the early days of electric experimentation, alternating current generally had no known use. The few uses for electricity, such as electroplating, used direct current provided by messy liquid batteries. Dynamos were invented as a replacement for batteries. The commutator is a set of contacts mounted on the machine's shaft, which reverses the connection of the windings to the external circuit when the potential reverses, so instead ofalternating current, a pulsing direct current is produced.

Spur Gear

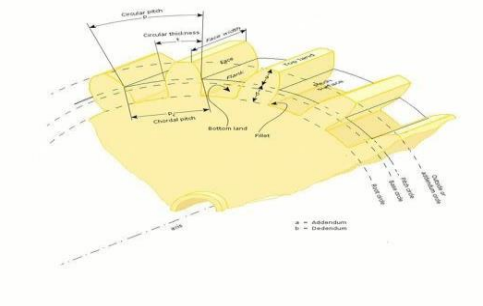
A gear is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part in order to transmit torque. Two or more gears working in tandem are called a transmission and can produce a mechanical advantage through a gear ratio and thus may be considered a simple machine. Geared devices can change the speed, torque, and direction of a power source. The most common situation is for a gear to mesh with another gear; however a gear can also mesh a non-rotating toothed part, called a rack, thereby producing translation instead of rotation.

The gears in a transmission are analogous to the wheels in a pulley. An advantage of gears is that the teeth of a gear prevent slipping.

When two gears of unequal number of teeth are combined a mechanical advantage is produced, with both the rotationalspeeds and the torques of the two gears differing in a simple relationship.

In transmissions which offer multiple gear ratios, such as bicycles and cars, the term gear, as in first gear, refers to a gearratio rather than an actual physical gear. The term is used to describe similar devices even when gear ratio is continuous rather than discrete, or when the device does not actually contain any gears, as in a continuously variable transmission.

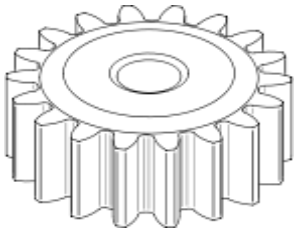
The earliest known reference to gears was circa A.D. 50 by Hero of Alexandria, but they can be traced back to the Greek mechanics of the Alexandrian school in the 3rd century B.C. and were greatly developed by the Greek polymath Archimedes (287– 212 B.C.). The Antikythera mechanism isan example of a very early and intricate geared device, designed to calculate astronomical positions. Its time of construction is now estimated between 150 and 100 BC.



The definite velocity ratio which results from having teeth gives gears an advantage over other drives (such as traction drives and V-belts) in precision machines such as watches that depend upon an exact velocity ratio. In cases where driver and follower are in close proximity gears also have an advantage over other drives in the reduced number of parts required; the downside is that gears are more expensive to manufacture and their lubrication requirements may impose a higher operating cost.

The automobile transmission allows selection between gears to give various mechanical advantages.

An external gear is one with the teeth formed on the outer surface of a cylinder or cone. Conversely, an internal gear isone with the teeth formed on the inner surface of a cylinder or cone. For bevel gears, an internal gear is one with the pitch angleexceeding 90 degrees. Internal gears do not cause direction reversal.



Spur gears or straight-cut gears are the simplest type of gear. They consist of a cylinder or disk with the teeth projectingradially, and although they are not straight-sided in form, the edge of each tooth is straight and aligned parallel to the axis of rotation. These gears can be meshed together correctly only if they are fitted to parallel shafts.

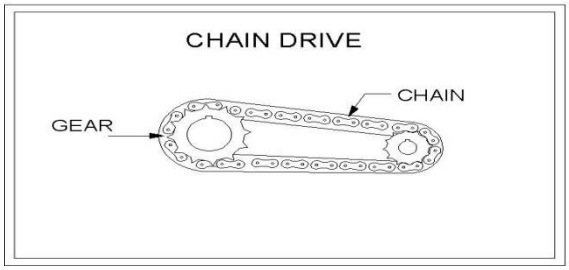
Advantages:

- It transmits exact velocity ratio.

- It may be used to transmit large power
- It may be used for small center distance of shafts.
- It has high efficiency
- It has reliable service.
- It has compact layout.

Chain Drive

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to thewheels of a vehicle, particularly bicycles and motorcycles. It is also used in a wide variety of machines besides vehicles. The power is conveyed by a roller chain, known as the drive chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain. The gear is turned, and this pulls the chain putting mechanical force.



Bearing

A bearing is a device to permit constrained relative motion between two parts, typically rotation or linear movement. Bearings may be classified broadly according to the motions they allow and according to their principle of operation. Low friction bearings are often important for efficiency, to reduce wear and to facilitate high speeds. Essentially, a bearing can reduce friction by virtue of its shape, by its material, or by introducing and containing a fluid between surfaces. By shape, gains advantage usually by using spheres or rollers. By material, exploits the nature of the bearing material used. Sliding bearings, usually called bushes bushings journal bearings sleeve bearings rifle bearings or plain bearings. rolling-element bearings such as ball bearings and roller bearings. Jewel bearings, in which the load is carried by rolling the axle slightly off-center. fluid bearings, in which the load is carried by a gas or liquid magnetic bearings, in which the load is carried by a magnetic field. Flexure bearings, in which themotion is supported by a load element which bends. Bearings vary greatly over the forces and speeds that they can support. Forcescan be radial, axial (thrust bearings) or moments perpendicular to the main axis. Bearings very typically involve some degree of relative movement between surfaces, and different types have limits as to the maximum relative surface speeds they can handle, and this can be specified as a speed in ft/s or m/s.

The moving parts there is considerable overlap between capabilities, but plain bearings can generally handle the lowestspeeds while rolling element bearings are faster, hydrostatic bearings faster still, followed by gas bearings and finally magnetic bearings which have no known upper speed limit.

Linear Bearing

A linear-motion bearing or linear slide is a bearing designed to provide free motion in one dimension. There are manydifferent types of linear motion bearings and this family of products is generally broken down into two subcategories: rolling- element and plane.

Motorized linear slides such as machine slides, XY tables, roller tables and some dovetail slides are bearings moved by drive mechanisms. Not all linear slides are motorized, and non-motorized dovetail slides, ball bearing slides and roller slides provide low-friction linear movement for equipment powered by inertia or by hand. All linear slides provide linear motion based on bearings, whether they are ball bearings, dovetail bearings or linear roller bearings. XY Tables, linear stages, machine slides and other advanced slides use linear motion bearings to provide movement along both X and Y multiple axis.

Different Bearing types

There are many types of bearings, each used for different purposes either singularly or in combinations. These include ballbearings, roller bearings, ball thrust bearings, roller thrust bearings and tapered roller thrust bearings.

Ball bearings

Ball bearings, as shown to the left, are the most common type by far. They are found in everything from skate boards to washing machines to PC hard drives. These bearings are capable of taking both radial and thrust loads, and are usually found in applications where the load is light to medium and is constant in nature (ie not shock loading). The bearing shown here has the outer ring cut away revealing the balls and ball retainer.

Roller bearings

Roller bearings like the one shown to the left are normally used in heavy duty applications such as conveyer belt rollers, where they must hold heavy radial loads. In these bearings the roller is a cylinder, so the contact between the inner and outer race is not apoint (like the ball bearing above) but a line. This spreads the load out over a larger area, allowing the roller bearing to handle much greater loads than a ball bearing. However, this type of bearing cannot handle thrust loads to any significant degree. A variation of this bearing design is called the needle bearing. The needle roller bearing uses cylindrical rollers like those above but with a very small diameter. This allows the bearing to fit into tight places such as gear boxes that rotate at higher speeds.

Thrust ball bearings

Ball thrust bearings like the one shown to the left are mostly used for low-speed non precision applications. They cannot takemuch radial load and are usually found in lazy susan turntables and low precision farm equipment.

Roller thrust bearing

Roller thrust bearings like the one illustrated to the left can support very large thrust loads. They are often found in gearsets likecar transmissions between gear sprockets, and between the housing and the rotating shafts. The helical gears used

in most transmissions have angled teeth, this can causes a high thrust load that must be supported by this type of bearing.

Taper roller bearing

Tapered roller bearings are designed to support large radial and large thrust loads. These loads can take the form of constant loads or shock loads. Tapered roller bearings are used in many car hubs, where they are usually mounted in pairs facing opposite directions. This gives them the ability to take thrust loads in both directions. The cutaway taper roller on the left shows thespecially designed tapered rollers and demonstrates their angular mounting which gives their dual load ability.

Other bearing types

The above bearing types are some of the most common. There are thousands of other designs, some standard and some specificapplications but all perform the same basic function. Essentially further types of bearings usually take all or some of the characteristics of the above bearings and blend them into one design.

Through the use of careful material selection and applying the correct degree of machining precision, a successful bearing solutioncan usually be found.

Sprocket

Sprocket is a profiled wheel with teeth that meshes with a chain. It is intended material. It is distinguished from a gear inthe sprockets are never meshed together directly. The drive sprocket and may be positioned at the front or back of the vehicle.

Sprockets are never meshed together directly, and from a pulley by not usually having a flange at each side. Transmit rotarymotion between two shafts where gears are unsuitable or to impart linear motion to a track.

III.RESULT

Spur Gear Calculation:

Gear 1:

Dia of gear = Ø105mmNo of teeth =96 no

Thickness of the gear =10mm MODULE. m:

This is the standard term used in S.I.units. It can be defined as the length on the pitch circle diameter per tooth. It is the reverseof the diameter pitch.

$$m = D/T$$

$$m = 105/96 \quad m = 1.093 \text{ mm}$$

Addendum: (A)

The radial distance between the pitch circle and the tip circle is known as Addendum.

$$a = 1 \text{ m}$$

$$a = 1 \times 1.093 \quad a = 1.093 \text{ mm}$$

Dedendum:

The radial distance between the pitch circle and the root circle is known as Dedendum (d).d=1.25m

$$d = 1.25 \times 1.093 \quad d = 1.366 \text{ mm}$$

Circular Pitch (Pc):

The distance between the corresponding sides of two adjacent of a gear measured on the pitch circle is known as circular pitch.

$$Pc = \pi D/T$$

$$Pc = \pi (105)/ 96 \quad Pc = 3.433 \text{ mm}$$

Diametral Pitch (Pd):

It is the ratio of the number of teeth per unit pitch diameter. This Is a mostly used in F.P.S. system.

Pd=T/D

Pd = 96/105

Pd = 0.914 mm

Gear 2:

Dia of gear = Ø30mmNo of teeth =24 no

Thickness of the gear =10mm

m = D/T m = 30/24 m = 1.25 mm a = 1 m a = 1 x 1.25 a = 1.25mm

d=1.25m

d = 1.25 x 1.25 d = 1.56 mm

Pc = □ D/T

Pc = □ (30)/ 24

Pc = 3.925 mm

Pd=T/D

Pd = 24/30

Pd = 0.8 mm

Gear ratio i = No of teeth on gear 1 No of teeth on gear 2i = 96/24 i = 4

Hence the gear ratio is 1: 4

When gear 1 rotates 1 revolution gear 2 rotates 4 revolutions.

IV.CONCLUSION

With the demand for energy increasing tremendously, different methods of extracting energy from the available environment is focused and world is in search of alternative sources. The way of producing power from the mechanical energythat can be wasted is persevered for the future purpose which is having a great scope. So, swing power generator is consideredas a promising alternate for exhausting energy sources. In this project, a new method for human power conversion based onchildren' s play on playground equipment has been proposed. If it is employed in every garden with proper designing it couldacquire sufficient power from it. To create awareness of electrical energy conservation in children. It will be a useful device which can be used in countryside area or in the agriculture field where electricity is not easily available. In the coming daysthe demand for energy resources will be increasing every day' s the aim of this research is to develop the world by enriching.By utilizing its resources more. Now time has come for using this type of innovative ideas and it should be brought into practice. It is full independent system. It outlines the need for cost effective technology in rural region

References

[1] Rajat, Sonu and S.K.Mude, Electrical Energy Generation by using Pendulum Motion, International Journal of Advance Research, Ideas and Innovations in Technology, 8 (262), 2012, 300-392.

[2] Manjunath K and Suresh P, Swing Electricity Generation System, International journal of specific progress and research, 444 (462), 2015, 385-450.

[3] R.S.Khurmi and J.K.Gupta " Machine Design" Eurasia Publications, Revised edition 2005.

[4] Gokul and Cyril John Tellis, Design and Fabrication of Human Power Swing for Electricity Generation, RecentInnovation in Science and Engineering, 3(92), 2016, 624- 710.

[5] S. Pandian, A Human Power Conversion System Based on Children's Play, Technology and Society of journal ISTAS, 66(566), 2004, 50- 122