

STUDY AND DESIGN OF TREADMILL ELECTRIC BICYCLE

Ranjith Kumar A | Karthick Raj B

(UG Scholar, Mechatronics Engineering, SNS College of Technology, Coimbatore, India.
Ranjithkumar1681999@gmail.com, karthikbalakrish12699@gmail.com)

Abstract—Our concept deals with the design and the fabrication of the treadmill bicycle with the power generation. This is a simple project which may be used for travelling for a shorter distances using human effort. The motion of the machine is achieved by transferring the human's energy to the machine through the concept of the treadmill. This machine can be useful for travelling to short distances and for exercise-minded peoples. Using this machine, allotting a separate time for their exercise is not needed. The same action performed on the treadmill is used in this machine for the movement of the machine. As we (the operator), walks forward, the machine moves forward and as we walk backwards, the machine moves backwards. The advantage of our project is that the power generation is also done with the help of solar panel and the energy is stored in the battery that energy is used by the DC motor to override the chain sprocket when the operator was unable to walk. The energy stored in the battery will be help to travel a few distance.

Keywords—Treadmill, Motor and Bicycle

1. INTRODUCTION

The treadmill bicycle is a totally new way of moving. With the electric assist it takes less effort to walk than “a walk in the park”. It is the combination of the electrical and mechanical energy. Increased use of fuel has resulted in increase of pollution and degradation of natural resources. With increasing population and their need, it has become necessary to control the use of fuel and decrease the pollution; so as to make it avail it's important to our coming generation. Due to heavy busy schedule people are not able to give attention to their health and physical fitness. As it uses no fuel so it saves energy simultaneously it can be used as treadmill and Bicycle. No need to use it as conventional treadmill in closed room; you can roam on roads also.

2. LITERATURE REVIEW

This project concept is designed with the help of existing components from treadmill, bicycle and some electrical components for control function

A. Treadmill belt

A treadmill belt is the major source of the treadmill this belt is manufactured with the help of specially treated PVC (Polyvinyl chloride is the world's third-most widely produced synthetic plastic polymer, after polyethylene and polypropylene). The belts are manufactured and undergone several tests to resist these properties Oil-Resistant, Tear-Resistant, Heat-Resistant, Wear-Resistant. These belts are manufactured in various sizes and thickness depends upon the usage.



Figure 1 : Treadmill belt

B. Rollers

Rollers plays a vital role in this project, were as the belt travels over the rollers the quantity of rollers depends on the length of the tread designed. The rollers are usually made on mild steel and all the rollers used will have equal size in diameter and also in their length. These rollers are fitted in the frame with the help of bearings the suitable bearing are chosen and they are rigidly fixed in the frame. The number of bearings used will be twice the number of rollers.



Figure 2 : Roller

C. Hand bar

Hand bar is the major component which is to support the treader (the person who walks on the tread belt) and to change the direction of the movement turning towards right and left from its straight path. The handle bar used here is existing bicycle handle bar with front wheel attaching provision. The handle bar is fitted with the frame with the help of bearing; the rotation of hand bar is restricted to $+60^{\circ}$ and -60° from its 0° position which prevents upset of the vehicle.



Figure 3 : Hand bar

D. Chain and chain sprocket

A sprocket or sprocket-wheel is a profiled wheel with teeth, or cogs, that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth.



Figure 4 : Chain sprocket

Sprockets are used in bicycles, motorcycles, cars, tracked vehicles, and other machinery either to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc. Perhaps the most common form of sprocket may be found in the bicycle, in which the pedal shaft carries a large sprocket-wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the rear wheel. Early automobiles were also largely driven by sprocket and chain mechanism, a practice largely copied from bicycles.

Sprockets are of various designs, a maximum of efficiency being claimed for each by its originator. Sprockets typically do not have a flange. Some sprockets used with timing belts have flanges to keep the timing belt centered. Sprockets and chains are also used for power transmission from one shaft to another where slippage is not admissible, sprocket chains being used instead of belts or ropes and sprocket-wheels instead of pulleys. They can be run at high speed and some forms of chain are so constructed as to be noiseless even at high speed.

E. DC motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC

motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.



Figure 5 : DC motor

DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

F. Solar panel

Photovoltaic solar panels absorb sunlight as a source of energy to generate direct current electricity. A photovoltaic (PV) module is a packaged, connected assembly of photovoltaic solar cells available in different voltages and wattages. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.



Figure 6 : Solar panel

3. LAYOUT DRAWING

TREADMILL ELECTRIC BICYCLE

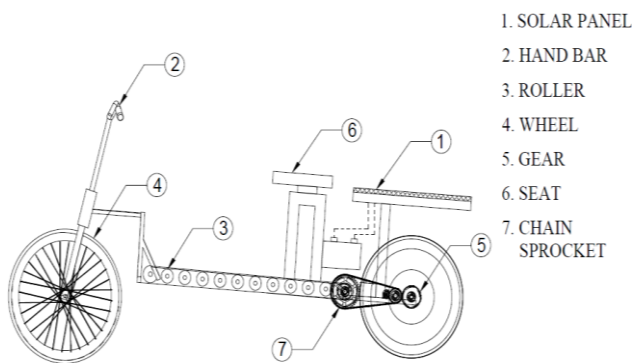


Figure 7 : Layout drawing

1. SOLAR PANEL
2. HAND BAR
3. ROLLER
4. WHEEL
5. GEAR
6. SEAT
7. CHAIN SPROCKET

4. WORKING PRINCIPLE

The setup consists of a treadmill setup which has a belt moving between two rollers. The motion to the conveyor setup is given by a hub motor. The motor is operated by a battery. The battery in turn is powered up by the solar panel. The sunrays falling on the solar panel is directly converted into the electrical energy and is stored up in the battery which later delivers power to the motor. The motor delivers motion to the treadmill setup through the pulley and the belt drive mechanism.

As the Switch ON, the power from the motor is delivered to the rollers such that the entire setup moves acting as an electric bike. As the bike moves, the traveler can able to walk on the belt so that separate time for walking may not be allotted. The shaft of the tread mill roller and the wheels of the electric bike are connected by means of sprocket and chain drive so that when the person walks, the wheels attains motion and the entire vehicle moves. The power is transmitted with the help of the spur

gears. The spur gears are used for increasing the rotational motion.

5. CONCLUSION

In this concept we have combined three different concepts together to make it to function as one. This concepts makes the people to be healthy and it reduces air pollution as well as the consumption of fuel is also reduced. In future this vehicle can be upgraded with several smart gadgets like lighting, self balancing concepts, improved braking techniques and the transmission systems.

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