

Generation of Electricity through Treadmill

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Abstract— In this modern world, people are busy with their daily chores. So, they could not concentrate on their personal health, as well as people are not interested on investing money on buying exercising machines and become stressful physically and mentally. Another problem faced by the world is energy crises. Many experts say that in future there will be more demand for energy and there will be a large energy deployment. Concentrating on these two problems the paper is aimed at producing electricity with the help of tread mill that run or operate manually. In this paper, two benefits are obtained out of one. The manually operated treadmill runs when the runner does some work on it. The output is fed to the dc generator and the regulator provides required amount of constant output. The paper provides seven times of the charging of the mobile or load when the tread mill is operated for fifteen minutes. Hence, electricity is not only generated but also saved to some extent. In addition, this system also keeps fitness lovers fit.

Key words: Manual Treadmill, DC Generator, Gear, Regulator, Load and Booster Circuit

I. INTRODUCTION

Energy is available in various resources. The two main categories of energy are renewable and non-renewable energy. The major sources of renewable energy are solar, wind, tidal, hydro and geothermal energy. Renewable energy is an energy that utilizes the sources available in nature.

A treadmill is a mechanical device that is used as an exercise machine for running and walking by staying in the same place. Sir William cubit in the year 1818 developed the manual treadmill. The main purpose for the invention is to give punishment to the prisoners. The Prisoners had to work on the manual treadmill for 6 - 12 hours a day. Grinding grains, pumping water, power ventilators in mines are some of the punishments given to prisoners.

Presently, there are two types of treadmill that are used for exercising. They are electric treadmill and manual treadmill. The electric treadmill uses electric power as the input where the conveyor belt is rotated by means of motor. Another type is manual treadmill here the conveyor belt is moved by the mechanical effort of the user. This paper describes about the use of manual treadmill.

The manual treadmill converts mechanical energy into electrical energy. So, the generation of electricity through manual treadmill comes under renewable form of energy. The manual treadmill uses up the waste mechanical energy that is delivered during the period of exercising and convert into useful electrical energy. This output electrical energy obtained can be used for energizing small to large electrical gadgets depend upon the amount of energy that is delivered at the period of operation.

The manual treadmill is provided with a large conveyor belt, when the user works on the manual treadmill the belt rotates from the mechanical energy applied by the user. The manual treadmill has one or more flywheel. The flywheel is connected with the belt and set into motion due to the rotation of the belt. The unwanted mechanical energy obtained from the flywheel is converted into an electrical energy. The amount of electrical energy produced also depends upon the number of flywheel connected to the system.

Cost is the major drawback of the existing electric treadmill system. Some of the treadmill uses loud motors which interfere with other activities of the nearby equipment. Maintaining and working on an electric treadmill always requires a professional trainee.

The conveyor belt in the electric treadmill rotates by providing an electrical energy to it and the user works on the running belt whereas, in manual treadmill the user gets the mechanical power as input to move or run the belt and performs the work. The output from the work is fed as a mechanical input to the generator that delivers electrical output. So, the process is vice versa.

Manual treadmill is used in order to reduce drawback of electric treadmill. It is not only used for producing electricity but also to keep the runner fit by working with more effort than electric treadmill.

In section II, description is given for manual treadmill. Section III discusses about different parameters and results. . The future work and conclusion are discussed in the Section V.

II. PROPOSED TREADMILL

The treadmill works on the basis of energy conversion. When a user is exercising on a treadmill the effort that is put by him can be converted as a useful energy.

The manual treadmill is provided with a conveyor belt. The belt moves by applying the mechanical power delivered by the user and drives the flywheel. The flywheel is attached with the belt and rotates the gear attached with it. The gear setup is selected depending upon the amount of energy required by the user from the manual treadmill. The gear that is found attached to the flywheel is known as the driving gear and the other gears are known as the driven gear.

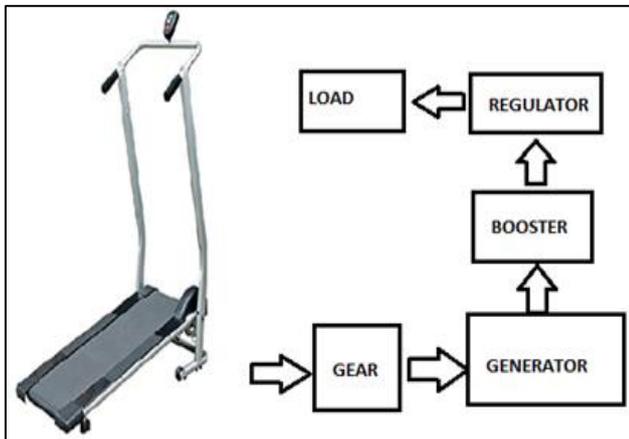
The number of teeth in the driven gear will be half in number with the number of teeth in the driving gear. One side of the driving gear is attached to the flywheel and the other end is connected to the shaft of the dc generator.

The rating for the dc generator also depends upon the amount of electrical output required by the user. The electrical energy obtained as the output from the dc generator is further sent to the booster circuit. In the booster circuit, the output voltage is boosted up from 2 V to 5 V.

The regulator circuit consists of an IC 7805 voltage regulator, which regulates and produces constant output of 5 V to the load.

Normally, electrical gadgets like mobile phone, chargers and the batteries can be connected to the treadmill setup as load. They can also be stored and used in future for further improvement on the manual treadmill.

A. Block Diagram:



The main objectives of the proposed system is to produce, save energy and generate electricity at low cost. The generation of electricity through manual treadmill not only reduces the pollution but also save energy to some extent.

B. Hardware Implementation



The above setup is the manual treadmill arrangement along with gear set up.

III. PERFORMANCE EVALUATION

The readings are recorded from three persons belonging to different weight by measuring the parameters such as speed and voltage.

The electrical equipments used for the measurements are tachometer and multimeter.

Speed can be measured using tachometer in terms of rpm (revolution per minute). Voltage can be measured using multimeter in terms of V (volt).

The rating of dc generator used is 12V and 1500 rpm.

Gear ratio:

$$\text{Driving gear} = 90 \text{ teeth}$$

$$\text{Driven gear} = 36 \text{ teeth}$$

$$\begin{aligned} \text{Number of rotations} &= \text{Driving gear} / \text{Driven gear} \\ &= 90/36 \\ &= 2.5 \text{ times} \end{aligned}$$

For one rotation of driving gear, the driven gear is rotated 2.5 times the driving gear. If the teeth of driven gear reduced then the number of rotations of the same will be increased.

A. Tabulation for Speed (rpm) Vs Voltage (V):

WEIGHT(kg)	SPEED(rpm)	VOLTAGE(V)
57	308	2.3
	509	5.4
	602	6.8
66	309	4.5
	510	6.6
	615	7.7
72	312	5.3
	508	7.4
	605	10.3
	813	11.6
	915	13.2

From the above table, it can be inferred that if the speed increases then the voltage increases for a constant weight is considered.

In the above table, for the set of reading with person between 75-80 kg the voltage obtained for the speed of 900 rpm is equal to that of the voltage obtained by the person between 65-70 kg running at 600 rpm. It is inferred that weight also as an account in the output voltage.

A person cannot run at required speed. Hence as person with different weight can run at different speed. The user cannot accurately maintain at a constant speed. Hence the speed slightly varies.

The above tabulation is also checked for different weights.

SPEED(rpm)	WEIGHT(kg)	VOLTAGE(V)
312	57	2.3
	66	4.5
	72	5.3
510	57	5.4
	66	6.6
	72	7.4
605	57	6.8
	66	7.8
	72	10.3

IV. CONCLUSION & FUTURE SCOPE

The manual operating treadmill is simple in design. This electricity generator is a more sustainable one. A wide range of health problems can be managed using this manual

treadmill. It is useful for areas where electricity is not available.

Electrical energy can be saved by using this low cost manual treadmill with electricity generator. Greenhouse gases can be reduced up to some extent and strength of muscles can also be improved.

The generation of electricity through treadmill can be expanded in future in many ways to serve many purposes such as to produce electrical energy and get fit.

As a part of future work, the number of gear systems can be increased and large amount of output voltage can be obtained. The energy can be stored in a power bank or in batteries.

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