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A Study on Solar Driven Walking Bi-Cycle

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ABSTRACT: As a humongous steep increase in global warming and major novice health concern which are caused due to combustibles, are in linkage to transportation facilities as humans are dependable, which cannot eradicate it. Solar power, a non conventional or renewable energy source and some fitness components are used in this project which is feasible and manoeuvre in real transportation world. So i took up an opening in combining these two major concerns and developed a new solar panel technology to an pre-existing bi-cycle called solar powered health cycle, which consists of a tread mill belt and a 12V brushless dc-motor, motor controller, a sealed lead ion battery, throttle valve and motor controllers. which are contemporarily and solely introduced in this project in which the pre-existing cycle has a dc chargeable power source, which works on it. But having another major problem in older version is Balancing which is completely resolved by having an two extra guided wheels of small size fitted to the rear wheel of this cycle which gives an immense balancing support in long deep turns and also the pot hole on road and an additional benefit of great gyroscopic balancing. So by this unorthodox design, human can achieve in minimizing the rise on effect in global warming and major health theme such as obesity, heart attack etc. and can also attain short-distance travel to home, office, etc. thereby reducing the pollution, as well as a great results in physical fitness by using this cycle.

KEYWORDS: Solar Panel, Photovoltaic, Treadmill Belt, Renewable Energy Dc Brushless Hub Motor, Sealed Lead Ion Battery, Motor Controller, Voltage Regulator, Sprocket, Chains.

I. INTRODUCTION

Bicycles are one of the most ubiquitous forms of transportation in the world. Most children remember their first bike; with it came the chance to explore their world with more freedom than ever before. As we grow, however, bicycling becomes more than just a childhood rite of passage. Wind in our hair and feet on the pedals, we have several good reasons to climb on and take a trip. Much of the world uses bicycles as a primary form of daily transportation. What would take several hours of travel on foot becomes faster and more efficient on two wheels. Some cyclists take trips across entire states or cross-country solely on a bicycle. Reaching speeds of 15 miles or 30 km an hour is achievable by even beginning cyclists, while more experienced riders can reach speeds equivalent to automobile travel. "Century riders" travel 100 miles or more within a typical day. Not to be constrained by simple transportation, bicycles (stationary and otherwise) have helped people become healthier by losing excess weight and improving cardiovascular fitness. The exercise benefits of cycling are well known. Using the largest muscles in the body, bicycling allows riders to reach aerobic heart rates that drive up metabolism, and give a good workout. With the relative newcomer in the bicycle world, mountain bikes, this form of transportation is taking us on rugged terrain once thought impassable by anything other than hiking boots or pack animals. Extreme sport enthusiasts have adapted the bicycle to perform gravity defying stunts, such as flips and mid air acrobatics, in a style known as BMX (Bicycle Motor cross). In short, bikes remain a popular way to get people between points A and B, whether those destinations are found on a map, from one state of health to another, or to explore the unknown. Bicycles have become an important part of the landscape. Most people understand the saying, "as easy as riding a bike." Or we understand that some dormant skill is easy to pick back up if it's "just like riding a bike." Likewise, many immediately think of bicycles when we make an allusion to coasting", "picking up speed", or "going downhill". Because of technological advances in storage cells and electric propulsion systems in recent years and in response to the growing demand for clean, efficient methods of transportation

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in our urban communities, electric bicycle development and marketing has surged ahead, especially in Asia and Europe.. E-bikes are not a replacement for conventional bicycles. However, they allow a greater number of people to travel on two-wheeled vehicles. In the future, they could even become a means of locomotion that could substitute for the automobile, particularly in warmer weather. E-bikes are for everybody, especially those who are not very active in sports, those with physical disabilities and seniors. They are also for veteran cyclists who commute to work on conventional bicycles to save money on fuel but wish to avoid arriving at the office covered in perspiration. Growth in e-bike use has skyrocketed since the electrically assisted bicycle (EAB) was introduced in 1997 by the Japanese firm Yamaha. This version of the e-bike has a small motor mounted on the back wheel to double the power generated by the cyclist. In 1998, the company scored a major commercial success by selling 500,000 units worldwide, making Japan the e-bike market leader. The European market is growing as well, with more than 100,000 units sold in 1999. The mechanism used in solar health cycle is versatile of its kind in which, the cycling pedals are replaced a treadmill belt. The prototype design requires an treadmill belt, shafts, the frame of treadmill, the freewheel gears, chain drive and gear chain. The platform on which the treadmill belt is placed is fabricated.

All the links are made up of normal MS (mild steel) including the head which has a direct contact with the treadmill belt. The system is expected to move as heavy weights up to 150 KGs approximately. The aim of the project work is to design and fabricate a solar walking cum cycle mechanism that makes much easier to move. People from one place(section) to the other even while processing in the factories, industries, etc.

Exercise are advised for health promotion, and prophylaxis for many cardiovascular diseases and also for rehabilitation after an episode of disease. Among the exercises aerobic exercises are appropriate for these purposes. To do aerobic exercise many methods are available for example: running, jogging, walking, cycling and others. Among different modes of exercises in the modern busy life, the cycling and treadmill exercises are the commonest to perform as indoor aerobic exercises. In solar powered motor driven treadmill exercise which is similarly to walking or jogging or running depending upon the speed of the treadmill motor is becoming more familiar to all. Thus we made an innovation to take that treadmill in park. This is nothing but having a walk in a park. The electric bicycle (e-bicycle) market varies greatly by product type and regional demand. The placement of electric motors for e-bicycles is also receiving increased consideration. E-bicycle can have motors in one of three locations: The rear wheel hub is the most popular location, and most of the large Chinese market and American as well as European markets is utilising rear hub motors. Rear wheel hubs are thought to be best for throttle-controlled bikes, whereas the other locations work well with e-bicycles that only provide electric power when the pedals are being used (pedal assistance). The mid-mount motor is the fastest growing segment, in part due to strong competitors like Panasonic and relatively new competitors including Bosch.

II. PROBLEM STATEMENT

Present modern day world, there are two main issues which are causing trouble for mankind is the global warming which is caused by extensive use of combustibles and automobiles even for short distances also. Due to this there is an immense effect on environment and also depletion of fuel sources. The second concern is that lot of people are now majorly suffering from novice health issues. This is because lack of proper exercise. So I came up with the new pioneering idea in modern transportation world and named as solar powered health bicycle which can make people walk while they ride.

III. OBJECTIVE

The solar powered health cycle is totally new gateway in transportation. With the solar powered electrical assistance it takes a very minimal effort to walk than "a walk in park". Its main working comprises of solar panel with voltage regulator and boost converter, a brushless direct current motor, a sealed lead ion battery, and the treadmill belt, all these components make cycle run smoother, easier and in very conventional way. By this the rise in pollution can be greatly minimized and also make people exercise while they travelling to various destinations. And ultimately the depletion of natural resources can be minimized.

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IV. WORKING



The working of the health cycle is as follows; they are four stages of working mechanism, in the first stage the solar panel play a key role, as we are running on solar energy, the sun rays contains of photons come and directly hits the solar panel which consists of schematic arrangement of solar cells , convert the photons into electrical energy using photovoltaic effect. The second stage consists of charge controller, voltage regulator, battery, in which the electrical energy from panel is in form of un controlled stage which in turns convert it into controlled state and voltage regulator regulates the voltage i.e; input voltage is converted into higher regulated voltage and stored in sealed lead ion battery of suitable amp power. In the third stage the energy stored in battery is the passed through the DC-DC boost converter and is then supplied to the brushless direct current motor which contains a permanent magnet and provides high torque and smooth noiseless operation which is fitted into the rear end of the cycle. Finally in the fourth stage, the sprocket and chain drive mechanism takes place . The power from motor is then transferred to the treadmill belt connected to the couple of rollers in front and rear of belt through sprocket and chain which is fitted in the rear end off the wheel and treadmill belt and then the belt turns moving the person in required direction.

V. MATERIAL SELECTION

The materials used in this project are detailed as follows:

- 1) Mild Steel.
- 2) Nylon rubber fabric.
- 3) PVC (polyvinyl chloride).

Mild Steel:

The frame of treadmill and front & rear rollers are made up of mild steel.

Reasons:

Easy availability.
It has good mechanical properties.

Nylon Rubber Fabric:

Standard material available for tread belt is nylon fabric. So we use this material for treadmill belt. Nylon rubber fabric is cheap and easily available, less in cost & having property of wear resistance.

PVC(Polyvinyl chloride):

PVC pipes are used as a supportive roller in treadmill frame. PVC pipes are used because those are light in weight, easily available, cost is less and also having a smooth surface finish which gives smooth motion of belt on the surface of supporting rollers.

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VI. SELECTION OF MATERIAL

1) HUB MOTOR:

| | |
|--------------------------|----------------------------------|
| Type and Design of Motor | Hub and Brushless Direct Current |
| Power Rating | 250W |
| Torque | 12 N-m |
| Speed (rpm) | 300 |
| Rated Voltage(V) | 24 |
| Efficiency(%) | 80 % (approximately) |
| Noise(db) | <65 |
| Weight(kg) | 4 |



2) SOLOR PANEL:

| | |
|---|-----------------------|
| Maximum Power (Watt) | 20 |
| Charging Current (Amp) | 2 |
| Open Circuit Voltage (V) | 21.6 |
| Max Power Voltage (V) | 17 |
| Short Circuit Current | 1.316 |
| Power Measured at Standard Test Condition | 1000W per m2 at 25 C |
| Lifespan | 25 years |
| Size | 500mm × 338mm. × 35mm |



3) VOLTAGE REGULATOR:

| | |
|----------------------|--------|
| Output Voltage | 24 V |
| Open Circuit Voltage | 26.8 V |
| Amp- Hour Rating | 10 A |



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4) SEALED LEAD ION BATTERY:

| | |
|------------------------------|-----------|
| Open Circuit Voltage (Volts) | 28.7 V |
| Charging Time | 8-9 Hours |
| Amp Hour Rating | 35 Amph |
| Voltage | 12 V |
| Cycle Life | 5 Years |
| Operating Temperature C | -10 TO 60 |



VII. SCOPE

What make the solar powered health bicycle amazing ? well we have the answer. It has same fat burning features as regular treadmill . but what makes it special ? yes it does because we can travel as well as we can do walking. Based on study, men burn 124 calorie in 1 km running on treadmill and 88 on walking. women on other hand burn 110 and 75 respectively.

It allows you stay physically active while travelling at the same time. we can practically stay healthy and do exercise at whatever time we can. if we go out often, you get to exercise often. it features a rugged design and all terrain that let you down through rough roads or any other paths.

we can travel seamless with the solar panel . But What do we do when there is no sunlight ? No problem, we also came up with solution , we have installed a high storage battery that let you drive up to the certain calculated distance .

It lets you jog or take a walk without getting your shoes dirty or modified. Because of its hard wearing belt that offers grip, you don't need to worry about slipping or falling off the treadmill.

We also came up with new idea in balancing of this cycle. It consist of two guided small wheel fitted to the rear end of the cycle with active spring that lets you give full balance under steep turns and has good structural stability in pot holes.

But even if you are not active. You can still ride the bike by switching of the treadmill and can reach the destination with solace.

VII. METHODOLOGY

DESIGN:

In our attempt to design a walking bike, we have adopted a very careful approach. Total design work has been divided into two parts mainly,

- 1) System Design.
- 2) Mechanical Design.

System design mainly concern with the various physical concern and ergonomics, space requirements, arrangement of various components on the main frame of treadmill, arrangement of tread belt and rollers, position of braking system, arrangement of motor, sprockets, ease of maintenance, scope of further improvements, ground clearance etc. In mechanical design, the components are categorized into two parts.

- 1) Design Parts.
- 2) Parts to be purchased.

For design parts, detailed design is done and dimensions thus obtained are compared to next highest dimensions which are readily available in the market. This simplifies the assembly as well as post production servicing work. The various tolerances on work pieces are specified in the manufacturing drawing. The process sheets are prepared and passed on to the manufacturing drawing. The process sheets are prepared and pass on to the manufacturing stage. The parts are to be purchased directly are specified and selected from standard catalogue.

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WORKFLOW :

sun rays consists of photons hits solar panel and electrical energy is generated



Electrical energy generated goes to battery via charge controller and voltage regulator



Energy stored in battery is given to the motor via DC-DC boost converter



Power from motor is transferred to treadmill belt via sprocket and chain mechanism.

IX. RESULT

The cycle which we have developed has been an important aspect in green transportation. From my experimental observation it has been found that, solar panel which we have installed takes 4 hours to fully charge the battery(the power of battery and solar panel has been taken in experimental condition). It has also been founded that the balancing of the cycle on principle of gyroscopic principle had worked out beneficiary in every kind of road condition. Finally the cycle which i have developed had been a satisfaction in our project.

X. CONCLUSION

Solar powered health bicycle is modification of existing walking bicycle. In this we have made a shear modification of treadmill and cycle running through solar assisted energy, which is a non-conventional and renewable energy. It has a great variable resistance feature which means people of young and old age can ride this bike with great pleasure as well can attain great body fitness and also can travel to their short from destination . It has also played a predominant role in global warming and also took up some part in fuel less transportation method. It is completely eco-friendly and emission free with no running cost and less maintenance. This cycle can be an adaptable mode of transportation for rural and urban areas.

REFERENCES

- [1] Design of machine members 1 by RS. KHURMI, S. Chand publications pvt.ltd 2016 edition(revised).
- [2] A Text Book Of Power Plant Engineering by R.K. RAJPUT.
- [3] Arsie, I., Rizzo, G., Sorrentino, M., "Optimal Design of a Hybrid Solar Vehicle," Proceedings of the International Symposium on Advanced Vehicle Control, Department of Mechanical Engineering, University of Salerno, Italy.
- [4] Khurmi R.S. & Gupta J.K., Theory of machines, S.chand, Delhi, 2008.
- [5] Bhandari V.B., Design of machine elements, eighteenth edition, MC Graw-hill companies,2003.
- [6] Graham S. Aikenhead, (2011) "Bicycle Applications for On-Board Solar Power Generation System Adaptation". Guelph Engineering Journal, Vol. 4, page 9 - 23. ISSN: 1916-1107.
- [7] Grin Technologies Ltd., "e Zee Bike Conversion Kit", October 2010.
- [8] Solar Engineering of Thermal Process by John A Duffie and William A Beckman.
- [9] Vijay Gupta "The bicycle story" publishes by Vigyan Prasasr.
- [10] . <http://motorbicycling.com>
- [11] International Journal of Sports Medicine [1998, 19(7):455-461] M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.
- [12] S.S. Ratan; Theory of Machine, the McGraw. Hill Companies, Second Edition.

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