Scientific Journal of Impact Factor (SJIF): 5.71

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Technophilia-2018.

Volume 5, Special Issue 04, Feb.-2018 (UGC Approved)

Flywheel Based Battery Charger

[1]Awad T.R., [2]Dongre A.S.,[3]Gupta P.S., [4]Hande N.S., [5]Padghamkar S.D.

[1]Mechanical Department, Jaihind Polytechnic Kuran, Maharashtra
[2]Mechanical Department, Jaihind Polytechnic Kuran, Maharashtra
[3] Mechanical Department, Jaihind Polytechnic Kuran, Maharashtra
[4]Mechanical Department, Jaihind Polytechnic Kuran, Maharashtra
[5]Mechanical Department, Jaihind Polytechnic Kuran, Maharashtra

Abstract — *In remote areas, hilly regions, strategic location, border areas (army deployment), Islands etc. generation of power is scanty if not nil. In these situations a Small Manual Battery Charging Unit would be of great help to provide power supply to battery chargers or battery operated gadgets like mobile phone, communication devices, radio, lamp, fan, TV etc. This product was conceived while studying various means to charge the batteries of an energy efficient lamp. The present design relates to very compact and easily portable power-generating unit, which besides being used as a power generator and battery charger can also be used as cycle exerciser. The power-generating unit is pedal operated. It serves dual purpose of power generation and helping the person to maintain physical fitness through exercise of muscles of legs and lower torso. The force applied to the pedals gets transmitted to the flywheel rotor unit of power generating device through chain-sprocket and gear train. The sizes of sprockets and gears are so chosen to achieve suitable rotating speed of the flywheel rotor for power generation. The shape and size of rotor is chosen to act as a flywheel and impart suitable moment of inertia. The electrical power so produced can be fed to a generator unit and plurality of electrical connectors in the generator unit provides electrical power to various electrical devices. As per the suitability of individual user the height of the present design can be adjusted. The design enables hands free operation and simultaneously the user can engage himself in other activities like reading, watching TV etc. The user can relax intermittently without stopping the motion of the rotor unit abruptly.*

Keywords- *Battery, generator, power generation, pedal, flywheel.*

I. INTRODUCTION

The use of fossil fuels and other non-reusable sources of energy must be reduced in order to keep emissions low and alleviate the use of diminishing resources. The idea of human powered generation has been implemented in many different situations. Some examples include hand-crank radios, shaking flashlights, and receiving power from gym equipment (William and Jeffrey, 2012). The use of exercise equipment for a clean source of energy would turn out to be an even more fun experience for participants; it would provide them a means to exercise while indirectly generating power. The pedal operated power generator utilizes human energy to produce electricity quickly and efficiently. The goal is to provide technological solution to problem in the rural world by using detailed opportunity recognition, evaluation, and development of prototype. The prototypes are then turned over to the developing world for manufacturing, distribution and use. Less commonly, pedal power is used to power agricultural and hand tools and even to generate electricity. Some applications include pedal powered laptops, pedal powered grinders and pedal powered water wells. Some third world development projects currently transform used bicycles into pedal powered tools for sustainable development. Using human powered generation gives a power source that is not directly derived from natural sources. An example is that a human powered generator can be operated if there is no sun for solar generation, no wind for wind generation, and no water for hydro generation. The power generated from pedal is perfect for remote areas, hilly regions, strategic location, Islands etc., where electricity generation is scanty if not nil. In these situations, a small portable power generating unit would be of great help to provide power supply to charge battery-operated gadgets like mobile phones, lamps, radio, communication devices, etc. It is important to visualize new ways to bring power to the people as population continues to grow and power shortages continue to occur. Much of the power that is provided to people today is done in very un-sustainable ways; new ideas are needed to transit into a post cheap-petroleum era. This design relates to very compact and easily portable power-generating unit, which besides being used as a power generator can also be through exercise of muscles of legs. It can be pedaled or cranked by hand/foot to charge 12 volt batteries and run small appliances used as cycle exerciser. It serves dual purpose of power generation and helping the person to maintain physical fitness.

II. LITERATURE REVIEW

2.1 Short History on Pedal Powered Machines

Throughout human history, energy has generally been applied through the use of the arms, hands, and back. With minor exceptions, it was only with the invention of the sliding-seat rowing shell, and particularly of the bicycle, that legs also began to be considered as a "normal" means of developing power from human muscles (Wilson, 1986). Over the centuries, the treadle has been the most common method of using the legs to produce power. Treadles are still common in the low-power range, especially for sewing machines. Historically, two treadles were used for some tasks, but even then the maximum output would have been quite small, perhaps only 0-15 percent of what an individual using pedal operated cranks can produce under optimum conditions. However, the combination of pedals and cranks, which today seems an obvious way to produce power, was not used for that purpose until quite recently. It was almost 50 years after Karl von Krais invented the steerable foot-propelled bicycle in 1817 that Pierre Michaud added pedals and cranks, and started the enormous wave of enthusiasm for bicycling that has lasted to the present. Ever since the arrival of fossil fuels and electricity, human powered tools and machines have been viewed as an obsolete technology. This makes it easy to forget that there has been a great deal of progress in their design, largely improving their productivity. The most efficient mechanism to harvest human energy appeared in the late 19th century: pedaling. Stationary pedal powered machines went through a boom in the turn of the 20th century, but the arrival of cheap electricity and fossil fuel abruptly stopped all further development (Kris, 2011). Otto Von Guericke is credited with building the first electrical machine in 1660. This form of electricity precedes electromagnetic energy which dominates today. The landscape for today's electricity usage practices bloomed from 1831 to 1846 with theoretical and experimental work from Faraday, Weber and Gauss in the relationship of current, magnetic fields and force. These theories enabled the design modern motors and generators. From 1880 to 1900, there was a period of rapid development in electrical machines. Thus this section reviews the works that has been done on human power generation.

2.2 Early Development

Studies in power generation shows that bicycling is one of the most efficient form of power generation known, in terms of energy expended per person. McCullagh, (1977) gives us an insight into the test conducted by Staurt Wilson using a 24V (at 1800rpm), 20A generator to charge a 12V car battery. A belt-drive was used to connect a 15.5” diameter bike flywheel to a 2.5” diameter pulley that turned the generator. During this test, an average cyclist produced 75W of sustainable electrical power 12V (900rpm) for a period of one hour. In 1980, Carl Nowiszewski a mechanical student at the Massachusetts Institute of Technology worked with Professor David Gordon Wilson on a design of a human powered generator which when built will serve as an auxiliary control function in a sail boat in an Atlantic crossing. The energy storage was primarily for automatic steering while the pilot sleep and the pedaling was a way of keeping warm and avoid boredom. The overwhelming problem in the design was the cramped quarters which Nowiszewski eventually solved. And then in 1988, George Alexander Holt III designed a human powered generator using recumbent bicycle technology for use in a sail boat using 6061-T6 aluminum; he built a light weight foldable apparatus. The human power requirement was 120watt at 75rpm (George, 1988).

2.3 Recent Development

Mohd and others (2013) discussed charkha device in India, stated that spinning wheel horizontally could be rotated by a cord encircling a large, hand-driven wheel where the fiber is held in the left hand and the wheel slowly turned with the right. Holding the fiber at a slight angle to the spindle produced the necessary twist. Jansen and Slob (2003) improved the power generation system known as “Better Water Maker” (BWM) water disinfection system. The BWM was designed for use where water is unsafe for drinking and electricity is scare. The BWM utilizes a manual hand crank to provide power to its pump. They also studied one hand cranking and found that 50w of power could be sustained for up to 30 minutes, which is more than double the 17w required by the BWM. As early as 2007, fitness facilities around the world have begun researching applications for converting human power to electricity. The California Fitness facility in Hong Kong was one of the first gym establishments to incorporate human powered machines. Started by French inventor Lucien Gambarota and entrepreneur Doug Woodring, the gym began a program called “Powered by YOU” in which the excess energy generated by members on 13-step cycling and cross training machines is diverted and converted to power lighting fixtures in the gym (Gerard, 2008).
Maha and Kimberly (2010), in the Proceedings of ASME 2010 4th International Conference on Energy Sustainability made us to understand that other gyms in the United States began to harness human power as well. The Dixon Recreation Center at Oregon State University (OSU) is one of the many facilities retrofitted between the years 2008 and 2009 by the Clearwater, Florida based company known as ReRev. The company retrofitted 22 elliptical machines at OSU so that the excess energy generated by patrons was diverted to the electric grid. According to the company’s website, “An elliptical machine in regular use at a gym using ReRev technology will generate one kilowatt-hour of electricity every two days.” Dean (2008) revealed that human legs are up to four (4) times more powerful than human arms. On average, a human can sustain about 100W of power through pedaling for an hour but only hand crank about 30Ww of power in an hour. Wilson

(2004) demonstrates that a person's oxygen consumption, and consequently their potential power output, decrease with age, with the peak of potential power output being between 20-40 years of age According to Jamie and Aaron (2012), Windstream, Convergence Tech and Magnificent Revolution have manufactured stationary pedal powered generators. Typical design included a back-wheel stand that elevates the bicycle and causes the back wheel to come in contact with a smaller wheel that is hooked up to a “bicycle dynamo” and a large battery.

Throughout human history, energy has generally been applied through the use of the arms, hands, and back. With minor exceptions, it was only with the invention of the sliding-seat rowing shell, and particularly of the bicycle, that legs also began to be considered as a "normal" means of developing power from human muscles (Wilson, 1986). Over the centuries, the treadle has been the most common method of using the legs to produce power. Treadles are still common in the low-power range, especially for sewing machines. Historically, two treadles were used for some tasks, but even then the maximum output would have been quite small, perhaps only 0-15 percent Innovative Systems Design and Engineering of what an individual using pedal operated cranks can produce under optimum conditions. However, the combination of pedals and cranks, which today seems an obvious way to produce power, was not used for that purpose until quite recently. It was almost 50 years after Karl von Krais invented the steerable foot-propelled bicycle in 1817 that Pierre Michaud added pedals and cranks, and started the enormous wave of enthusiasm for bicycling that has lasted to the present. Ever since the arrival of fossil fuels and electricity, human powered tools and machines have been viewed as an obsolete technology. This makes it easy to forget that there has been a great deal of progress in their design, largely improving their productivity. The most efficient mechanism to harvest human energy appeared in the late 19th century pedaling. Stationary pedal powered machines went through a boom in the turn of the 20th century, but the arrival of cheap electricity and fossil fuel abruptly stopped all further development (Kris, 2011). Otto Von Guericke is credited with building the first electrical machine in 1660. This form of electricity precedes electromagnetic energy which dominates today. The landscape for today's electricity usage practices bloomed from 1831 to 1846 with theoretical and experimental work from Faraday, Weber and Gauss in the relationship of current, magnetic fields and force. These theories enabled the design modern motors and generators. From 1880 to 1900, there was a period of rapid development in electrical machines. Thus this section reviews the works that has been done on human power generation.

III. PROBLEM DESCRIPITION

In rural area lack of electricity are the major problem so ,this project is solved the problem of electricity. As we know that the electricity is the main source so project defined electricity save. This project are also helpful for hill station and army sector where electricity are not reached. Its save the money, compact in size and its stored electricity so we used for home appliances and other components.

III. WORK METHODOLOGGY

1. Market Survey
2. Need / Aim
3. Synthesis
4. Material selection
5. Material Description
6. Design of components
7. Modification (Resolution of forces)
8. Detail drawing
9. Manufacturing (Actual work)

REFERENCES

[1] David Gordon Wilson “UNDERSTANDING PEDAL POWER” ISBN: *0-86619-268-9 [C] , Volunteers in Technical Assistance”,* Technical paper 51 VITA 1600 Wilson Boulevard USA 1986
[2] 5-hour energy creator to roll out pedal powered energy solution in India –https://www.treehugger.com/clean-technology/5-hour-energy-creator-roll-out-pedal-powered-energysolution india .hyml
[3] Battery management System –http://www.engineering.com/ProductShowcase/BatteryManagementSystems.aspx
[4] Design and Fabrication of a Pedal Operated Power Generator – Paper by Anyanwu, S. Ikechuku and Ashine E. Anthony, Department of Mechanical Engineering, University of Port Harcourt, Nigeria
[5] A Guide To Understand LI-PO Batteries- https://rogershobbycenter.com/lipoguide
[6] The upcycle eco charger -http://www.thegreenmicrogym.com/the-story-of-the-upcycle-eco-charger/
[7] Low RPM Generators -http://www.pmgenerators.com/lowrpmgenerators/
[8] Battery management System – http://www.engineering.com/ProductShowcase/BatteryManagementSystems.aspx