SINGLE PEDAL POWER GRINDER

A PROJECT REPORT

Submitted by

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SANJAY.M (927622BME077)

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in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

MECHANICAL ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR

ANNA UNIVERSITY: CHENNAI 600 025

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BONAFIDE CERTIFICATE

Certified that this project report **" SINGLE PEDAL POWER GRINDER "** is the bonafide work of **" SAKTHIVEL.S (927622BME076), SANJAY.M (927622BME077)VIKAS.V (927622BME101)"**who carried out the project work during the academic year 2022 – 2023 under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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This project report has been submitted for the end semester project viva voce Examination held on _____

INTERNAL EXAMINER EXTERNAL EXAMINER

DECLARATION

We affirm that the Project titled “SINGLE PEDAL POWER GRINDER ” being submitted in partial fulfillment of for the award of Bachelor of Engineering in Mechanical Engineering, is the original work carried out by us. It has not formed the part of any other project or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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2. SANJAY.M	----------
3. VIKAS.V	----------

Name and signature of the supervisor with date

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INSTITUTION VISION & MISSION

Vision

- To emerge as a leader among the top institutions in the field of technical education.

Mission

- Produce smart technocrats with empirical knowledge who can surmount the global challenges.
- Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students.
- Maintain mutually beneficial partnerships with our alumni, industry and professional associations.

DEPARTMENT VISION, MISSION, PEO, PO & PSO

Vision

- To create globally recognized competent Mechanical engineers to work in multicultural environment.

Mission

- To impart quality education in the field of mechanical engineering and to enhance their skills, to pursue careers or enter into higher education in their area of interest.
- To establish a learner-centric atmosphere along with state-of-the-art research facility.
- To make collaboration with industries, distinguished research institution and to become a centre of excellence

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

The graduates of Mechanical Engineering will be able to

- PEO1: Graduates of the program will accommodate insightful information of engineering principles necessary for the applications of engineering.
- PEO2: Graduates of the program will acquire knowledge of recent trends in technology and solve problem in industry.
- PEO3: Graduates of the program will have practical experience and interpersonal skills to work both in local and international environments.
- PEO4: Graduates of the program will possess creative professionalism, understand their ethical responsibility and committed towards society.

PROGRAM OUTCOMES

The following are the Program Outcomes of Engineering Graduates: Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of
13. technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs) The following are the Program Specific Outcomes of Engineering Graduates: The students will demonstrate the abilities

1. **Real world application:** To comprehend, analyze, design and develop innovative products and provide solutions for the real-life problems.
2. **Multi-disciplinary areas:** To work collaboratively on multi-disciplinary areas and make quality projects.

Research oriented innovative ideas and methods: To adopt modern tools, mathematical, scientific and engineering fundamentals required to solve industrial and societal problems

Course Outcomes	At the end of this course, learners will be able to:	**Knowledge Level**
CO-1	Identify the issues and challenges related to industry, society and environment.	Apply
CO-2	Describe the identified problem and formulate the possible solutions	Apply
CO-3	Design / Fabricate new experimental set up/devices to provide solutions for the identified problems	Analyse
CO-4	Prepare a detailed report describing the project outcome	Apply
CO-5	Communicate outcome of the project and defend by making an effective oral presentation.	Apply

MAPPING OF PO & PSO WITH THE PROJECT OUTCOME

Course Outcomes	**ProgramOutcomes**												**Program Specific Outcomes**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO - 1	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 2	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 3	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 4	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3
CO - 5	3	3	3	3	2	2	2	2	3	3	2	2	3	2	3

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ABSTRACT

Now-a-day's pedal powered grinding machine is used only for grinding purpose. Also, it requires lots of efforts and limited for single application use. Another problem in existing model is that it consumed more time and also has lower efficiency. Our aim is to design a human powered grinding machine which can also be used for many purposes like pumping, grinding, washing, cutting, etc

It can carry water to a height 8 meter and produces 4 ampere of electricity in most effective way. The system is also useful for the health conscious work out purpose. The purpose of this technical study is to increase the performance and output capacity of pedal powered grinding machine.

The multipurpose machine that Is ‘exercise bicycle’ which was basically used for exercising purpose has been modified for grinding. Source of power utilized for above purpose is pedal power. The process is relatively simple, small parts of the object is small grinder, using electric drive is not conducive to energy saving.

According to the above technical solution, the operator holds the part to be machined, sit on the seat cushion, two feet on the foot pedal handle and rotate the handle, the handle foot drive shaft rotates, the first drive shaft on which two sprocket rotation, the second sprocket.

Scope of this project

The scope of the project is to get electricity from the flow of water. After power cut we can utilize this power for domestic purpose. It is a portable equipment which is easy to carry anywhere. It is a cost efficient technology. It can generate the electricity for domestic purpose. Portable hydroelectric generator for personal and commercial use. The initial goal is to develop a proof of concept based on the idea of a portable hydroelectric generator. This proof of concept will demonstrate a modular alternator based electrical system that will be mechanically powered by means of a rotating water wheel and helical turbine in two different variations of a mechanical framework It will change the generator voltage so that a control equipment is needed to regulate the voltage. The river flow turbine will start working when water enters the turbine. The water is directed by the guiding angle towards the runner and exits through a draft tube. The runner will rotate due to the kinetic energy of the water so that the turbine shaft will rotate .The generator coupled to the turbine will generate voltage at the output terminal. This type of water turbine is suitable for application in flat rivers and irrigation channels. Environmentally friendly/sustainable, Scalable, Affordability, Reliability, Versatility One of our primary goals is to create a renewable energy generation device that has a low environmental impact. Building upon this primary goal, we want to create an energy generation device that can be efficiently scaled up to meet a variety of electrical demands. While building towards these goals, a key consideration will include developing a cost-efficient design that has a high degree of reliability and versatility. Low-power infrastructure zones; Third-world countries, rural areas. The primary market being targeted by the intended design are areas with low-power infrastructure. The intended meaning of low-power infrastructure zones is an area that has little to no infrastructure for power generation whether commercial or individual. Examples of these low-power infrastructures zones were then considered to be third world countries and rural, isolated areas. A prerequisite for these areas to be considered would be to have a moving water source such as tidal, rivers, streams.

CHAPTER-1

INTRODUCTION

Pedal power is the transfer of energy from a human source through the use of a foot pedal and crank system. This technology is most commonly used for transportation and has been used to propel system. This technology is most commonly used for transportation and has been used to propel bicycles for over a hundred years. Less commonly pedal power is used to power agricultural and hand tools and even to generate electricity. Some applications include pedal powered laptops, pedal power hack saw and pedal powered water wells. Some third world development projects currently transform used bicycles into pedal powered tools for sustainable development. This project concentrates on pedal powered Grinding machining.

An individual can generate four times more power (1/4 HP) by pedaling than by hand-cranking. At the rate of % HP, continuous pedaling can be served for only short periods, approximately 10 minutes. However, pedaling at half this power (1/8 HP) can be sustained for close to 60 minutes but power capability can depend upon age. As a consequence of the brainstorming exercise, it was apparent that the primary function of pedal power one specific product was particularly useful: the bicycle many devices can be run right away with mechanical energy. A grinder is a tool that uses a abrasive particles to remove the materials.

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For exercising purpose has been modified for grinding. Source of power
Utilized for above purpose is pedal power. The process is relatively simple,
Small parts of the object is small grinder, using electric drive is not conducive
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The part to be machined, sit on the seat cushion, two feet on the foot pedal
Handle and rotate the handle, the handle foot drive shaft rotates, the first drive
Shaft on which two sprocket rotation, the second sprocket

There are many electrically operated grinding machines of different configurations and different manufacturers are available for the use in machine shop. These machines can grind jobs of different material preciscly. But our project main to reduce the electrical energy.

CHAPTER-2

2. WORKING

The transmission of power from human to processing unit is carried out through the chain drive. The operator uses his feet & legs to rotate pedal around the crank axle. The bicycle pedals are fixed to a chainring (large sprocket) with teeth that engage the bicycle s continuous chain.

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other.

Gear drives can increase or decrease the speed of the driven shaft relative to the driver. This is achieved by using gears with different pitch diameters or numbers of teeth. A large driver coupled to a small driven gear increases the output speed. Conversely, using a small driver and a large driven gear produces the opposite result. This relationship comes from the fact that the linear speed at a point of contact along the pitch circles of both gears must be constant. This is true for an ideal scenario. This is given by, where v is the linear speed (or velocity), ray and rob are the gear radii. The angular speeds of the driver and driven gears, respectively. The ratio between the numbers of teeth of the driven to the driver gear is known as the gear ratio. Other references define the gear ratio by dividing the number of teeth of the larger gear by the number of teeth of the smaller gear, regardless of the direction of power transmission. The relationship between the angular speed, pitch diameters, and number of gear teeth is expressed by the expressions, Where da and db. Are the pitch diameters, and Na and Nab are the numbers of teeth of the driver and driven gears, respectively. . This relationship comes from the fact that the linear speed at a point of contact along the pitch circles of both gears must be constant. This is true for an ideal scenario. This is given by, where v is the linear speed (or velocity), ray and rob are the gear radii. The angular speeds of the driver and driven gears, respectively. The ratio between the numbers of teeth of the driven to the driver gear is known as the gear ratio. Speed of rotation can also be altered using combinations of different gear types. Examples are worm drives and planetary gear drives. A worm drive consists of a gear with a screw like profile called a worm, and an external gear similar to a spur gear called a worm gear or worm wheel. This arrangement produces output speeds with reduction ratios far higher than ordinary gear trains. However, they cannot be driven in reverse, unlike other gear trains

CHAPTER-3

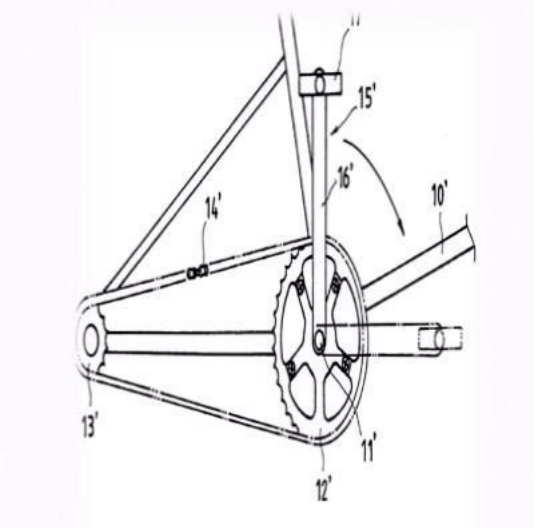
3. MATERIALS

Materials Used:

- Metal frame
- Pedal Arrangement
- Seat
- Ball bearings
- Gear drive
- Chain Sprocket
- Catcher
- Shaft
- Grinder

3.1. PEDAL ARRANGEMENT

A bicycle pedal is the part of bicycle that the rider pushes with their foot to propel the bicycle. The bottom bracket spindle and propel the bicycle's wheels.



3.2.SEAT

A seat is place to sit, often referring to the area one sits upon as opposed to other elements like armrests. Seat is an arrangement in any bicycle on which a person can sit comfortably. In seating arrangement the design factor is always consider according to their use in any vehicle. Seat may be made of plastic, rubber, metal etc.

3.3. BALL BEARINGS

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other.

Ball bearings tend to have lower load capacity for their size than other kinds of rolling element bearings due to the smaller contact area between the balls and races. However, they can tolerate some misalignment of the inner and outer races

3.4. GEAR DRIVE

Gear drives can increase or decrease the speed of the driven shaft relative to the driver. This is achieved by using gears with different pitch diameters or numbers of teeth. A large driver coupled to a small driven gear increases the output speed. Conversely, using a small driver and a large driven gear produces the opposite result. This relationship comes from the fact that the linear speed at a point of contact along the pitch circles of both gears must be constant. This is true for an ideal scenario. This is given by, where v is the linear speed (or velocity), ray and rob are the gear radii. The angular speeds of the driver and driven gears, respectively. The ratio between the numbers of teeth of the driven to the driver gear is known as the gear ratio. Other references define the gear ratio by dividing the number of teeth of the larger gear by the number of teeth of the smaller gear, regardless of the direction of power transmission. The relationship between the angular speed, pitch diameters, and number of gear teeth is expressed by the expressions, Where da and db. Are the pitch diameters, and Na and Nab are the numbers of teeth of the driver and driven gears, respectively. . This relationship comes from the fact that the linear speed at a point of contact along the pitch circles of both gears must be constant. This is true for an ideal scenario. This is given by, where v is the linear speed (or velocity), ray and rob are the gear radii. The angular speeds of the driver and driven gears, respectively. The ratio between the numbers of teeth of the driven to the driver gear is known as the gear ratio. Speed of rotation can also be altered using combinations of different gear types. Examples are worm drives and planetary gear drives. A worm drive consists of a gear with a screw like profile called a worm, and an external gear similar to a spur gear called a worm gear or worm wheel. This arrangement produces output speeds with reduction ratios far higher than ordinary gear trains. However, they cannot be driven in reverse, unlike other gear trains.

3.5.CHAIN SPROCKET

When creating your own human powered vehicles. A chain drive will likely be your chosen power transfer system as t is an inexpensive, easy to install and highly efficient drive mechanism.

3.6. CATCHER

Catcher is a part of rickshaw on which sprocket could be mount. On it threaded design is made by using it sprocket could be tighten.

3.7. SHAFT

Shaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected Directly because of distance or the need to allow for relative movement between them Drive shafts are carriers of torque.

3.8. GRINDER

Stone grinder: It consists of a granite stones which rotate inside a metal drum with the help of an electric motor and the food grains get crushed between the stone and drum.

3.9. COST ESTIMATION:

Components	**Cost(Rs)**	**Total(Rs)**
Metal frame	1200	1200
Seat, chain sprocket	600	600
Pedal Arrangement	500	500
Shaft, bearings	1200	1200
Stone grinder	500	500
	Total(Rs)	4000

CHAPTER-4

4. DESIGN

Design for domestic purpose

CHAPTER-5

5. WORKING PRINCIPLE

The blades where connected with the motor. The blades are kept under the water drain and the force of water rotates the gear drive. The gear drive gives multiple rotations in the dc motor. The increase in force increases the electricity production. The electricity can be stored in battery. In high level industries the power can be consumed directly from the output.

5.1. USES

Basically it can be used in the field of irrigation. Used in

places where there is a continuous drain of water.

e.g. step dams, cooling water drainer, water pumps, etc…

Reduces the energy requirements. It is useful for domestic purposes.

5.2. ADVANTAGES

- Budget friendly
- Renewable energy
- Eco friendly
- Easy to maintain
- No skilled person are required

CONCLUSION

The multipurpose machine that Is ‘exercise bicycle’ which was basically used For exercising purpose has been modified for grinding. Source of power Utilized for above purpose is pedal power. The process is relatively simple, Small parts of the object is small grinder, using electric drive is not conducive

To energy saving. According to the above technical solution, the operator holds The part to be machined, sit on the seat cushion, two feet on the foot pedal Handle and rotate the handle, the handle foot drive shaft rotates, the first drive Shaft on which two sprocket rotation, the second sprocket

CHAPTER-6

6. REFERENCE

[1]. World watch Institute “Use and Capacity of Global Hydropower Increases”

[2]. History of Hydropower” U.S. Department of Energy

[3]. Fardo, S.W., Patrick, D.R., 1985, Electrical power systems technology: Englewood Cliffs, N.J., Prentice- Hall

[4]. U.S. Bureau of Reclamation, 1983,Hydropower, water at work: Denver, Colo.

[5]. U.S. Department of Energy, 1989, Electric power annual, 1988: Administration.

[6]. Inventory of power plants in the United States 1989: Energy Information Administration Publication DOE/ EIA-0095 (89.

[7]. Viessman, W., Jr., and Welty, C., 1985, Water management technology and institutions: New York, Harper and Row [8]. Warnick, C.C., 1984, Hydropower engineering