PEDAL OPERATED WATER PUMP

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ABSTRACT

The Pedal Operated Water Pump is a simple and eco-friendly mechanical system developed to pump water without the use of electricity or fuel. The system utilizes human pedaling effort as the primary source of energy for operating a centrifugal water pump. Rotary motion generated through a bicycle pedal mechanism is transmitted through a belt drive arrangement to the pump shaft, enabling water to be lifted from a lower level to a higher level. The system is economical, easy to maintain, and suitable for rural and remote regions where electrical power is unavailable or unreliable. The developed model demonstrates an effective method of converting human mechanical energy into useful pumping work for small-scale irrigation, gardening, household water supply, and emergency applications.

Keywords: Pedal Operated Pump, Human Powered System, Centrifugal Pump, Rural Water Supply, Sustainable Energy, Water Lifting Mechanism

INTRODUCTION

Water is an essential requirement for domestic, agricultural, and industrial activities. In many rural and remote locations, access to electricity remains limited, making conventional electric pumping systems difficult to operate. Alternative pumping methods that do not depend on electrical energy are therefore necessary.

Pumps are mechanical devices that convert mechanical energy into fluid energy. Among various types of pumps, centrifugal pumps are widely used because of their simple construction, low maintenance requirements, and suitability for continuous water discharge. The proposed pedal operated water pump utilizes human power through a bicycle pedaling mechanism to operate a centrifugal pump, thereby providing an economical and environmentally friendly solution for water lifting applications.

LITERATURE SURVEY

Several methods are available for water pumping, including hand pumps, electric pumps, and engine-driven pumps. Hand pumps are simple but require continuous manual effort and are unsuitable for large quantities of water. Electric pumps provide continuous discharge but depend entirely on electrical supply. Diesel and petrol-driven pumps offer higher capacity but involve fuel expenses, maintenance requirements, and environmental pollution.

Recent studies indicate that pedal-operated systems provide a practical alternative because human pedaling can generate greater power with less fatigue compared to hand-operated mechanisms. Bicycle pedal systems are mechanically efficient, inexpensive, and widely available. These advantages make pedal-operated pumping systems suitable for rural and low-resource environments.

The survey identified the need for a simple, electricity-free, low-cost, and eco-friendly water pumping system capable of operating effectively using human effort alone.

IMPLEMENTATION AND WORKING

Diagram

Construction

The system consists of:

- Mild steel frame
- Bicycle pedal and crank assembly
- Rear wheel mechanism
- Belt drive arrangement
- Centrifugal water pump
- Pump support stand
- Suction pipe
- Delivery pipe

The bicycle mechanism is mounted on a rigid frame. The rear wheel is connected to the centrifugal pump through a belt drive arrangement that transfers rotary motion generated by pedaling.

Working Principle

When the operator pedals the bicycle mechanism, rotary motion is produced at the rear wheel. This motion is transmitted through the belt drive to the pump shaft. The centrifugal pump impeller rotates and generates centrifugal force, creating suction at the inlet pipe and forcing water through the outlet pipe. The process enables continuous water lifting without electricity or fuel.

Methodology

The development of the project was carried out through the following stages:

Step 1: Project Planning

Selection of a human-powered pumping concept suitable for rural applications.

Step 2: Frame Design

A mild steel frame was designed to support the bicycle mechanism and pump assembly.

Step 3: Bicycle Mechanism Selection

A bicycle pedal and rear wheel arrangement was selected to generate rotary motion.

Step 4: Pump Installation

A centrifugal pump was mounted on a separate stand and aligned properly with the wheel mechanism.

Step 5: Belt Drive Arrangement

A belt drive system was installed between the bicycle wheel and pump pulley to transmit power efficiently.

Step 6: Pipe Connection

Suction and delivery pipes were connected to facilitate water intake and discharge.

Step 7: Testing and Adjustment

The assembled model was tested under operating conditions and adjustments were made to improve belt tension, alignment, and performance.

Design Considerations

The following design requirements were considered during development:

- Strong and stable frame construction
- Comfortable pedaling operation
- Efficient power transmission
- Accurate pump alignment
- Ease of fabrication and maintenance
- Low manufacturing cost

These factors contributed to the reliability and practicality of the developed system.

RESULTS AND DISCUSSION

The fabricated model was successfully tested and demonstrated effective water pumping through human-powered operation. During testing, the bicycle mechanism transmitted rotational motion efficiently to the centrifugal pump through the belt drive system. The pump generated sufficient suction and discharge for small-scale water lifting applications.

The system demonstrated the following outcomes:

- Successful transmission of human mechanical power
- Effective operation of the centrifugal pump
- Water pumping without electrical energy
- Smooth operation with proper alignment
- Economical and environmentally friendly performance

The experimental observations confirmed the feasibility of using human energy as a sustainable source for water pumping applications.

APPLICATIONS

The proposed system can be used in:

- Small-scale irrigation systems
- Home gardening and nurseries

- Rural water supply schemes
- Household water storage applications
- Emergency water pumping during power outages
- Educational demonstrations of mechanical engineering principles

These applications demonstrate the versatility and practicality of the developed system.

CONCLUSION

The Pedal Operated Water Pump provides an economical, eco-friendly, and sustainable method of lifting water without electricity or fuel. The developed system successfully converts human mechanical energy into useful pumping work through a bicycle pedal mechanism and centrifugal pump arrangement. The project demonstrates a practical solution for rural and remote areas where conventional pumping systems may not be feasible. The system is simple to construct, easy to maintain, and suitable for a variety of small-scale water pumping applications.

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