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Pedal operated bicycle drain cleaner

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Abstract – *pedal operated bicycle drain cleaner is used to remove the garbage from drainage system. Drain cleaner works on electricity but we are replacing electricity by pedal power. Pedal power generates the rotary motion by using bicycle and rotary motion is converted into mechanical energy which runs the drain cleaner. The drain cleaner are couple with sprocket of bicycle with the help shaft and that shaft rotated the drain cleaner. In Drain cleaner the reversing mechanism is fitted inside the drain cleaner that easily run the drain cleaner according to the sprocket speed. The Pedal Power drains cleaner works only on mechanical energy without electricity. The pedal operated drain cleaner are work without electricity that helps the irrigation in remote areas where electricity is still a major problem along with providing eco friendly environment. It also helps to regulate a good health while pedaling Pedal Powered drain cleaner is not only free from pollution but also provide healthy exercise. Pedal Powered drain cleaner Produces the rising energy costs. Bicycle is the main mode of transportation for many India villagers. Most of these villages are un-electrified. Power generated by pedaling can be converted from mechanical to electrical energy by using either dynamo or alternator. Small powered lighting devices can be charged using dynamo and can be used in the night by students for study purposes. This paper presents methods in generating electricity by pedaling a bicycle. It also explains in detail the method using bottle dynamo to generate power. A detailed analysis of using pedal power is also presented.*

***Key words*:** Belt, Bicycle, Drain Cleaner, Waste Management

1. Introduction

A bicycle, often called a bike or cycle, is a human-powered, having two wheels attached to a frame, one behind the other. The bicycle has undergone continual adaptation and improvement since its inception. Bicycles can be categorized in many different ways: by function, by number of riders, by general construction, by gearing. The more common types include utility bicycles, mountain bi cycles, racing bicycle .The bicycle is extraordinarily efficient in both biological and mechanical terms. The bicycle is the most efficient human-powered means of transportation in terms of energy. India is the second most popular nation in the world and we all know that energy can neither be created nor destroyed but can be transformed from one form to another. But we are wasting resources that can produce energy as if they are limitless.

2. Literature Survey

The Drainage system cleaner is a machine which helps to protect the environment from different kinds of environmental hazards through the promotion waste management by the removal of garbage from the drainage system. These wastes when not removed end up settling in residential places where these wastes are burnt thereby causing climate change otherwise these wastes block the drainage systems thereby causing flooding. The machine is designed in such a way that it generates motion for its functions by itself through the action of running water thereby cutting out the dangers of the powering the machine by other sources of power because of the harshness of the rain on these other sources. The drainage system cleaner has three major parts which are the Propeller, the Cleaner and the Pan all make up for its effective functioning. The Drainage system cleaner was tested on three different days in the first day it rained in the months of September, October and November 2012 respectively. Based on the findings made after the test the Drainage system functioned well when there is maximum load. I therefore recommend the use of this system by various individuals, government companies and waste recycling companies for prevention of environmental hazards and also encouraging waste management. [1]

In this research paper the proposed concept is to replace the manual work in drainage cleaning by mechanical drain cleaner. Now-a-days even though mechanical drainage plays a vital role in all industrial applications in the proper disposal of sewages from industries and commercials are still a challenging task. Drainage pipes are using for the disposal and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage system. [2]

This paper presents fabrication and experimentally investigates the working of Pedal Powered drain cleaner is positioned on its stand in such a way that driven shaft of the centrifugal pump was butted to the bicycle wheel. By pedaling the bicycle, the bicycle wheel rotates thereby rotating the centrifugal pump which in turns discharges water from the sump. It provides irrigation in remote areas where electricity is not available. It is not only free from pollution but also provide healthy exercise. It is reduces the rising energy costs. [3]

In this project the proposal concept is to replace the manual work in drainage cleaning by automated system. Now a day's even through automation plays a vital role in all industrial applications in the proper disposal of sewages from industries and commercials are still a challenging task. Drainage pipes are using for the disposal and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes. [4]

Bicycle is also used for power generation. Power generated by pedaling can be converted from mechanical to electrical energy by using either dynamo or alternator. Small powered lighting devices can be charged using dynamo and can be used in the night by students for study purposes. This principle can be extended to power mobiles, iPods, laptops etc. Power can be also generated from the rotation of the wheels of alternator vehicles like bikes and cars, where there is a possibility of generating more power. The generated power can be either used in the same vehicle or can be stored in a battery for powering some other devices. Riding bicycle helps in maintaining a good physic and along with it power can be also generated. This paper presents methods in generating electricity by pedaling a bicycle. [5]

By doing some research in the past we can say that it is seen that major factors that affect the strength of the machine are design parameters, material selection, raw material defect, and surface imperfection. It is seen that design parameters i.e. operating modes, operating temperature, and imperfections, as we seen as temperature increases the strength of material decreases. [6]

2.1 Overcome From Literature Survey

The human power there is vast scope in economical use of bicycle mechanism as an alternative energy source thereby renewable energy generation as well as exercising for good health cause. The benefits associated with access to safe drainage system provide strong arguments to increase resource allocation to aim at further improving the current waste management situation.

2.2 Objective

The main objective of this project is to minimize or overcome the problem which is in manual machine. Also to increased the dumping rate of waste. And help to operator do easily work the purpose of selecting drain waste water cleaner machine are is follow-

- To make Design Simple and Control.
- Easy to operate
- To save the electricity
- To make the machine easily portable.

2.3 Scope of study

- In future we can tie up with much organization which helps people in their villages to make their life better.
- It is easily used in disaster and ruler area with better efficiency.

Organization is may tied up with the government to help people in rural areas and remote areas

2.4 Benefits from study

- Electricity is save using pedal power.
- It is easily operated and required less maintenance cost.
- It is helps to access safe and clean water for people.
- It removes the garbage from drainage system.

3. Block Diagram

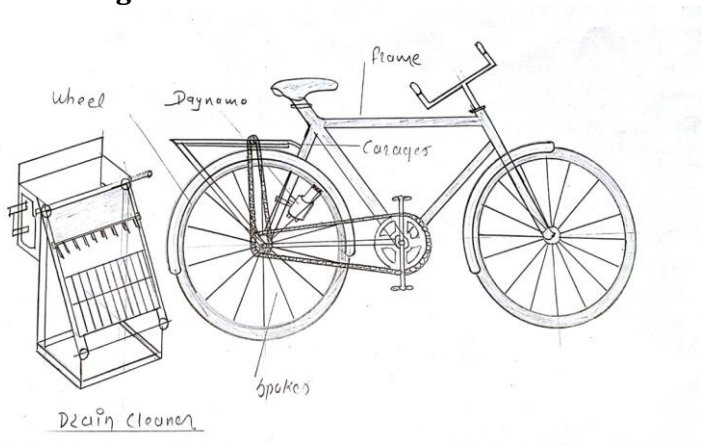

Fig.3 pedal operated bicycle drain cleaner

3.1 Problem definition

Existing problem the drain cleaner work on electricity by using of dc motors and that cannot be used in rural and disaster area. Because there is no availability of electricity, That the reason we are converting drain cleaner which is work on electricity by pedal operated drain cleaner pedal energy. Pedal operated drain cleaner works on rotary motion which generated by bicycle. And To find a solution for the problem of water logging due to plastic, thermocol, metal, etc. To treat problems like malaria, typhoid, etc. caused due to water accumulation.

4. Design Calculation

1] Sprocket

Sprocket pitch = 12.7 mm
Sprocket width = 3.17 mm
Sprocket teeth = 18mm
Inner diameter sprocket =35mm
Outer diameter sprocket = 78mm

2] Chain drive

Link = 112
Chain length =160 cm

3] Bearing

UC bearing =25 mm
BALL bearing =35 mm

4] Shaft

Shaft length =24 cm
Shaft diameter =3.5 mm

Drain box height =33 cm
Drain box width =17 cm
Speed = 60
u =0.31
Q =2.1
We know that

Where

T1= tension in tight side on the belt
T2 = slack side on the belt
V= velocity of flow
A= cross-sectional area
b= width belt
t= thickness of belt
l= length of belt
P= power capacity belt
T= torque transmitted by shaft

V=3.141×0.78×60÷60
V=2.45 m/s

Crass section area on the belt
A= b×t
A=3.17×18
A=57.06 mm square

Maximum tension tight side on the belt
T= tn = 6×a
=2.2×57.06
T=125.53 N.

The mass of length on the belt
M = A×l×d
=57.06×0.160×3.17
M =28.94 kg/m

Centrifugal tension
Tc= m× (v×v)
=28.94× (10.21×10.21)
Tc =301.68

The tension tight side on the belt
T1 = t-tc
=125.53-301.68
T1 = 95.3 N

The tension slack side on the belt
2.3(T1÷T2) = uθ
Log (95.36÷T2) =0.651÷2.3
T2 = 49.69 N

The Power Capacity of the Belt
p = (T1-T2) ×V
P = (95.36-49.69) ×10.21
P=466.29 KW.

The torque transmitted by the shaft
T= P×60÷2×3.141×N
T = 4660.29×60÷2×3.141×60
T = 74.21 N-MM

Adjustable plate as per required height
Back side waste bin Lifting mechanism attached on chain

5. Components and Material Selected

1] Shaft: material is used cast iron

2] Sprocket: material used cast iron

3] Bearing: material used mild steel

4] Chain drive: material used cast iron

5] Drain box: material used cast iron

6] Reversing Gear: material used cast iron

Propeller

This mechanism generates energy needed for the entire machine system through the action of running water in the drainage system. The propeller constitute of eight arms which are flat and are connected to a center rod, also the center rod is rigidly fixed to the two rigidly fixed holding poles across the sides of the drainage system. The arms are interconnected and are being connected to the center rod through a central axis which ensures swift rotation of arms. The arms are of the same width with the drainage systems but only marginally different but is higher in length allowing the arms to easily oppose the running water. The arms also, due to its lightness are pushed by running water to cause rotation. The arms also have soles that are flat that help them to balance and resist motion from oncoming water effectively. The motion is passed out through belts drives A and B. Belt drives A and B are connected to the second and third mechanism respectively.

Belts drives

The links in the drainage system cleaner consist of gears and belts drives, which transmit motion to other parts of the machine system. Belt drive A is connected to the cleaner which allows it to make a motion to sieve out the waste materials in the drainage system. The cleaners move in opposite direction to the propeller, the motion provided by Belt drive a (gear A) is then linked to gear B which allows the Belt drive A to provide a mechanism in the cleaner that moves opposite the direction of the running water.

Cleaner

The cleaner sieves out the waste materials. Just like the propeller, the cleaner consist of eight arms which are also connected to a center rod to allow motion. It receives it source of energy through Belt drive-A from the propeller. Unlike the propeller the cleaner does not wholly constitute of a flat metal but half of it is made of a net to effectively sieve the running water without any form of blockage. The soles of the arms are also made of nets which help the arms effectively sieve the water running in the drainage system

Pan and pan mechanism

The pan is the third part of the system which helps to remove waste materials that has been removed by the cleaner to the trash can it is made of a light metal, it is receives its own energy through Belt B from the propeller and it is also connected to one of the holding poles of the cleaner. The mechanism made up of two gears; gear 1 and gear 2.

The gears are connected with the ratio of 4:1 which helps gear be to create a complete rotator motion, gear 2 constitutes a flat curved "S" shaped metal connected on top of it and also attached in its center to the holding pole. Also the pan itself is held by a smooth rod which allows it to spin thereby releasing material from the cleaner to a trash can. A trash can is dropped at a close distance allowing the pan to pour in the materials from the cleaner.

6. Drain cleaner

6.1 Construction

From design calculation the material which effective to run the drain cleaner is used with proper dimension and material.The pedal operated drain cleaner consist of two main components drain cleaner and bicycle. The drain cleaner is run with the help of bicycle. Drain cleaner also may consist of shaft which is used to run the drain cleaner and also consist bearing, chain drive, cleaner blade etc. the drain cleaner is run on the electricity in existing but we are replacing the electricity by pedal power. The bicycle pedal energy is converted into mechanical energy.

6.2 Working

There are only three major principles on which our working model generally works

Power Transmission through Chain Drive

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, particularly bicycles and motorcycles. It is also used in a wide variety of machines besides vehicles. Most often, the power is conveyed by a roller chain, known as the drive chain or transmission chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the Chain. The gear is turned, and this pulls the chain putting mechanical force into the system

Power Transmission through pulley belt arrangement

Belts are the cheapest utility of power transmission between shafts that may not be axially aligned. Power transmission is achieved by specially designed pulley and belt. They run smoothly and with little noise, and cushion motor and bearings against load changes. This arrangement is made for power transmission and to reduce rpm as per requirements.

Fig. 6 drain cleaner

7. Advantages

- Low-cost drain-off solution if drains already exist.
- It is Portable
- Quick response for rural and disaster area.
- Easily to operated and maintenance.
- Electricity is save using pedal power

8. Disadvantages

- It not constant pedaling process.

9. Applications

- It can be used to separate plastic, thermocol from sewage.
- It can be used in plastic industries.
- Remote area where there is no power supply

10. CONCLUSION

The pedal operated drain cleaner is designed and manufactured by using gear changing and shaft coupling principle. In shafts waste removal plates, dust bin, bearings, sprocket and chains, Construction materials are easily available create employment (construction and maintenance), simple to construct. And villagers who use bicycle are going to benefit the most.

11. Future scope

In the future we can improve and work on this project to make it much more effective and efficient. Some of the future aspects of our project are**:**

- It can be used to generate electricity**.**
- It can be used to remove the garbage with higher accuracy from drainage system.
- It can be used in disaster affected areas.
- It can be easily portable.
- It can be used for domestic purposes in rural areas.
- Unit can be operated manually with pedaling system.

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