Pedal Operated Pumping, Cutting & Generating Water Pump

Suraj Betageri [1], Abdulwahid Nadaf [2], Sachin Patil[3], Venkatesh Savai[4], Prof. Sharanbasappa Zampa[5], Dr. Rajendra M Galagali[6]

[1,2,3,4]*Student, Department of Mechanical Engineering, S. G. Balekundri Institute of Technology, Belagavi*

[5]*Professor, Department of Mechanical Engineering, S. G. Balekundri Institute of Technology, Belagavi*

[6]*HOD, Department of Mechanical Engineering, S. G. Balekundri Institute of Technology, Belagavi*

***Abstract*— Irrigation and drinking water in which strength isn't available. They can be built the usage of domestically available substances and may be effortlessly tailored to suit the desires of neighborhood human beings. They free the person from rising power Fees, may be used anywhere, produce no pollutants, and offer wholesome exercising. Power is the number one and maximum prevalent measure of all type of work via human being and nature. The entirety what occur in the world in the expression of go with the flow of power is considered one of its forms. Most people use the arena electricity for input to our bodies or to the machines and hence approximately fuels and Electricity. Electricity is an essential enter in all sectors of counters economic system**

***Index Terms*—Pedal , Pumping, Cutting , Water pump , Impellers**

I. INTRODUCTION

PCG provides drinking water and irrigation in remote areas without the use of electricity. The PCG consists of a centrifugal pump driven by a pedal drive. PCG (Pedal Operated Pumping, Cutting & Generating Water Pump) is an eco-friendly water pump. power pedals to reduce rising energy costs. The centrifugal pump is mounted on the stand so that the drive shaft of the centrifugal pump is in contact with the wheels of the bicycle.

OBJECTIVES

- The motive of this newsletter is to design, manufacture, and experimentally have a look at the operation of pump cutters and generator sets (PCGs) used for consuming water deliver and irrigation of small gardens.
- When you pedal, the bicycle wheels rotate and the centrifugal pump rotates to empty water from the sump.
- PCG offers consuming water and irrigation in far flung regions without electricity. PCG isn't most effective eco-friendly, however additionally offers wholesome training. PCG reduces the rising energy cost of
- The PCG is portable and can be used for irrigation in a variety of locations.
- Conduct experimental research and run GPT at various speeds.

II. LITERATURE SURVEY

[1] Atul.P.Ganorkar : This article consists of the layout and production of foot-operated water pumps used for small scale irrigation, lawn irrigation, and tank pumping. Foot-operated pumps may be constructed the use of neighborhood substances and technology. The water pumping machine consists of a centrifugal pump pushed via way of means of a pedal drive. [1]

[2] Vishal Garg: The objective of this paper become to configuration, manufacture and experimentally investigate the working of Pedal Powered Centrifugal Pump (PPCP) which used in little ingesting water convey and yard water system. PPCP incorporates a centrifugal siphon worked with the guide of utilizing pedal power... [2]

[3] Ademola Samuel Akinwonmi: The layout composed a peristaltic pump powered via way of means of paddling, a carbon clears out and hose or bendy tube. This layout will lessen the labor, value and weariness because of transporting and sanitizing drinkable water. [3]

[4] Bryan Lee: The pedal operated pump can be constructed the use of community substances and skill. It frees the patron from developing strength costs, can be used anywhere, produce no pollution and provide healthy exercise. In this paper consists of the format and bring together a pedal operated water pump.[4]

[5] M.Serazul Islam: The pedal pump can pump water from a shallow depth (up to 2 m) to irrigate small plots like greens and seed beds. It is capable of be operated with the useful resource of the use of one man or woman for an prolonged time(extra than 2 hours) continuously without being tired [5]

III.ESSENTIAL COMPONENTS

3.1. Centrifugal pump

In siphon strength is granted to the liquid in state of speed or dynamic strength and that is then changed into strain strength of the liquid this is frequently being siphoned. This state of solidarity substitute happens through method of method for prime of significant components of the siphon. First the pivoting part impeller confers dynamic solidarity to the liquids after which the sitting part diffuser or volute proselytes motor strength of the liquid into strain strength. Flow centrifugal siphon Mix

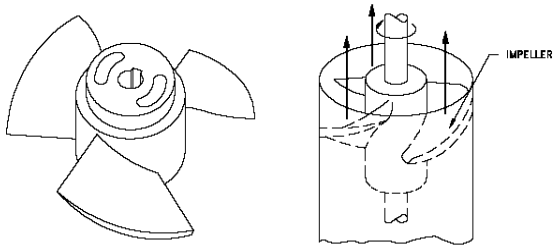

Fig: 3.1 Impellers

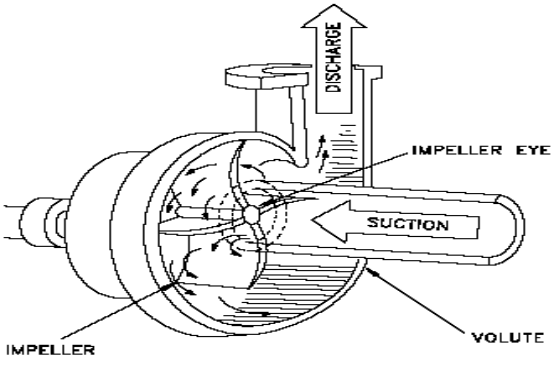

Fig: 3.2 Centrifugal Pump

3.1.2 Principle

Since the fluid leaves the eye of the impeller an intermittent pressure locale is framed causing more noteworthy fluid to drift on the gulf. Since the impeller sharp edges/vanes are of bend shape, the fluid is driven during a digressive and outspread way through the radial strain. The strength made through the outward tension is active strength and relative to the speed at the edge or vane tip of the impeller. The siphon volute or diffuser makes the main obstruction after which withinside the release spout wherein it gets comparatively de-raised and furthermore the active strength is changed into pressure strength in accordance with Bernoulli's standard. In pivotal drift siphons the overwhelming of running is specific as volute and diffusers aren't there, so Kinetic strength granted through impeller gets changed part of the way into stress and halfway it stays in indistinguishable structure. Siphon bends connected with the drift charge and stress (head) high level through the siphon at explicit impeller sizes and RPM

3.1.3 Construction of Centrifugal Pump

Generally, a single stage centrifugal pump consists of the following main parts,

- A casing with volute
- An impeller (closed vane or open vane)
- A shaft
- A gland housing with gland packing or Mechanical seal assembly
- Anti friction bearings
- Lantern rings.

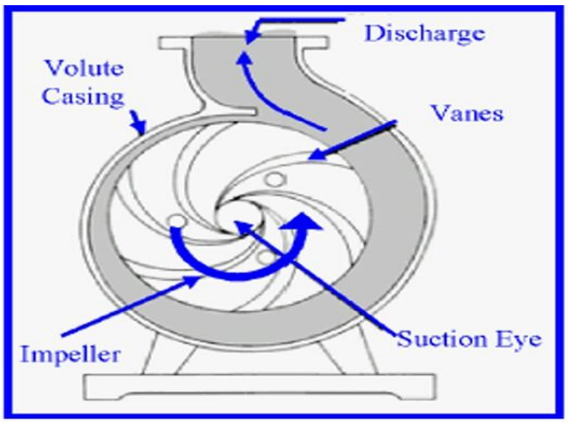

Fig: 3.3 Pump casing

3.2 Flywheels

Energy is transferred to a flywheel through the software of a torque thereto, thereby growing its

rotational speed, and as a result its saved strength. Conversely, a flywheel releases saved strength through making use of torque to a mechanical load, thereby lowering the flywheel`s rotational speed. Some current flywheels are made of carbon fiber substances and appoint magnetic bearings, allowing them to revolve at accelerate to 60,000 RPM.4.4

Common uses of a flywheel include

For illustration, flywheels are employed in repaying machines due to the fact the power force, necklace from the machine, is intermittent. Delivering power at prices past the capacity of anon-stop power force.

Fig: 3.4 Flywheel

3.3 Chain drive

A medium wherein energy is transmitted from an machine to bus of a machine or a boat s propeller by way of a transferring innumerous chain.

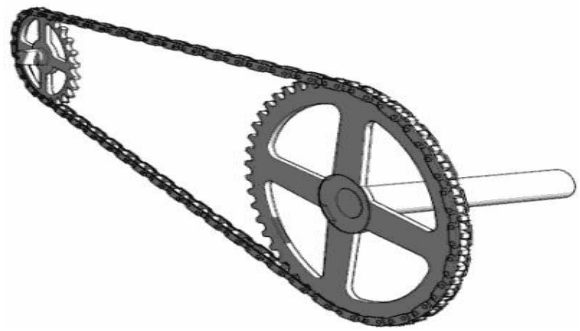

Fig: 3.5 Chain drive

3.4 METHODOLOGY

Pedal operated medium includes unattached centrifugal pump that's constant in the front of 24 ” flywheel. By pedal operated centrifugal water pump that's run via way of means of rotating the pedal of a cycle. Centrifugal pump is set up on body that's operated because of the gyration of flywheel which creates the vacuumed in pump. via way of means of the operation of a paddling We power a pedal, the hinder wheel of the bike rotates at unique rpm the operation of paddle. And this small flywheel rotates the impellers of the centrifugal pump via way of means of sliding stir among flywheel and pulley still the rpm of the flywheel could be veritably low so we're suitable to t get bear head and energy attempt at the paddling is low so for producing inordinate pace in much lower energy we're suitable to use the pulley that's set up at the shaft of the pump.

3.5 Ball Bearing

They correspond of an S- kind ball bearing and forged iron casing which may be used, for case, in husbandry ministry, conveyor systems and product outfit. The sealed deep groove ball bearing with spherically bottom external diameter is assembled right into a matching round seat of the casing immolation tone-alignment of the bearing in the casing at mounting.

Fig: 3.6 Bearing

V. METHODOLOGY

The chain force of the centrifugal pump is hooked up to the uncommon wheel mecca of the bike; it also rotates whilst the uncommon wheel of the bike is turned around with the help of the gyration contrivance and to the shaft DC creator is been hooked up which generates the strength and coincidently the variety of slicing blades are connected to the rotating contrivance or pulley. The shaft of the centrifugal pump rotates as important as 2200rpm.

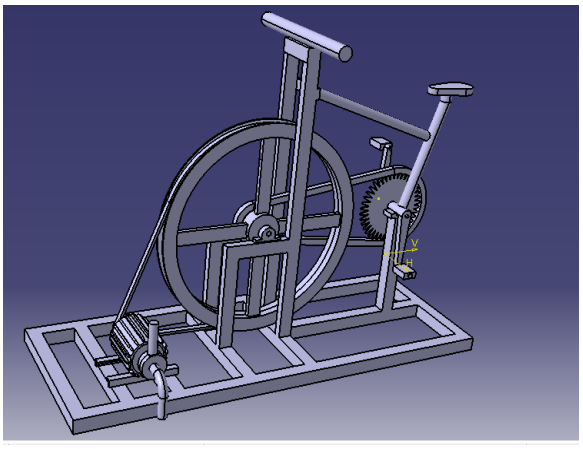

Fig 5.1 : 3-D Model

VI . SPECIFICATIONS

Bicycle chain drive specifications

1. Diameter of the driver D_1=182.07mm
2. Diameter of the driven D_2 =74.4mm
3. Maximum speed of the driver N_1=120 rpm
4. Maximum speed of the driven N_2=293rpm
5. Teeth of the driver T_1=44 numbers
6. Teeth of the driven T_2=18 numbers
7. The centre length between driver and driven x=500 mm
8. Length of chain L= $\pi (r_1+r_2) +2x+ (r_1-r_2)^2/x$ =1408.64mm

Pump specification:

1. Diameter of the motor shaft d =13mm
2. Length of the motor shaft l =220mm
3. Type of pump: centrifugal type
4. Power of the pump: 0.5HP
5. Suction diameter of the pump =25.4mm
6. Discharge diameter of the pump =19.05mm

Pulley specification

1. Diameter of larger pulley d_1 = 609.6mm
2. Diameter of smaller pulley d_2 =76.2mm
3. Speed of larger pulley n_1 = 293rpm
4. Speed of smaller pulley n_2 = 2200rpm
5. Center distance between the two pulleys = 500mm

VII.DESIGN

Selection of belt material: **V belt**

c/s Symbol	Nominal Top Width 'W'	Nominal Thickness 't'	Density
B	17 mm	11 mm	1038 kg/m^3

Table no.7.1 Selection of belt

7.1 POWER TRANSMISSION

Considering a motor having a power of 0.5 HP at 2200 rpm.

$P = 2\pi NT / 60$ 1HP = 0.746KW

$= 746$ W

$373 = 2\pi \times 2200 \times T / (60 \times 1000)$

$T = 1619$ Nmm

Velocity

$V = \pi d_2 N_2 / 60$

$= (\pi \times 76.2 \times 2200) / (60 \times 1000)$

$V = 9.312$ m/s

7.2 PULLEY

Diameter of larger pulley (d_1) = 609.6mm

Diameter of smaller pulley (d_2) = 76.2mm

Speed of larger pulley (n_1) = 293 rpm

Speed of smaller pulley (n_2) = 2200 rpm

Center distance between larger and smaller pulley (c) = 500mm

Angle of contact between larger pulley and belt, is

$\theta_L = \pi + 2 \sin^{-1}(d_1-d_2)/2$

$= 3.142 + 2 \sin^{-1}(609.6-76.2)/2$

$\theta_L = 228.13°$

For smaller pulley,

$\theta_S = \pi - 2 \sin^{-1}(d_1-d_2)/2$

$= 3.142 - 22 \sin^{-1}(609.6-76.2)/2$

ASSEMBLY OF PCG

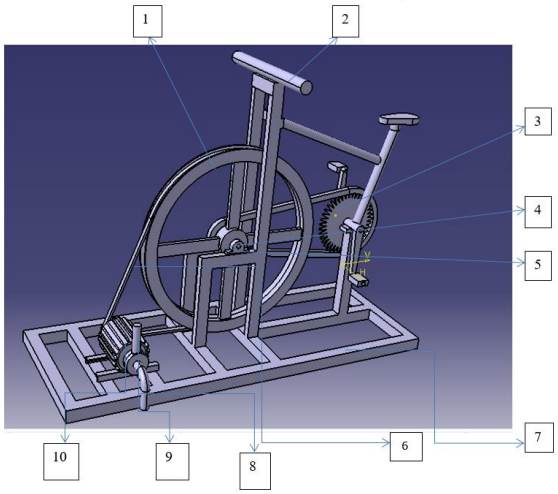

Fig: 7 Isometric view of PCG

1) Fly wheel
2) Handle
3) Crank
4) Ball bearings
5) Shaft
6) V belt
7) Frame(base)
8) Suction
9) Discharge
10) Centrifugal pump

7.1 2-D view of PCG assembly

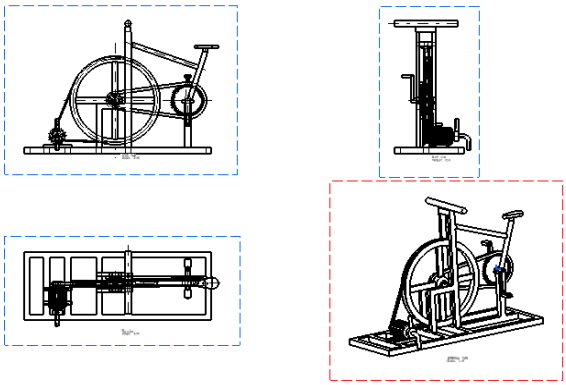

Fig: 7.1 2-D PCG assembly

7.2 Dimension of frame

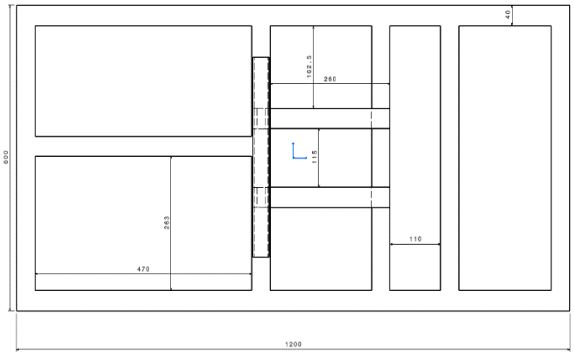

Fig: 7.2 Frame

7.3 Dimension of big fly wheel

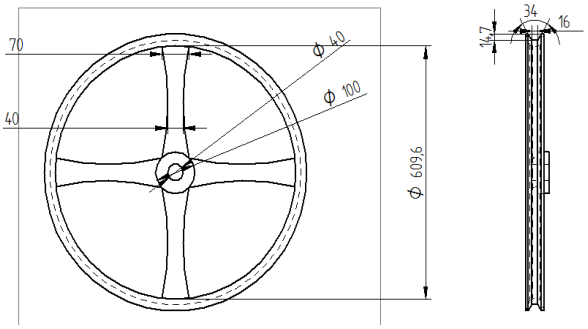

Fig: 7.3 Big fly wheel

7.4 Dimension of shaft

M38

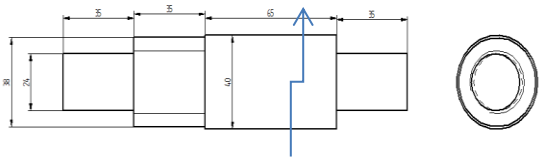

Fig: 7.4 Dimension of shaft

7.5 Smaller pulley

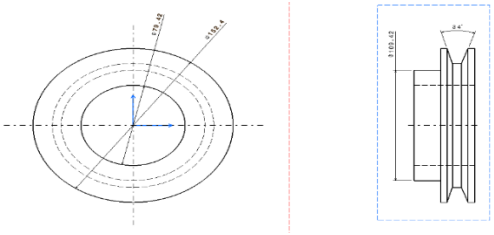

Fig: 7.5 Smaller pulley

VIII.MATERIAL SELECTION

SI NO.	COMPONENTS	MATERIAL
1	Frame	Mild Steel
2	Nut, Bolts and Washer	Carbon Steel
3	Pulley	Cast Iron
4	Roller Bearing	Cast Iron
5	Centrifugal Pump	-
6	Belt	Rubber
7	Chain, Crank Free wheel	Cast Iron
8	Shaft, key	EN 8
9	Pipes, clamps, foot valve	Canvas

Table 1 Material Selection

IX. FABRICATION PROCESS

FABRICATION PROCESS

1) SHAFT

Material: Carbon steel

Operations

2) PULLEY

Material: Cast Iron

Operations

3) FRAME

Material: Mild Steel

Operations

X.ADVANTAGES, DISADVANTAGES, APPLICATIONS

ADVANTAGES

1 By the use of this mechanism we are able to effortlessly carry the water.
2 By the use of those we are able to shop the electrical power.
3 It is portable.
4 It is low constable.
5 It is utilized for to get guide worked water siphoning non mechanized with the guide of utilizing simple system.
6 Its activity and safeguarding could be extremely simple.
7 It is smaller and compact.
8 It is simple and firm in development.
9 Manufacturing expense is lesser than state of the art water siphoning machine.
10 It bears the cost of higher speed changes approach at the utilizing unit.
11 Power put away and genuine exercise for all individuals.

DISADVANTAGES

1 Continuous pedaling motion is needed for device operation in order that lot of labor can`t execute.
2 It isn't appropriate for optimum carry water.
3 High guy strength required.

APPLICATION

- Pedal Power centrifugal pump is used for home purpose.
- PCG is used to irrigation.
- PCG is utilized in inexperienced house.
- PCG is utilized in small constructional area.

XI.FUTURE SCOPE

Accelerating does now never again help at business undertaking or overall degree anyway it's additionally supporting us in hold our physic. At the point when you pedal at homegrown you lose a couple creeps out of your edge and create a couple of electric fueled energy to run your home gear at indistinguishable time. You can save your created power into batteries

XII. CONCLUSION

One such trade manner to generate electricity is offered on this paper. We had efficiently confirmed the calibration and operating of centrifugal pump with pedal electricity of bicycle kind for gardening reason and it`s also appropriate for small scale work

REFERNCE

[1] Atul.P.Ganorkar, K.S.Zakiuddin, H.A.Hussain, “An Experiment on Development of Pedal Operated Water Pump”, IOSR, e-ISSN:2278-1684,(2014). [1]
[2] Vishal Garg, NeeleshKhandare, GautamYadav, “An Experimental Setup and Design of Pedal Powered Water Pump”, International Journal of Engineering Research and Technology (Vol.2, Issue.1) (2013). [2]
[3] Ademola Samuel Akinwonmi, Stephen KwasiAdzimah, Fredrick Oppong, “An Experiment on Pumping Cutting and Generatingfor Purified Water Supply Device” ISDE (Vol.3, No.11) (2012).
[4] Bryan Lee, “A Design of Simple Human Powered Water Pump”, International Journal of Technology (2007).
[5] M.Serazul Islam, M.ZakariaHossai and M.AbdulKhadir, “Design and Development of Pedal Pump for Low Lift Irrigation”, JARD, 5(1&2)116-126 (2007).