Design and Fabrication of Development of Sand filter and Separator Pedal Powered

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Abstract – Here we demonstrate the fabrication system. Sand is used in construction, manufacturing and many industries. Sand needs to be filtered and separated from unneeded particles, stones and other large particles before it is put to use. Our system puts forward a fully automated sand filtering and separator system that automatically filters sand poured on it. Here we use amotorized shaft that is mounted horizontally using mounts. The shaft is connected to a filter frame with mesh below and enclosing frame on the sides. We now have a rod connected from the shaft to the filter frame in a way such as to achieve the best horizontal motion. Also we have a frame to hold the filter frame in place while ensuring proper horizontal motion at the same time. On switching on the motor using our motor controller circuit, the system allows to operate the motor. This allows us to operate the sand filter motion for appropriate sand filtering needs.

Index Terms – Frames, Pedals, Tool Equipments.

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 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 powered grinders 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 sand filter and separation. An individual can generate four times more power (1/4 HP) by pedaling than by hand cranking. At the rate of ¼ 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. Sieving machine serves is to remove large grains with a small grain through a sieve. Separation occurs when the sand is placed on top of a filter having holes size. The first sieving is done to get rid of the sand with a larger than standard withholding sand filter and the second sieving is done to get rid of the sand with a size too small means that the sand filter is ignored. A sieve is a device for separating wanted elements from unwanted material or for characterizing the particle size distribution of a sample, typically using a woven screen such as a mesh or net or metal.

1.1 WHAT ARE SAND FILTERS?

Generally while preparing the concrete for construction purpose, the process of sieving and mixing is carried out separately. These processes are carried out manually. Sieving of sand is carried out using rectangular mesh which is inclined at certain angle. In the present sand sieving method, the sample is subjected to horizontal or vertical movement in accordance with the chosen method. This causes a relative motion between the particles and the sieve. Depending on their size the individual particles either pass through the sieve mesh or retained on the sieve surface.

1.2 PEDAL OPERATED MECHANISM

If we boost the research on pedal powered technology - trying to make up for seven decades of lost opportunities - and steer it in the right direction, pedals and cranks could make an important contribution to running a post-carbon society that maintains many of the comforts of a modern life. The possibilities of pedal power largely exceed the use of the bicycle. Pedaling a modern stationary mechanism to produce electricity might be a great workout, but in many cases, it is not sustainable. While humans are rather inefficient engines converting food into work, this is not the problem we want to address here; people have to move in order to stay healthy, so we might as well use that energy to operate machinery. The trouble is that the present approach to pedal power results in highly inefficient machines.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 at the turn of the 20th century.

2. LITERATURE REVIEW

"Sanjay N. Havaldar, Altaf Somani, Anushka Pikle, Yash Siriah & Samiksha Patil; International Journal of Current Engineering & Technology, 02 March 2016 (E-ISSN 2277 – 4106). This paper analyzes the design of a pedal operated water filtration system to be used by local dwellers.

It works on the principle of compression and sudden release of a tube by creating negative pressure in the tube and this vacuum created draws water from the sump into the pump while rollers push the water through to the filter where adsorption takes place to purify the water. "Technology (IJERT), 01 January 2013. In this paper, design and construction of pedal operated water pump which is used in small irrigation and garden irrigation.

The pedal operated pump can be constructed using local material and skill. A water system includes a Centrifugal pump operated by pedal power.

"Sanjay N.Havaldar, Altaf Somani, Anusha Pikle, Yash Siriah and Samiksha Patil", InternationalJournal of Current Engineering and Technology (IMPRESSCO), 4 March 2016. This paper analyses the design of a pedal operated water filtration system to be used by local dwellers. It works on the principle of compression and sudden release of a tube by creating negative pressure in the tube and this vacuum created draws water from the sump into the pump while rollers push the water through to the filter where adsorption takes place to purify the water. The design comprises of a peristaltic pump powered by pedaling, a filter and hose or flexible tube. As the operator sits on the seat and pedals, the pedal crank transfers the motion to the rotor thus the rollers and the tube is squeezed by the set of rollers to move the fluid.

3. MECHANISM

3.1Belt Drive

A belt is a looped strip of flexible material used to mechanically link two or more rotating shafts. A belt drive offers smooth transmission of power between shafts at a considerable distance. Belt drives are used as the source of motion to transfer to efficiently transmit power or to track relative movement

3.2COMPONENT

Components used in sand filter:

1. Pedal arrangement
2. Caster wheels
3. Supported Frame
4. Shaft
5. Bearings
6. Metallic net

1.PEDAL ARRANGEMENT:

The pedal used to rotate the wheel. When we rotate the pedal, the wheel also rotates. It is a simple design without any interrupts.

A pair of pedals is attached to the stand setup in which the power will be generated manually.

A typical Bicycle arrangement is used.

Bicycle pedal is the part of a bicycle that the rider pushes with their foot to propel the bicycle. It provides the connection between the cyclist's foot or shoe and the crank allowing the leg to turn the bottom bracket spindle and propel the bicycle's wheels.

CASTER WHEELS

A caster (also castor according to some dictionaries) is a wheeled device typically mounted to a larger object that enables relatively easy rolling movement of the object. Casters are essentially special housings that include a wheel, facilitating the installation of wheels on objects. Casters are found virtually everywhere, from office desk chairs to shipyards, from hospital beds to automotive factories. They range in size from the very small furniture casters to massive

industrial casters, and individual load capacities span 100 pounds (45 kg) or less to 100,000 pounds (45 t). Wheel materials include cast iron, plastic, rubber, polyurethane, forged steel, stainless steel, aluminum, and more.

Swivel caster:

This type of caster allows for movement in multiple directions. They can have one or two sets of raceways that allow the caster to swivel 360 degrees under a load. The different types of swivel casters include the following:

Locking casters: There are several devices that can be added to casters to prevent thewheel from rotating or the swivel assembly from turning.

ii. Kingpin-less casters: This caster does not have a bolt and nut kingpin. The raceways are a one piece construction forged together. This design is extremely durable and can be used in abusive applications and shock load applications where kingpin type casters may fail.

iii. Hollow Kingpin casters: This type of caster has a tubular rivet that holds the caster together. The hole in the rivet can accept a bolt or a customized stem for any type of mounting requirement.

iv. Plate casters: This is the most common type of means to mount a caster to a unit and is sometimes called the top plate. Most mounting plates contain four holes used to bolt the caster to the unit. Top plates are offered with various hole patterns to match numerous types of mounting requirements.

v. Stem casters: This type caster can have various stem styles to be used to mount the caster to a unit. Some common types of stems are threaded, round or square with mounting holes, friction ring & expandable stems

Rigid caster

This style of caster only allows forward and backward movement. Rigid casters tend tobe stronger than swivel casters. They are rated at the same capacity as the swivel casters for safety reasons.

They can be a one piece construction or a two piece construction that is riveted or welded.

SUPPORTED FRAME

The supported frame is used to support the components. The total arrangement is depends on this frame. This frame is made of iron or mild steel.

SHAFT:

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to machine which absorbs power. The various members such as pulleys and gears are mounted on it.

BEARINGS:

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts

METALLIC NET:

A metal net is a barrier made of connected strands of metal, fiber, or other flexible or ductile materials. A mesh is similar to a web or a net in that it has many attached or woven strands.

4. WORKING PROCESS

The figure shows the sand filter and separator. In this the whole work is based on the mechanism of pedal operated mechanism. The rotation of the pedal transfers the motion to the movement of rectangular shape filter

It consists of the pedal arrangement which rotates the crank and through it slider consists of oscillating mechanism. The power is transmitted to the crank and slider mechanism. This mechanism is used to rotate the crank disc; the disc which is having an extended rod is connected to the sliding portion of the rectangular plate directly by means of a linkage. The rectangular plate is passed through the guide ways by means of maintaining the cutting axis. As the user operated the pedal, the plate moves linearly on guided path. The dead weight is for compressive force while the user operated the foot pedal.

The pedal is connected to the flywheel which is transfer the motion from one to another. The flywheel is connected to another wheel which is connected to the rectangular filter plate through chain/belt. The rotating motion of the electrical pump converts to the sliding motion using two flywheels and chain/belt. The sliding crank mechanism is used in this project. The flywheel which is placed at the top is used as crank and connecting rod in between the rectangular plate and flywheel. When the flywheel is rotating, the rectangular plate slides linearly.

4.1 ADVANTAGES

Time saving as compared.

Power saving as it is manually operated.

Easy machinery used.

As it is pedal operated so good for health.

Comfortable than ordinary machine.

It is portable.

5. DESIGN CONSIDERATIONS

The device should be suitable for local manufacturing capabilities.

2. The attachment should employ low-cost materials and manufacturing methods.

3. It should be accessible and affordable by low-income groups, and should fulfil their basic need for mechanical power.

4. It should be simple to manufacture, operate, maintain and repair.

5. It should be as multi-purpose as possible, providing power for various agricultural implements and for small machines used in rural industry.

6. It should employ locally available materials and skills. Standard steel pieces such as steel plates, iron rods, angle iron, and flat stock that are locally available should be used. Standard tools used in machine shop such as hack saw, files, punches, taps & dies; medium duty welder; drill press; small lathe and milling machine should be adequate to fabricate the parts needed for the dual-purpose bicycle.

7. It should make use of standard bicycle parts wherever possible

8. The device should adapt easily to as many different bicycles as possible. No permanent structural modification should be made to the bicycle.

9. Though the device should be easy to take off the bicycle, it is assumed that it would usually remain attached to facilitate readiness and ease of transport from site to site. The device, therefore, should not interfere with the bicycle's transportation mode.

10. The broad stand, which provides stability during power production mode, can be flipped upward during the transport mode. This stand/carrier would be a permanent fixture of the dual purpose bicycle.

11. The power take-off mechanism should be as efficient as possible, and should develop relatively high RPM (close to 200) for versatility of application. We had seen designs for devices that take power from the rear tire by means of a friction roller pressed against it, but we had doubts about the efficiency of this arrangement. In order to improve efficiency we used hard bearing surfaces such as roller chains, sprockets and ball bearings. We decided that the most appropriate location for this power take-off mechanism would be at the front of the bike near the fork tube Care must be exercised to insure that the power take-off assembly is far enough forward so as not to interfere with pedaling. Most standard adult bicycle frames have plenty of room for the power take-off mechanism and pulley. Power is supplied to the shaft by means of a chain from the bike's chain wheel (crank) to aratcheted sprocket on the shaft. During the prime-mover mode, the bike's regular chain is slipped off of the chain-wheel, and the specially sized chain to the power take-off mechanism is slipped on.

13. The device should be able to transmit power to a variety of machines, and changing drive ratios should be as simple as possible. We decided that a V-belt and pulley arrangement would be most appropriate for this. Belts do not require the precise alignment that chains do. Belts can even accommodate pulleys that are slightly skewed with respect to each other. Changing drive ratios is as easy as changing pulleys. Also, belts are reasonably efficient.

14. The device should contain a ratcheting mechanism that would let the operator "coast" periodically to rest and conserve energy. A free wheel from any bicycle can be easily adapted for this purpose.

15. Excessive weight should be avoided, as durability is a prime consideration.

6. CONCLUSION

Thus a low cost and simple design pedal operated sand filter and separated machine is fabricated. This machine reduces the

human effort and hence we don't need multiple persons to filter the sand. This simple design of conventional design which can enhance day today household needs and daily day to day purposes and it can be also used in for industrial applications during power shut down scenarios. By using this method we can do any operation as per our requirement without the use of electricity. So we can save the electrical power.

FUTURE SCOPE

Following all types of operation can be carried out by the proper pedal attachment as per the requirement. Here are some operations

1. Rice Threshing
2. Winnowing
3. Corn Shelling
4. Peanut Shelling
5. Operating a Circular Saw
6. Water Pumping from a Shallow Well
7. Operating a Wood Working Lathe

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