Motor Operated Pendulum Pump-A Review

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Abstract

This paper discusses the significance of a pendulum pump which can be used as a complementary device for pumping water and is made to replace hand pumps. The research done till today is concentrated on the working and effectiveness of the mechanism only. Our objective is to save electricity required in pumping water and also to reduce human work in hand pump. By link mechanism and spring force, we can attain linear motion from oscillatory motion and can use that to operate a pump. So the energy consumption of this system will be the lowest. The traditional hand pump is a very tedious method which required more effort, the man who operated hand pump requires to apply continuous force on the lever of the pump due to which man who using pump get tired immediately. Thus important thing of pendulum pump is that the work is alleviated all we can say it makes work easier than a traditional hand pump. By the use of pendulum based water pumping structure, we can enhance the efficiency of the plant and reduce the effort, cost of manufacturing, manufacturing time, manpower requirement.

Keywords:- *Pendulum and Effort, Oscillating Pendulum, Reciprocating Pump, Lever, Spring, Pendulum Bracket, Bearing, Battery Operated DC Motor, Manpower Saving*

1. INTRODUCTION

The ever increasing demand for energy has led to the formation of various advanced resources which produces a certain part of the required energy. The main advantage of pendulum pump is that initiation of energy required to pumping the water is in the form of swinging of a pendulum. Which is considerably less than energy or effort required in case of hand pump. The advantage of pendulum pump compared to conventional pump:-less force to start pump, less electricity consumption.

Water hand pump are manually operated pump, they are used for bringing water from earth underground to earth surface and is used in every country for a variety of industrial marine, irrigation and household purposes. There are several types of water hand pumps. Most commonly used hand pumps are positive displacement pump, positive displacement pump having reciprocating plunger.

With the cost of diesel and electricity rising constantly, solar powered water pump are the perfect alternative for rulers regions as these have a low maintenance cost and ensure a long product life. our solar powered water pump are a low cost solution enabling residents in these area to spend the more time increasing their income by growing crops etc. rather than ferrying water from far off distance.

Manual operated dead weight pump is a simple body which moves freely until any damper is present. Hence, if the oscillation is forced, then it is possible to gain continuous movement. Input energy for starting the process of pumping, in form of occasional pushing of the pendulum, is much less than with typical hand pumps. Hand water pump with a pendulum for pumping water out from wells or reservoirs consists of a cylinder with a piston, lever system, a seesaw, a pendulum, a reservoir and output water pipe.

2. LITERATURE REIVEW

R. Ortega 2013 from Depto. De Matemática Aplicada, Universidad de Granada, 18071 - Granada, Spain presented the stability of the equilibrium of a pendulum of variable length in terms of the third approximation. In contrast, the traditional linearization procedure is not always faithful. Alternative characterizations of stability are also presented. They are based on degree theory and on the algebraic structure of the symplectic group.

Violaine et al.2014 from UMR 6233 ISM Marey, Université de la Méditerranée, 163, avenue de Luminy, Francemade analysis of the mechanical constraints operating suggested that the gymnast should be considered as a pendulum of variable length. Increasing and decreasing pendulum length at appropriate phases of the swing effectively allows energy to be injected into the system, thereby compensating the energy lost to friction.

Rahul Singh and Vijay Kumar 2014 from Dept. of Electronics and Communication Indian Institute of Technology, Roorkee, India presented an approach for the swing up and stabilization of a rotary inverted pendulum (RIP).

Tao Hana et al. from Department of Mechanical and Industrial Engineering, University of Illinois at Chicago, United States observed on 2013 a pendulum-like motion of the usually straight electrified jet experimentally and theoretically modeled. Pendulum-like motion arises due to repulsive Coulomb force between the straight electrified jet and the charges accumulated on the collector. This electrical force repels the similarly charged landing jet segment in the collector plane. The motion is transferred to the whole jet via elastic stress sustained by the jet.

W. Szyszkowski and D.S.D. Stilling 2014 of Mechanical Engineering Department, University of Saskatchewan, 57 Campus Drive, Saskatoon, Canada studied the damping effects that are generated in a frictionless oscillating physical pendulum by a continuous motion of an auxiliary mass. The analysis presented shows how a mass sliding in a periodic pattern along the rotating member affects the system oscillations. The resulting rotational motion of the pendulum is not exactly periodic. Therefore, the mass motion should be continuously synchronized to control the phase angle. If the mass motion period is not adjusted properly (if kept constant, for example) then undesired "beating" effects would result over extended oscillations of the pendulum.

Dian-Hong et al.2013 from department of Mechanical and Electronic Engineering, China University of Geosciences, Wuhan 430074, PR China, amplified the geomagnetic influence on torsion pendulum experiment by producing an additional horizontal magnetic field, and obtained the dissipation, which is proportional to B2 in the disc shaped torsion pendulum experiment. The geomagnetic influence should be considered due to the inelasticity correction in G measurement in high Q-factor torsion pendulum experiments.

3. OBJECTIVES

Primary object of the present invention is to provide an apparatus for pumping of water with the help of oscillating energy of pendulum. Our objective is to save electricity consumption to pump the water and to reduce human effort in motorized operated pump. By link mechanism and spring force, we can attain linear motion from oscillatory motion and can use that to operate a pump

- To develop continuous pumping system without use of electricity.
- To reduce the effort of farmer for supplying of water for drip irrigation.
- To reduce the work of supplying of water for gardening.
- Reduce the manpower
- To achieve the least cost
- To develop mechanism with least friction and wastage of energy

4. METHODOLOGY

In hand pump, the pump cylinder and pump valves are above ground in the pump head. Repeated strokes of the pump handle gradually sucks water up the riser main and into the cylinder and out the spout. Because of their

mechanical limitations, the operational depth of suction pump is limited to seven or eight meters. In hand pump there is a requirement of large effort for pumping which is eliminated in pendulum pump.

A solar powered water pumping system is composed of power source of consisting of one or more photovoltaic panels. Solar cells are building blocks for solar panels which has specially prepared layers of semi-conducting material that produce electricity when exposed to sunlight. This current then flows to control box which manages power generated. When sun shines, the current turns the motor and pump operates. For longer hours requirement of pump battery system must be included.

A motor operated pendulum pump is made to replace previous method used for pumping such as solar operated pumping system and hand pump. In solar operated pumping system there is a need of PV panels which has high cost. In solar system battery also needed for long run. Which is totally eliminated in motor operated pendulum pump. In hand pump, we need to apply more effort for pumping which is reduced or totally eliminated by using pendulum oscillation for pumping through lever mechanism.

5. PENDULUM PUMP

Pendulum is used to hold the weights and it is the oscillating part of the system and thus it acts like a pendulum. The main importance of a pendulum pump is that the initiation energy for starting the process of pumping, swinging of the pendulum, is considerably minimum when compared with the work required to operate hand pumps. Typical hand pumps require sufficiently large effort and an average person can use the pump continuously only for a short time, but the pendulum pump requires only minimum of the effort, because it is only required to oscillate the pendulum and can maintain these oscillations for several hours, without any fatigue.

Pendulum pump is depends on the main parts like pendulum with suitable counter weight, main lever, oscillating mechanisms, reciprocating pump, spring. The motion of pendulum is depends on the effort applied by human being. The pendulum is connected to one end of lever. When we apply the force on the pendulum then pendulum starts oscillates this oscillates motion of pendulum transferred to the main lever.

The main lever starts oscillates due to movement of pendulum, the liver is mounted on the top of the frame. The liver is supported by two pedestal bearing, which is termed as the oscillating mechanism. The connecting rod of the piston is connected to the liver the oscillating motion of liver is transferred to piston rod and then the oscillating motion of liver is converting in to reciprocating motion of piston.

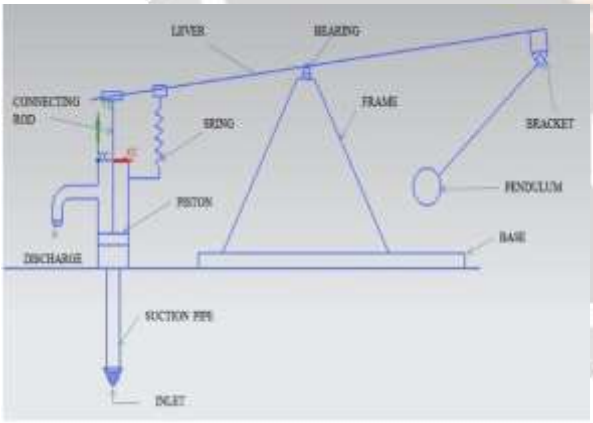

Fig- 1: Schematic Diagram

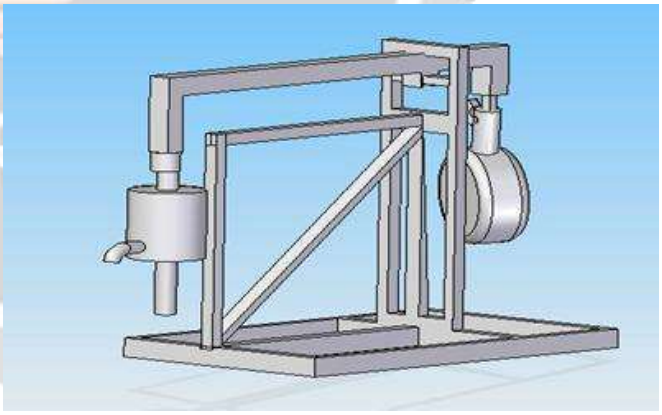

Fig-2: 3D drawing of model

6. RESULTS AND DISCUSSION

1. Manually operated pump required at least one person for lifting the water.
2. Hand pump required sufficiently large effort but the pendulum pump required minimum of the effort.
3. In case of solar and pendulum pump they does not required any manpower.

4. Manually operated pendulum pump does not provide constant discharge.
5. Solar operated pendulum pump has high cost than pendulum pump.

7. CONCLUSION

We can conclude that the pendulum based motor operated pendulum pump is the pump which can continuously pump the water from desired head by utilizing combined power of pendulum & counter weight. The swing of pendulum is maintained by using wiper motor. It can continuously work. We have reduced the human effort by providing the pendulum bob which is attached to the end of lever. While pumping the pendulum oscillates to and fro and provides continuous energy to the lever which pressurizes the water and lifts the water from lower head to higher head and provides the continuous flow of liquid. This is one of the methods that help the rural people to access liquid easily for spraying pesticides, gardening purpose and for Drip irrigation.

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