International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 03 | Mar 2019 www.irjet.net p-ISSN: 2395-0072

PENDULUM OPERATED HAND PUMP

Tejas Rajendra Niturkar[1], Sagar Rajendra Niturkar[2], Kapil Dattatraya Dhulshette[3] , Akash Satish Lavande[4], Mr. Patwari A.N.[5]

[1,2,3,4]Students of Vishweshwarayya Abhiyantriki Padvika Mahavidyalaya, Almala, Latur
[5]Mr.Patwari Anant Nagnath, lecturer, Dept. of mechanical Engineering ,Vishweshwarayya Abhiyantriki padvika Mahavidyalaya, latur, Maharashtra, India.

Abstract - *The traditional hand water pump may take more efforts, the man who operates traditional hand water pump has to apply his force continuously on the lever of pump, due to which man who are using this pump get tired immediately. One important think of a pump with a pendulum is that the work is alleviated or in simple terms it makes work rather easier when is compared with a traditional hand water pump. By the use of pendulum based water pumping system we can increase the efficiency of the plant and reduce the effort, cost of production, production time, and manpower requirement. The research done fill today is concentrated on the working and effectiveness of the mechanism only. Considering all of the advantages of the mechanism it was decided to use it for lifting water with the help of reciprocating pump such that the input to the mechanism is given by humans which is comparatively less than the effort applied by humans to lift water using hand pumps directly.*

***Key Words*: *effectiveness of the mechanism, efficiency, cost of production, production time, water pump*.**

1. INTRODUCTION

The main importance of a pendulum pump is that the initiation energy for starting the process of pumping, swinging of the pendulum, is considerably less 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 oscillation for several hours, without any fatigue. The advantage of this invention compared to present hand pump solutions are: less force to start the pump, less water consumption, and both arms can be used to fetch the water.

New and technically original idea - hand water pump with a pendulum - provides alleviation of work, because it is enough to move the pendulum occasionally with a little finger to pump the water, instead of large swings.

1.1 OBJECTIVES

The main objective of pendulum pump is to reduce the effort made by the farmer for supplying fertilizers, to reduce the effort of farmer for supplying of water for drip irrigation, to reduce the work of supplying of water for gardening, to reduce human effort in desert area for drinking water and to save the electricity consumption,

1.2 COMPONENTS

1) Frame 2) Reciprocating Pump 3) Springs 4) Lever 5) Ball bearing 6) Pendulum

2. COMPONENT DISCRIPTION

1) Reciprocating Pum: - A reciprocating pump is a class of positive-displacement pumps which includes the piston pump, plunger pump and diaphragm pump. In reciprocating pumps, the chamber in which the liquid is trapped, is a stationary cylinder that contains the piston or plunger.

2) Springs:- A spring is an elastic object that stores mechanical energy. Springs are typically made of spring steel. There are many spring designs. In everyday use, the term often refers to coil springs.

3) Levers:- It is also the main component of the pump system and is made up of steel. Lever converts the oscillating movement of the pendulum on one side to the reciprocating motion of the piston to the other side**.** There are different types of levers which are based on the relative positions of the effort point, the load point and the fulcrum.

4) Roller Bearings:- Ball bearings are the elements which uses balls between bearings. These are used to reduce rotational friction and support axial loads.

5) Pendulum :- A pendulum is a weight suspended from a pivot so that it can swing freely. When a pendulum is displaced sideways from its resting, equilibrium position, it is subject to a restoring force due to gravity that will accelerate it back toward the equilibrium position. When released, the restoring force acting on the pendulum's mass causes it to oscillate about the equilibrium position, swinging back and forth. The time for one complete cycle, a left swing and a right swing, is called the period. The period depends on the length of the pendulum and also to a slight degree on the amplitude, the width of the pendulum's swing.

6) Angle Bars : A steel angle is long steel with mutually vertical sides. The steel angles are the CD steel. The most commonly found steel angles are formed at a 90 degree angle length. The sides are either equal or of different sizes. There are most basic formed and has two legs of equal. Variations in the steel angles depending on its basic construction.

7) Metal Bracket :- An angle bracket or angle brace or Angle Cleat is an L-shaped fastener used to join two parts generally at a 90 degree angle. It is typically made of metal but it can also be made of wood or plastic. The metallic angle brackets feature holes in them for screws.

8) Nuts and bolts :- Vehicles contain many different styles and types of nuts and bolts. Below list of common types of nuts and bolts that students should become familiar with,

1)Hex or flat nut 2) Lock nuts 3)Slotted or castle nut:

4)Set screw 5) U bolt 6) Thumb screw

3. MANUFACTURING PROCESS

3.1) ARC WELDING : Arc welding is a welding process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals.

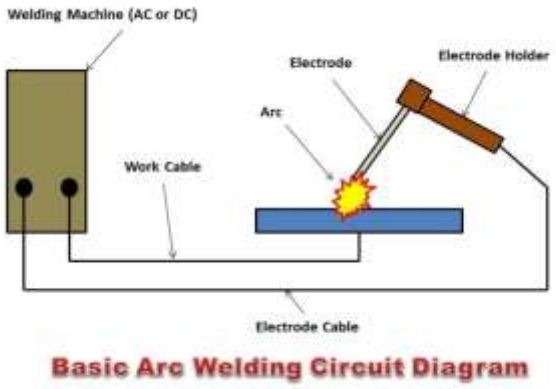

Fig -1: Arc Welding

It is a type of welding that uses a welding power supply to create an electric arc between a metal stick ("electrode") and the base material to melt the metals at the point-of-contact. Arc welders can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes.

3.2) DRILLING:

Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drill bit is usually a rotary cutting tool, often multi-point. The bit is pressed against the work-piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work-piece, cutting off chips from the hole as it is drilled.

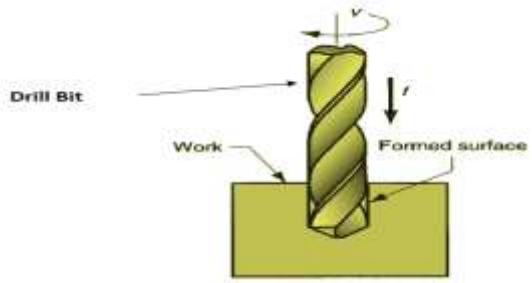

Fig -2: Drilling Operation

3.3) METAL CUTTING : Cutting is the separation or opening of a physical object, into two or more portions, through the application of an acutely directed force.

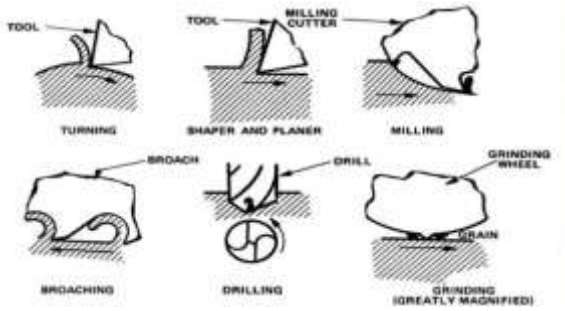

Fig -3: Metal Cutting

4) WORKING PRINCIPLE

The pump is made of pendulum, two-leg lever and cylinder with the piston which pumps the water. Oscillation of the pendulum is maintained by periodical action of the human arm. Oscillation period of the pendulum is twice bigger than the period of the lever oscillation. Piston of the pump has reverse effect on the lever and damps its oscillation. Damping of the lever motion causes damping of the pendulum, but the work of the force damping the pendulum is less than the work of the forces which damp the lever. Equilibrium position of the lever is horizontal, and the equilibrium position of the pendulum is vertical. Oscillation of the lever and the pendulum takes place in the same plane, vertical in reference to the ground. Physical model of this type of water pump was shown at a number of exhibitions.

4.1) ADVANTAGES :-

- Farmer can supply water and spray pesticides without use of electricity.
- It is portable.
- Reduction of farmers work.
- Improve human health.

- Uses the minimum of human strength in comparison to present hand water pumps.
- Compact size, easy to relocate, less moving parts, less maintenance cost.

4.2) DISADVANTAGES :-

- Not suitable for large scale farming.
- Leakage problems.

4.3) APPLICATIONS :-

Drip irrigation. For spraying pesticides. Gardening purposes.

5. CONCLUSIONS

From this design and fabrication of pendulum hand pump, we have reduced the human effort by providing the pendulum bob which is attached in the hand lever. While pumping the pendulum oscillates to and fro and provides continuous energy to the hand lever which pressurizes the water and lifts the water from lower head to higher head and provides the continuous flow of liquid.

REFERENCES

[1] Rahul Singh, Vijay Kumar, "Swing up and Stabilization of Rotary Inverted Pendulum using TS Fuzzy", International Journal of Scientific Research Engineering & Technology, Volume 2 Issue11 pp 753-759, 2014.

[2] R. Ortega, "The stability of the equilibrium", Depto. deMatemática Aplicada, Universidad de Granada, March 2007, 2013, pp.215–234.

[3] W. Szyszkowski and D. S. D. Stilling, "On damping properties of a frictionless physical pendulum with a moving mass," International Journal of Non-Linear Mechanics, vol. 40, no. 5, pp. 669–681, 2014.

[4] Tao Hana, Darrell H. Renekera, Alexander L. Yarinb, "Pendulum-like motion of straight electrified jets", Department of Mechanical and Industrial Engineering, University of Illinois at Chicago, United States, 2013, pp. 2160–2169.

[5] Dian-Hong Wang, Liang Zhao, Liang-Cheng Tu, Liang-Cheng Tu, "Eddy current loss testing in the torsion pendulum", School of Physics, Huazhong University of Science and Technology, Wu-hanshih, Hubei, China, December 17, 2013, pp. 41 - 48.