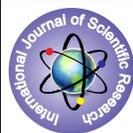


Conversion of Reciprocating Motion Into Rotary Motion in Conventional Hand Pump



Engineering

KEYWORDS : Human Power, Hand Pump, Rotary motion, Effort

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ABSTRACT

A human power pumped designed to lift the water from a depth of 50 m or less. The pump was designed to serve to village water needs. This type of hand pump is difficult to repair to village level and mechanism involves for more effort for pumping. In present scenarios Indian society are in need of water supply and use of hand pump is most effective way for supply of water. We are seeing hand pumps which uses crank type of pumping, which need a greater effort for pumping. In this paper we go for a rotary type of motion in handling the pump. This conversion is mainly focused on senior citizen who find difficult to pump using a conventional pump. The effort made by them is really minimized.

1. INTRODUCTION

1.1 Pump

A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps. Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps. Mechanical pumps serve in a wide range of applications such as pumping water from wells, aquarium filtering, pond filtering and aeration, in the car industry for water-cooling and fuel injection, in the energy industry for pumping oil and natural gas or for operating cooling towers. In the medical industry, pumps are used for biochemical processes in developing and manufacturing medicine, and as artificial replacements for body parts, in particular the artificial heart and penile prosthesis. In biology, many different types of chemical and bio-mechanical pumps have evolved, and bio-mimicry is sometimes used in developing new types of mechanical pumps.

1.2 Calcification of pump.

1. Positive displacement pump
2. Impulse Pumps
3. Velocity pumps
4. Gravity pumps
5. Steam pumps
6. Valveless pumps

1.3 Positive displacement pump

A positive displacement pump makes a fluid move by trapping a fixed amount and forcing (displacing) that trapped volume into the discharge pipe. Some positive displacement pumps use an expanding cavity on the suction side and a decreasing cavity

on the discharge side. Liquid flows into the pump as the cavity on the suction side expands and the liquid flows out of the discharge as the cavity collapses. The volume is constant through each cycle of operation

1.3.1 Positive displacement types

1. Rotary-type positive displacement: internal gear, screw, shuttle block, flexible vane or sliding vane, circumferential piston, flexible impeller, helical twisted roots (e.g. the Wendelkolben pump) or liquid ring vacuum pumps
2. Reciprocating-type positive displacement: piston or diaphragm pumps
3. Linear-type positive displacement: rope pumps and chain pumps

1.4 Handpump

Hand pumps are manually operated pumps; they use human power and mechanical advantage to move fluids or air from one place to another. They are widely used in every country in the world for a variety of industrial, marine, irrigation and leisure activities. There are many different types of hand pump available, mainly operating on a piston, diaphragm or rotary vane principle with a check valve on the entry and exit ports to the chamber operating in opposing directions. Most hand pumps have plungers or reciprocating pistons, and are positive displacement.

1.5 Calcification of hand pump.

1. Suction and lift hand pumps
2. Siphons
3. Direct action
4. Deep wells
5. Diaphragm
6. Progressive cavity
7. Range of lift

1.5.1 Suction and lift hand pumps

Suction and lift are important considerations when pumping fluids. Suction is the vertical distance between the fluid to be pumped and the centre of the pump, while lift is the vertical distance between the pump and the delivery point. The depth from which a hand pump will suck is limited by atmospheric pressure to an operating depth of less than 7 metres.[2] The height to which a hand pump will lift is governed by the ability of the pump and the operator to lift the weight in the delivery pipe. Thus the same pump and operator will be able to achieve a greater lift with a smaller diameter pipe than they could with a larger diameter pipe.

1.5.2 Siphons

Water will always try to find its lowest level. Using this principle, very simple pumps with plastic or rubber bulb with flap valve at each end are used for emptying fuel or water cans into tanks. Once the bulb is full the fluid will flow without further effort from the higher to the lower container. Many hand pumps will allow the passage of fluid through them in the direction of flow and diaphragm pumps are particularly good at this. Thus where the levels are correct large volumes of liquid such as swimming pools can be emptied with very little effort and no expensive energy use.

1.5.3 Direct action

Direct action hand pumps have a pumping rod that is moved up and down, directly by the user, discharging water. Direct action hand pumps are easy to install and maintain but are limited to the maximum column of water a person can physically lift of up to 15 m.

1.5.4 Deep wells

Deep well hand pumps are used for high lifts of more than 15 m. The weight of the column of water is too great to be lifted directly and some form of mechanical advantage system such as a lever or flywheel is used. High lift pumps need to be stronger and sturdier to cope with the extra stresses. The installation, maintenance and repair of deep well hand pumps is more complicated than with other hand pumps.

A deep well hand pump theoretically has no limit to which it can extract water. In practice, the depth is limited by the physical power a human being can exert in lifting the column of water, which is around 80 m.

1.5.5 Diaphragm

Diaphragm pumps have the advantage that they pump relatively lightly due to the lack of pulling rods and are corrosion resistant. Their disadvantage is that they need a specific length of tubing and high quality rubber diaphragms, which are costly and are relatively inefficient due to the extra work needed to deform the diaphragm.

Rubber diaphragms will eventually leak and need to be replaced. Because this is usually complicated and costly, diaphragm pumps operating in poor rural areas are often abandoned once the diaphragm wears out.

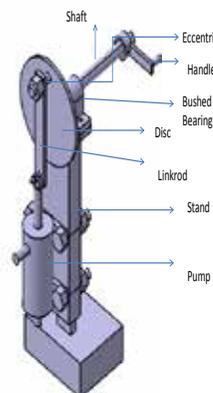
1.5.6 Progressive cavity

Progressive cavity pumps consist of a single helix rotor inserted into a double helix stator. As the rotor is turned, the voids in the stator are screwed upwards along the axis of rotation. Progressive cavity pumps can have complicated gearing mechanisms and are difficult for local pump technicians to maintain and repair. A rope and washer pump is a type of progressive cavity hand pump.

2.1 Construction

The pump is fixed in the middle of the frame where the bushed bearing is fixed in the top of the frame with the help of nuts and

bolts. The shaft which is fixed in the bearing where on end is fixed in the disk plate the other end is fixed in the handle. The disk plate eccentric and pump piston rod are connected with the help of links, nuts & bolts. The suction port is connected to the reservoir where the water is sucked in it.



2.2 Specification

2.2.1 Frame

Dimensions of frame are given in Table 2.1.

Length	Width	Material
600mm	200mm	MS

Table 2.1: Dimensions of the frame.

2.2.2 Reciprocating pump

Specifications of the Reciprocating pump are given in Table 2.2

Hand Pump No	Stroke length	Suction range
2	200mm	5m to 7m

Table 2.2: Specifications of the Reciprocating pump.

2.2.3 Bushed Bearing

Specifications of the bushed bearing are given in

Type bearing	Dia of the bearing
Ball	16 mm

2.2.4 Disc plate

Specifications of Disc plate are given in Table 2.4

Disk diameter	plate	Eccentric PCD	Thickness of the plate	Material
250 mm		200 mm	5 mm	MS

Table 2.4: It the specifications Disc plate

2.2.5 Shaft

Specifications of the Shaft are given in Table 2.5

Length	Shaft diameter	MATERIAL
150 mm	16 mm	MS

Table 2.5: It the specifications Shaft

3. WORKING

3.1 Working

While rotating the handle the disc starts rotating the disc has an eccentric hole. The eccentric hole is connected to the piston rod so that rotary motion is converted into reciprocating motion with the help of that reciprocating motion the piston while create some pressure in the pump that pressure is used to suck the water from the sump.

3.2 Advantages

The advantages can be specified by anyone, due the vast project scope specialities.

Therefore we listed out below

1. Discharge is high
2. Operating depth is high
3. Reduced cost
4. Easy installation
5. Less maintains.

4. Conclusion

This project may be developed with the full utilization of man, machines, method and materials. Also we have followed throughout the study of time motion and made our project economical and efficient with available existing resources. This system was designed, fabricated successfully and also tested. It works fully satisfactorily. We hope that this will be done among the most versatile and interchangeable in future modifications. Thus we worked out our Conversion of Reciprocating Motion in to Rotary Motion in Conventional Hand Pump.

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