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APPLICATION OF RACK & PINION IN PEDAL OPERATED WATER TAP

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ABSTRACT

This paper presents the concept of **"APPLICATION OF RACK & PINION IN PEDDLE OPERATED WATER TAP"**mainly carried out for saving excess uses of water in some basic activities like hand washing, shaving, washing utensils etc. the water is using with high rate in every field of works. So the universe has major problems of water crises in these days, which is graduallyincreases with the time.This problem will be main cause for disappearing of human races, animals, trees etc.

Today some ideas is in demand but these ideas is very expensive.Theseideas is not affordable by every person.People wants save water in low effort in minimum expenditure.So in this project named as **APPLICATION OF RACK & PINION IN PEDDLE OPERATED WATER TAP** is used to operate the water tap for some basic activities like hand washing, brushing, shaving washing utensils etc.In above activities we can save the excess water by pressing and depressing to peddle with the help of RACK & PINION over the water tap. This project is very cheap and the maintenance cost is also very low.

This project works on the rack and pinion principal which means "the translation motion of the rack is transfer into the rotary motion of the pinion". In this project, the peddle is bounded with the springs and one springs is attached with peddle. When peddle press the spring allow to rack to moves up and then pinion rotates, and when it depresses then system takes its original position.

I. INTRODUCTION

My Research describes the design of a**"APPLICATION OF RACK & PINION IN PEDDLE OPERATED WATER TAP"** which is based on the concept of rack and pinion principal, to avoid the excess uses of water in some basic activities like hand washing, shaving, washing utensils, etc. I have worked on the same project at my college presenting a synopsis showing its basic construction & working. The project work subject is one, in which actually we are learning the theoretical concepts in practical way. Also the practical experience is one of the aim of this subject. To solve water crises problem, this project play a vital role on the earth.

II. ELEMENTS OF THE PROJECT

THERE are many elements uses in this project. These elements are

1. Water tank

Water tank is used for collecting the water as a water source for the water tap. This tank is made of plastic. It is cylindrical in shape and closed from the bottom. The capacity of the water tank is 5 litre.

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2. Spring

The spring is an object that stores mechanical energy when it loaded and releases this energy when is unloaded. Tension springs are tightly wound coils that are designed to operate with tension. The spring stretches to a specific length as the load/force is applied to it. In an unloaded position, the loops of the spring are touching, with either a loop or hook attached at one end, and it is when this attachment is directed with force that the spring stretches. When these components are pulled apart, usually from either side, the spring tries to hold itself together, causing the springing action, until the force is stopped and it can return to its original form. The spring material is GALVANIZED IRON. The spring obeys HOOKES LAW, which states that"the force with which the spring pushes back is linearly proportional to the distance from it equilibrium length."

F = -kx

Where--

x is the displacement vector--- the distance and direction the spring deformed from its equilibrium length.
F is the resultant force factor--- the magnitude direction of the restoring force the spring exerts.
k is the spring constant which depend upon spring material (i.e. galvanized iron.).

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Specification

Number of turns---------- **24**
Mean coil diameter---------- **15.0mm**
Wire diameter---------- **3.0mm**
Length in before compression---------- **14.0mm**
Length after compression---------- **10.5mm**

3. Nozzle

A nozzle is a device designed to control the direction or characteristics of a fluid flow (especially to increase velocity) as it exits (or enters) an enclosed chamber or pipe. OR NOZZLE is a spout at the end of a hose, pipe, bellows, etc., by which a stream of liquid or gas may be directed and controlled

A nozzle is often a hard tube of varying cross sectional area and hollow, and it can be used to direct or modify the flow of a fluid (liquid or gas). Nozzles are frequently used to control the rate of flow, speed, direction, mass, shape, and/or the pressure of the stream that emerges from them. In a nozzle, the velocity of fluid increases at the expense of its pressure energy. The material of the nozzle is stainless steel.

4. Rack & pinion

A rack and pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion and its vice versa. A circular gear called "the pinion" engages teeth on a linear "gear" bar called "the rack"; rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion.

For every pair of conjugate involute profile, there is a basic rack. This basic rack is the profile of the conjugate gear of infinite pitch radius (i.e. a toothed straight edge)

Rack and pinion combinations are often used as part of a simple linear actuator, where the rotation of a shaft powered by hand or by a motor is converted to linear motion.

The rack carries the full load of the actuator directly and so the driving pinion is usually small, so that the gear ratio reduces the torque required. This force, thus torque, may still be substantial and so it is common for there to be a reduction gear immediately before this by either a gear or worm gear reduction. Rack gears have a higher ratio, thus require a greater driving torque, than screw actuators.

In this project when pressure applied on peddle then it transfer to spring that attached bottom of the rack, and thenrack moves and along with pinion also rotates.

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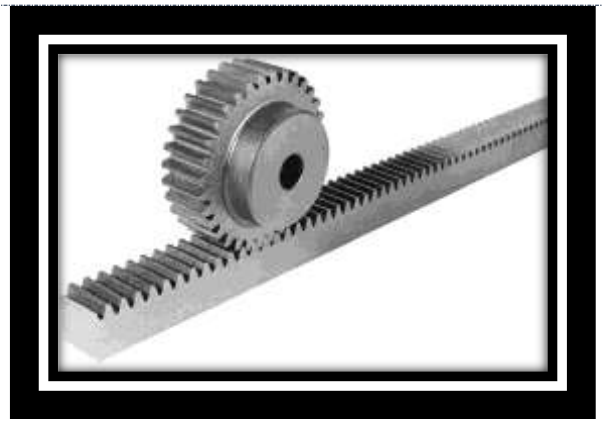

Specification
LENGTH OF THE Rack ---------- **460mm**
Number of teeth in rack---------- **120**
Number of teeth in pinion---------- **26**
Diameter of the pinion---------- **30mm**
Width of the rack---------- **7.5mm**
Width of the pinion---------- **7.5mm**

5. Frame

The frame of the setup for the peddle operated tap consist of 3 straight rod which are welded with the 3 circular rings. The top ring is the base of water tank, the middle ring is the base of the basin and the bottom ring is used for
better support.

Specification
Material of the rings and rod---------- Mild steel rod
Height of the straight rod---------- 152.4cm
Diameter of the rings---------- 27.38cm

6. Angle valve

Angle valve is structured so that the centre line of the entrance and exit of the fluid intersect perpendicularly. In general , the horizontal line is the entrance and the vertical line is the exit. A manually operated valve with its outlet opening oriented at right angle to its inlet opening used for regulating the flow of a fluid in a pipe.

Specification
Temperature sustain---------- **0 to 425C**
Material of the angle valve---------- **Stainless steel, carbon steel, Cr-Mo.**

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III. WORKING PRINCIPAL

The principal is cited below

- In this Project peddle is connected to a tensile spring and upper end of the spring is connected to rack bar.
- When pedal press down the spring pushes to the rack bar upward.
- When the rack bar goes upside also the pinion rotates and it open to tap and allow flowing the water in wash basin.
- When we left the pedal; pedal attached to spring compresses and rack andrack bar comes to its original position i.e. down side and the tap closes.

IV. ANALYSIS/ TESTING

In normal conventional tap, the amount of water used during one time washing hands is 800 ml.
In our project the amount of water used in same activity is 300ml.
HENCE the amount of water is saved by our project is 500ml.

V. CONCLUSION

The project is inexpensive and easy to build if it will be adopted into the commonly. We recognized the water crises problemand designed the ideafrom which we can save the water, save the earth, save the life.

VI. FUTURE SCOPE

- Used in hotels
- Used in restaurants
- Used in homes

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