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A paper on 'Utilization of Mechanical Linkages for Water Savage in Wash Basin'

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Abstract: **— Now day by day, water wastage has become the most common problem about which awareness should be must taking India's future into account. After a survey, one of the leading newspapers declared that, in public buildings, there is a large wastage of water while using wash basin for different purposes like washing face or hands using soap due to the time gap between opening and closing of the tap. This project tried to minimize this time gap.**

Keywords: **Pedal, lever, spring, rack-pinion, eccentric follower, spring etc.**

I. INTRODUCTION

The water is precious and must be saved as possible to overcome the future problems by using such type of mechanism. The project is used to operate the opening and closing of tap through easy operation of pressing the pedal simply by leg. It utilizes the mechanical linkages consisting of rack-pinion and eccentric follower which transfer their motion to pedal which will operate the opening and closing of tap and hence saves almost all the time which was going to waste in ordinary taps.

II.LITERATURE REVIEW

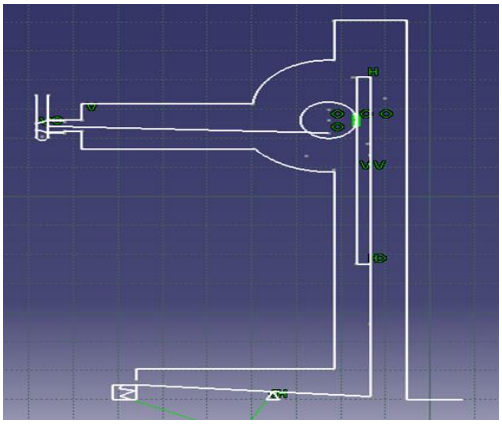
M. Sailaja, M. Raja Roy, S. Phani Kumar [1]. "Design of Rack and Pinion Mechanism for Power Generation at Speed Breaker"
The paper includes information about rack and pinion. Rack and pinion is used to transfer linear motion into rotary motion. Indian standard helical extension spring, IS7907 (part 1): 2004. This paper includes information about "Extension spring experiences tension." Its stiffness is the major part in designing spring.

Objectives
The project is used to operate the opening and closing of tap through easy operation of pressing the pedal simply by leg. The pedal can be easily operated without much effort. Children even can operate it with very less force. It is having very less maintenance cost. The project can be very useful to implement for hotels, resorts, lodges, boarding etc. and affordable too.

III. WORKING PRINCIPLE

The water tank is fixed on the top of the system which is used to store water, the pedal is connected to a small moving shaft which is connected to rack bar. When pedal moves down, the moving shaft presses the rack bar to upside as shown in fig. When the rack bar goes to upside also the pinion moves 90 degree and it opens the tap and allows flowing the water in wash basin. When we leave the pedal, the pedal attached to spring compresses and again rack bar comes to its original position i.e. downside and the tap closes.

Design



Working steps

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1. When pedal gets pressed, lever attached to it gets lifted from other end owing to lever action using fulcrum.
2. Lever transfers its motion to rack attached vertical to it.
3. This vertical motion of rack is again transferred to pinion, which will act as an eccentric cam.
4. The cam converts its rotary motion to translational motion of follower rod.
5. The follower rod is having a tapered knob at its other end which operates opening and closing of valve either by stopping or allowing the flow of water from tank in basin through the tap.

Design Methodology

1. For Rack and Pinion,
   - Circular pitch:
     $P_c = \pi D/T$
     D =diameter of pitch circle
     T = no. of teeth
   - Diametral pitch:
     $P_d = T/D = \pi/P_c$
   - Module:
     m = D/T
2. For Lever,
   - Lever ratio:
     $F_1 \times L_1 = F_2 \times L_2$
     F_1 = effort
     L_1 = distance of effort from fulcrum point
     F_2 = load
     L_2 = distance of load from fulcrum point
3. Spring
   - Mean coil diameter:
     D = (Di + Do)/2
     Di = inside diameter of spring coil
     Do = outside diameter of coil
   - Spring Index:
     C = D/d
     D = mean coil diameter
     d = wire diameter of spring
   - Solid length:
     Ls = Nt × d
     N_t = total no. of coils
   - Total gap:
     Gap = (N_t – 1) × gap between adjacent coil.
   - Stiffness:
     k = P/ð
     P = axial spring force
     Ð = axial deflection of the spring corresponding to the force P

Advantages
1. No electricity needed.
2. Prevents wastage of water.
3. Very less maintenance.
4. Highly reliable.
5. Easy to operate.

Limitations
1. It is not suitable for domestic purpose.
2. It is less sensitive.

Applications
1. Used in Hotels
2. Used in restaurants
3. Used in railway, bus stands

Future scope

- The mechanical system used in the project can be replaced by hydraulic system
- Also electrical sensors can be used.

IV. CONCLUSION

Now days, a large quantity of water gets wasted because of unnecessary opened valves in wash basins. Water saving is a need of this era. To avoid excess of water through tap water different systems are developed. The concept ensures flexibility to adapt and exchange as change is often required. Now, population is increasing and hence the tap water use in basin too. Hence our project will prove to be useful for water saving in public buildings.

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