Design and Fabrication of Spring Loaded Urinal Flushing System

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Abstract **- In India, one of the most important problem is infected public toilets especially urinals that no one worried about the flushing of urinals. Hence, the infected urinals cause diseases to the users by spreading infectious germs, therefore complete cleaning of urinals is important to take care of the hygienic conditions. Most of the water is wasted when people do not turn off the tap after using out of laziness or negligence. People leave water running, which consumes more litres of water for every flush. To avoid this, sensor-based urinals are used in malls, theatres, private hospitals. But it is not possible to install the sensor-based urinals in public places and industries because of its cost and power consumption. To overcome this, we have designed and fabricated the mechanically working urinals using mechanical components.**

Index Terms **- Flushing, Hygienic, Mechanical, Toilets, Urinals.**

I.INTRODUCTION

Maintaining an honest hygiene and pleasant sight in every toilet may be a key priority in every public and commercial establishment. A flush urinal-toilet disposes body waste by using water through a drainpipe to different location. A series of urinal-toilets are fitted in offices, malls, multiplexes, educational institutions, bus stands, railway stations, airports, commercial complexes, stadia and other public places. Most have operated by hand flushing systems like push button, trigger, pull chain, etc. however, use of such operated by hand flush can spread germs and bacteria when contacted and thus users avoid to flush-on or flush-off, which may result in dirty toilets or wastage of water if used. Now a day's laser or infrared sensor operated flushes also are employed in the places of high commercial value and importance but are expensive and required continuous O&M, which cannot be affordable to all or not. Therefore, the toiletries-sanitary facilities may remain un-flushed resulting in dirty, unhygienic environment and foul smell, because of which individuals refrain from using it, and should ends up in open defecation even in places with toilets, which can result in various diseases. Thus, there is a good need for a low-cost automatic flushing apparatus which may flush the essential-controlled amount of water and avoid direct hand contact, thus conserving water likewise as maintaining personal hygiene and sanitation. The current invention discloses an automatic flusher with flow control valve mechanism actuated by a mechanical spring.

II. OBJECTIVES

- To provide alternative for sensor-based urinals
- To reduce the initial cost
- To avoid power consumption
- To avoid human contact
- To save water

III. METHODOLOGY

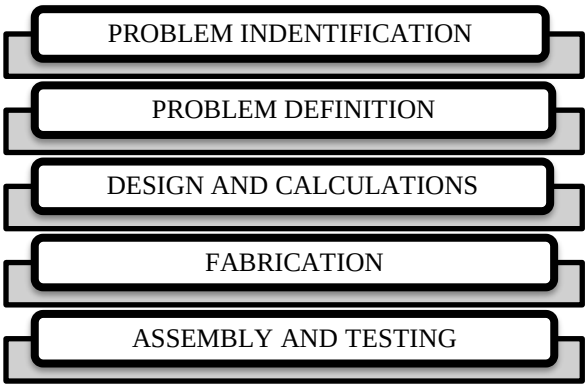

Fig 1 Methodology

IV. LITERATURE REVIEW

Suman Banik [1] explained that in today's life, most people of any age forget to flush the urinal system after

using it. It creates bad odor and unpleasant environment especially in public restrooms, schools and colleges which affects the health of the people using it. This causes various problems to the environment. Water is an important resource, which we owe the responsibility to pass to the future generations. The wastage of excess water as well as the unpleasant conditions in the surrounding is the threat to the environment and it is also very unhygienic. To overcome these environment and unhygienic problems, it is proposed to design an automatic flushing system for both urinal and commode by using the hydraulic method and Pascal's low, which flushes the urinal and commode system automatically after every usage. Only limited amount of water at high pressure is used to flush after every usage so that wastage of water would be stopped. The body weight of user is used to actuate the system eliminating need of user to press button after use. Commode lid will close automatically and gets locked till flushing is complete. It is very economic and provides a good and clean hygienic environment for the public and the students of schools and colleges. It does not require any electrical power for operation and can be utilized in large scale in rural areas with minimum capital cost and maintenance.

Shervin Hashemi et al [2] said that one of the important challenges with current sanitation practices is pipe blockage in urinals caused by urine scale formation. Urinal material and flushing water type are the two most important factors affecting scale formation. This paper examines the scale formation process on different materials which are commonly used in urinal manufacturing and exposed to different urine-based aqua cultures. This study shows that urine scale formation is the greatest for carbon steel material, and the least for PVC. Additionally, material exposure to the urine-rainwater mixture resulted in the smallest amount of scale formation. Based on these results, two new methods for improving sanitation practices are proposed: (1) using PVC as production material for urinals and pipelines; and (2) using rainwater for flushing systems.

Kitisak Osathanunkul et al [3] said that the automatic urinal flushing system has been developed in the market for a long time. However, none of them is smart. No information is collected from the traditional automatic urinal flushing system. No one knows how many times it has been used in a day. No operational status is informed unless users have to be present right in front of them. In this paper, a smart automatic urinal flushing system is proposed. It is designed and implemented to provide the usage information to a caretaker. With the smart system, a caretaker will be able to use the usage information to estimate or to analyze the number of users in each day, or each week. It is also possible to know which urinal has been used the most, so it should be taken care more than the other ones. The proposed system is tested under different scenarios. The results show that in a normal circumstance, the propose system is working as expected.

C.P.Flanagan et al [4] said that Waterless urinals can save significant amounts of water but they can also be used to separate concentrated urine at source. Urine collection in established buildings is often costly because the plumbing system must be retrofitted for separate urine pipes. In addition, waterless urinals often have issues with blockages because of solids building up in the piping system. To solve these challenges, we have developed a fertilizer-producing urinal that uses no water and does not have to be connected to a conventional sewage line to operate. We designed and constructed the urinal using a plastic funnel and collection tank. The urinal recovered 11.23 ± 1.3 g of solid fertilizer per kg of urine and we found that 1000 nutrient recovery urinals could produce an income of $85/day. This novel approach offers a new and easy method for collecting urine within office blocks or other commercial buildings. In addition, the recycling of nutrients at source offers a more sustainable and environmentally method for fertilizer production since minimal energy is required and "waste" streams are converted into useful products.

V. COMPONENTS USED

- Spring
- Base plate
- Flat bar
- Push tap
- Ball valve
- Bolt and Nut
- Urinal basin

VI. COMPONENTS SPECIFICATIONS

1.SPRING:

Fig. 2 Spring

Table 1 Specifications of Spring

Outer diameter	57.15 mm
Inner diameter	47.15 mm
Mean diameter	52.15 mm
Wire diameter	5 mm
Pitch	12.9 mm
No of active coils	4
Solid length	30 mm

2. BASE PLATE:

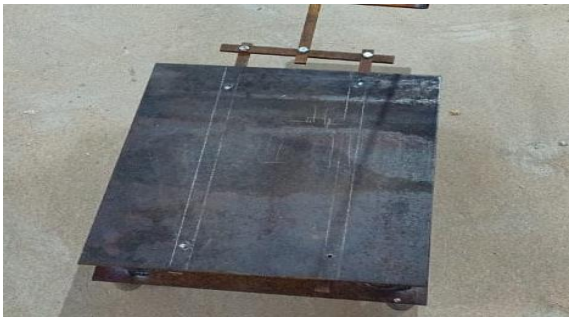

Fig. 3 Base Plate

Table 2 Specifications of Base Plate

Dimension	457.2 mm x 457.2 mm
Thickness	4 mm
Material	Mild Steel
FOS	1.8752

3. THIN PLATE:

Fig. 4 Thin Plate

Table 3 Specifications of thin plate

Width	19.75 mm
Thickness	6 mm
Material	Mild Steel

4. PUSH TAP:

Fig. 5 Push Tap

5. BALL VALVE

Fig. 6 Ball Valve

6. BOLT AND NUT

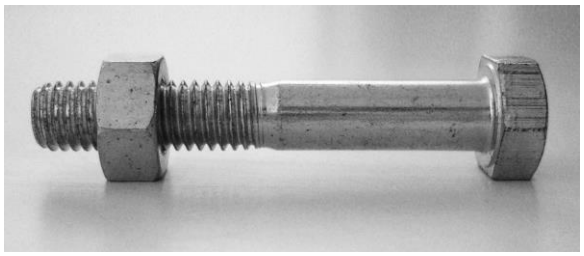

Fig.7 Bolt and Nut

7. URINAL BASIN

Fig.8 Urinal Basin

VII. WORKING PRINCIPLE

In this project, four helical compression springs are mounted on the base plate which is fixed on the floor. When the load is acting on the base plate it compresses the springs which transmits the force through the hollow rod cylinder to the spring valve. It opens the water flow from the water storage. When the load is released from the base plate the springs return to their home position. Then it stops the water flow from the tap immediately. It prevents the excess water flow from the tap.

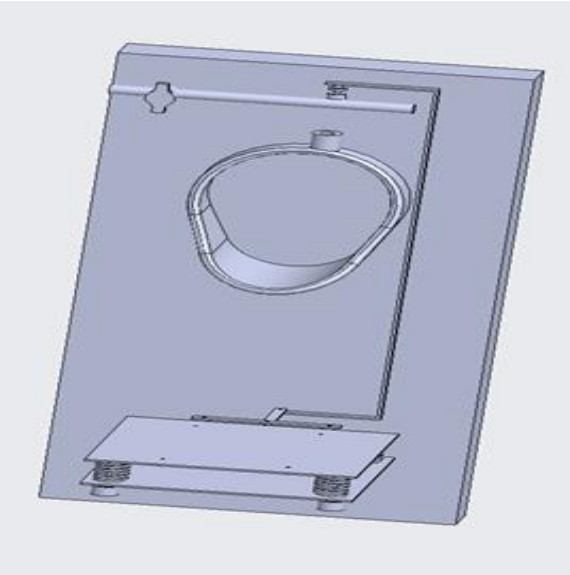

Fig.9 Spring loaded flushing system

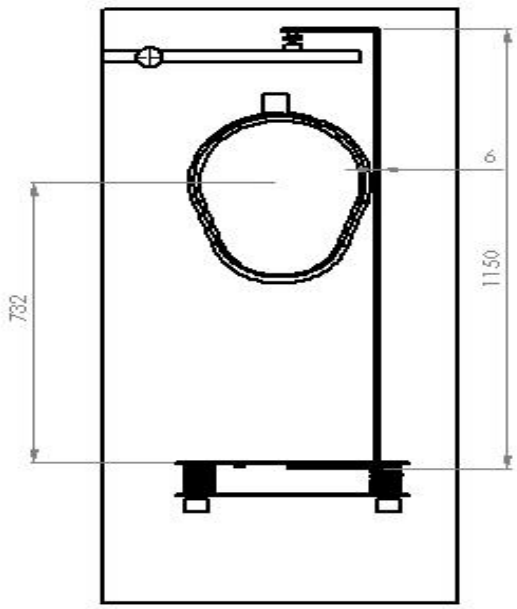

Fig.10 Spring loaded flushing system

VIII. TESTING

Testing of spring compression in base plate:
Spring attached with base plate sfitted is placed on ground and it is fitted with flat bar with the help of nut and bolt when load is applied the spring compressed at rate of 2.5mm – 5mm the springs are designed to with stand load up to 150kg. So, it is safe to use it in public.

Testing of push tap:
Push tap is fitted on the top of the basin the flat bar from the base plate is sit above the push button of the tap which is fitted on the wall. When load is applied on the base plate push bar also move along with base plate which push the tap it allows water flow from tap to urinal basin. When load is removed it goes to home position which stops the water flow.

Testing of water flow:
When water flow from ball valve to tap, it can be adjusted for various purposes of minimum of 2.1 liters per minute to maximum of 6.3 liter per minute. It helps to reduce water usage and save water.

Calculation
Maximum
For 15 seconds = 1.6 liters
Flow rate = 0.106 liter/second
For 1 minute = 6.3 liter
Minimum
For 15 seconds = 0.525 liters
Flow rate = 0.035 liter/second
For 1 minute = 2.1 liter

VIII. ADVANTAGES AND APPLICATIONS

Advantages:
- Easy to use, easier to install.
- Affordable cost less than sensor taps.
- Hygienic solution.
- Save money on water bills and energy consumption.
- Easy to maintain and service

Applications:
- Mainly it can be installed and used in restrooms in public bus stands and in public places.
- It can be also used in industries.

IX. CONCLUSIONS

This project is developed for the satisfaction of societal needs. These types of urinal flush system can be installed in public places to provide a clean, hygienic and flexibility use of toilets. It is fabricated with a help of mechanical elements and no electrical and electronic components can be used. The main advantage of flushing system is cost reduction, less usage of water and clean environment.

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