Paper ID: ET-P08

Reducing the Wastage of Water by Efficient Water Faucet

Ifrat Jahan Tisha[1], Nafis Faiyaz[2], Moniruzzaman Peash[3]
[1]Undergraduate student, Department of Mechanical and Production Engineering
Ahsanullah University of Science & Technology, Dhaka, Bangladesh
E-mail: tisha.aust@gmail.com
[2]Undergraduate student, Department of Mechanical and Production Engineering
Ahsanullah University of Science & Technology, Dhaka, Bangladesh
E-mail: emon_278@yahoo.com
[3]Undergraduate student, Department of Mechanical and Production Engineering
Ahsanullah University of Science & Technology, Dhaka, Bangladesh
E-mail: mzpeash@gmail.com

Abstract

Of all the water in the world, only 3% is fresh. Nearly 70% of that fresh water is frozen in the icecaps of Antarctica and Greenland; most of the remainder is present as soil moisture, or lies in deep underground aquifers as groundwater not accessible to human use in fact, less than one third of 1% of this fresh water is available for human use. Freshwater withdrawals have tripled over the last 50 years and about 1.4 billion people live without clean drinking water. On the other hand many of us use water thoughtlessly. The average person wastes up to 115 liters of water every day. About 4 liters of water is wasted in 20 sec by leaving the water running during hand washing just for scrubbing hands with soap, which is sufficient for a person to drink over two days. The efficient and improved water faucet designed over the traditional water faucet by integrating a soap dispenser in a water body to minimize the water wastage. Water flows from the one side and soap dispenses from the other side of the faucet. After watering hand when a user takes step to dispense soap, water flow is automatically stopped and thus keeping a check on unnecessary water wastage during scrubbing the hands with soap. This design facilitates to use soap and water individually in fact the user cannot use both soap and water at the same time. Eventually, this product saves water all the time while washing hand. Using mechanical energy, this faucet becomes more effective than other water saving faucet by its low cost, high efficiency and durability characteristic. The newly efficient designed of water faucet can be equipped in restaurant, public restroom and community center to reduce the wastage of water during washing hands. It can also be used everywhere instead of traditional faucet.

Keywords: Faucet, water waste, reducing water wastage, user.

1. Introduction

The use of water faucet is playing an important role in the daily life of people. With the gradual improvement of living standard, the design idea of faucet has changed to hygiene, practicality, convenience, water-saving, environment-friendly, healthy, user-friendly from simple function and complicated operation gradually. Now more and more water saving faucets are used in public places such as hotel, airport, recreational center, hospital, office as well as factory and private places like villa, high-grade residence etc. and always keep upgrading. Some of existing water saving faucet in the market is automated faucet. Some are timer faucet and some are sensor faucet. These faucets definitely help to conserve water but they do come with some unavoidable problem. First, they demand built in energy cost. Most automatic faucets operate on battery or A/C power and require sensors to work. This can be costly and inconvenient when the batteries run out and need to be replaced. Second, if you choose to use an automatic faucet in your home, you will more than likely need a professional plumber to install it for you. The installation process can be tricky. Not only does the automatic faucet require power in the form of electricity, and sensors, but it is installed differently than a traditional faucet. Third, these faucets are much more expensive than any other faucet and this is the main reason of less use of these faucets than expected. Also, the installation cost and energy cost of these faucets are greater than any other faucet. And usually the more stylish models are going to be the most expensive. Fourth, sometimes user need the water keep running to get enough water in the tub for washing. If the normal faucets are replaced by automatic once, user should have something staying under the automatic sense switch. It will bring a lot of troubles. Even if the

automatic sense switch can be changed for the regular once, it will cost more effort in daily life to switch from one to the other. Fifth, in timer faucet, if the turning down time is too short, the water might not enough for use and if the turning down time is too long the water might be wasted. Sixth, the automatic faucets are normally not as durable as the normal once. The valve in the faucets is the key. The automatic faucets are cost more, but if something wrong with the sensor, the switch will not be active as the good ones. The water will not be able to turn on and off in time. Thus a user may have to spend more effort and money in this regard. And finally, the worst thing is that a new study of automatic faucet shows they may be more hospitable to bacteria than the manually-operated faucets. On the other hand efficient water faucet is a manual water faucet with water saving features. So it comes without the problem of automated faucets.

2. Design analysis of efficient water faucet

Efficient water faucet is powered by mechanical components. So there is no use of electricity. The efficient water faucet is designed such a way that it becomes easy to manufacture, cheap in price, durable and convenient also.

Basic parts of efficient water faucet

Efficient water faucet consists of nine basic parts. Every part has its specific significance.

Cover

The cover is the fundamental part of the product. For the unique design of the cover the faucet becomes aesthetic and gorgeous. The cover of this product is made of stainless steel. It also protects the faucet's inner parts from direct corrosion of weather. It is also a support of lever and it carries the total load of faucet.

Handle

Handle is the major part of the efficient water faucet. It is the only part that has a relation with user. The user rotates handle to get water and liquid soap respectively from faucet and soap dispenser. It is an aesthetic part also. It is designed user friendly. There is no compromise with aesthetic and as it is convenience to use hopefully it will satisfy user. It is also designed as user can also use the handle with the dorsum of hand.

Gear

Gear is a vital part of this product. The gear is connected to the handle but it stays inner side of the cover. The force which is imposed on the gear is converted to pressure. In fact user rotates handle thus the gear rotates also with the same angle. And this gear is meshed with another pinion which is permanently attached to a lever. When user rotates handle, gear transmits this force to pinion which creates pressure in to check valve or soap dispenser through connecting rods.

Lever

The lever is the functional part of this product. The main function of this lever is to transmit the force of user into pressure and hold the connecting rod. It also converts rotating motion into linear motion. This part is like a common mild steel bar with 10mm thickness which bears the whole load of connection rods and gear.

Lock

Lock is a technical part of this product. Its main function is to lock the gear in any position so that the user can create a continuous pressure on the check valve with a single rotation of the handle. Thus it ensures the continuous flow of water. When user pushes the handle slightly to the backward direction, the gear meshes with the lock. Hence, it restrains the rotational motion of gear.

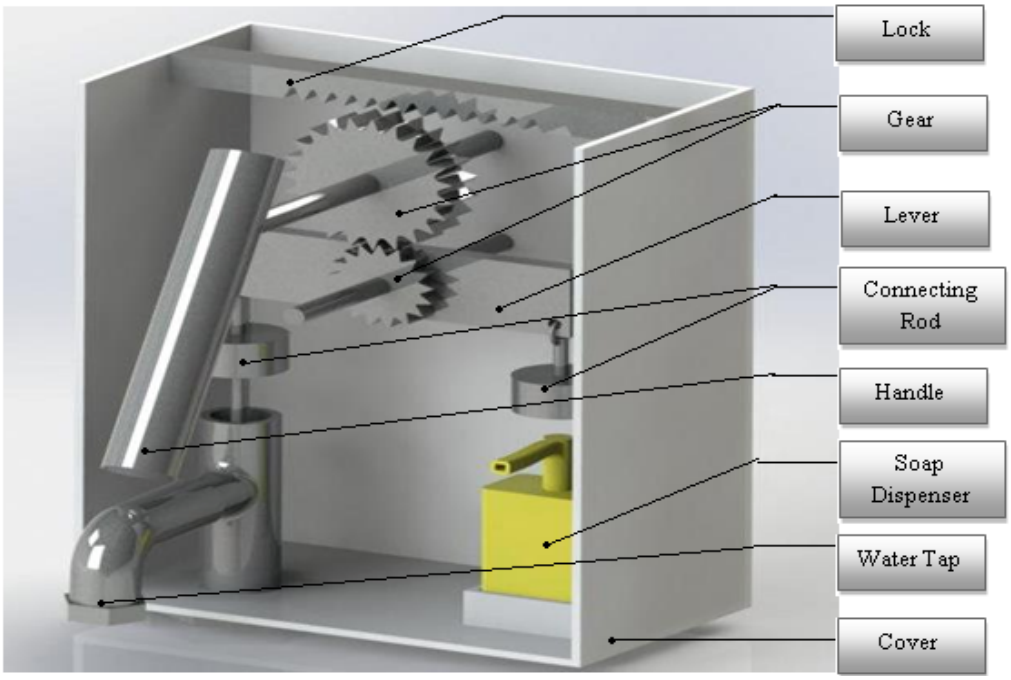

Fig 1. Efficient water faucet without front and top cover

Connecting rod

The connecting rod is multifunctional and multi-usable part of this product. Its main function is to create pressure on check valve and soap dispenser. Here there are two connecting rods. And these connecting rods are also used as the weight required for producing enough pressure to soap dispenser and check valve. It moves linearly when the user rotates the handle.

Check valve

The check valve is one of the most important parts of this product. Without this the whole mechanism will change. A check valve is a mechanical device, a valve, which normally allows fluid to flow through it only in one direction. The check valve is most available part in any hardware shop.

Soap dispenser

Soap dispenser is also a fundamental part of this product. Its main purpose is to dispense liquid soap. This built in soap dispenser feature makes efficient water faucet more convenience for washing hands.

Material selection of efficient water faucet

Material selection is important for the process of designing any physical object. In the context of product design, the main goal of material selection is to minimize cost while meeting product performance goals. Systematic selection of the best material for a given application begins with properties and costs of candidate materials. In efficient water faucet stainless steel is used in the body for both practical and aesthetic reasons. Stainless steel's resistance to corrosion and staining, low maintenance and familiar luster make it an ideal material for the body of efficient water faucet. For gear, lock, connecting rod and lever mild steel is used as it is cost efficient and easy to machining. And for the check valve brass is used as it is corrosion resistant and durable. Lastly plastic is used for soap dispenser as it is light in weight and cheaper than any other material.

3. Principle of mechanism

The efficient hand washer has been designed to dispense both water and liquid soap in two step lever mechanism. When the lever remains in neutral position there will be no dispensing of both water and liquid soap. In the 1ststep, when the user moves the handle, a rotational motion of gear is converted into linear motion of the lever and so a connecting rod pushes the check valve and thus the water is dispensed. And then user can lock the gear by pushing the handle slightly to the backward direction to get continuous flow of water. In the last step, after wetting hands with water, when the user unlock the gear and moves the handle to the opposite direction to dispense soap, another connecting rod pushes the soap dispenser and release pressure from the check valve. Hence water flow automatically stops and soap dispenses from the soap jar. After dispensing soap, it automatically returns to the neutral position.

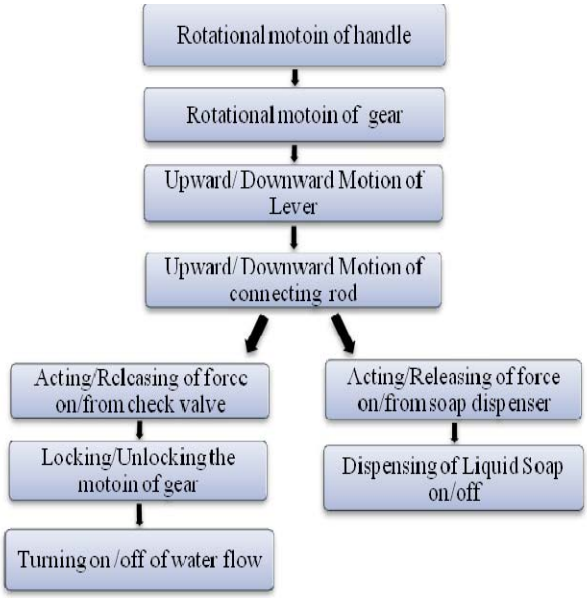

Fig 2. Flow chart of mechanism of efficient water faucet.

.

4. Benefits of efficient water faucet

The efficient water faucet is different from the other traditional faucet. This faucet is highly effective in reducing water wastage during washing hands. This faucet is fully mechanical so it doesn't need any electrical energy. Thus the faucet is easy to repair and it is durable also. There is no chance to leak of water. The installation process of this faucet is very much easy. In fact anyone can install it. The efficient water faucet is also convenient and environmentally friendly. The user can turn on or off the water manually and the turning on and off system is very simple. So there is no chance of irritation for turning down time as too long turning down time waste water and too short turning down time might be unable to deliver sufficient water. Moreover if user rubs both hands with soap then they can use their dorsum or wrist of hand to turning on the water. And the most interesting thing is that it has built in soap dispenser feature. So the user doesn't need to buy additional soap dispenser. The efficient water faucet is actually very cost effective than any other water saving faucet. You can use this product not only for hand-washing purpose but also for other household or cleaning purposes.

5. Conclusion

Saving water should never become a public concern only in times of drought when water is undeniably scarce. The world water supply is finite. Every drop of water wasted is a drop less in a wild and scenic river, a drop less of a needed salmon run. Every drop of water that circles a drain unnecessarily wastes energy through the manufacturing of chemicals in the cycle of sewage treatment. It's high time to concern about to save water. Now water savings is possible by using technology in water faucet even when you wash your hands. Water faucets in various designs are hugely used now days in public washrooms, restaurant, and community center etc. Among these, little number of faucets uses technology to eliminate water wastage. This type of faucets is highly inspired as available fresh water is decreasing tremendously. People mainly waste water by faucet during washing hands. Efficient water faucet eliminates water wastage during washing hands which is cheaper and efficient than other water saving faucet. Through customer surveys, it is come to know that this product is highly acceptable by people who are concerned about water saving. No matter how efficient it is, it will definitely increase public consciousness about water saving which we badly need.

6. Acknowledgement

The authors wish to express their sincere gratitude to Dr. Dewan Hasan Ahmed, Associate professor of the Ahsanullah University of Science and Technology and Mahmood Al Bashir, Lecturer of the Ahsanullah University of Science and Technology for their valuable guidance, proper advice, painstaking and constant encouragement. Authors are also grateful to the department of Mechanical and Production Engineering, AUST for giving them the opportunity to design and develop the product efficient water faucet.

7. Reference

[1] Dahl, Mellessa (2011), "Automatic faucets germier than the old-fashioned kind, study shows". NBC NEWS Health Available at: http://www.nbcnews.com/health/automatic-faucets-germier-old-fashioned-kind-study-shows-1C9386853 (Accessed 30-may-2013)

[2] Hadhazy, Adam (2008) "Top 10 Water Wasters: From Washing Dishes to Watering the Desert," ScientificAmerican™, Available at: http://www.scientificamerican.com/article.cfm?id=top-10-water-wasters (Accessed 30-may-2013)

[3] How products are made, volume 6. Faucet. [Online]. Available at: http://www.madehow.com/Volume-6/Faucet.html (Accessed 30-may-2013)

[4] Wikipedia the free encyclopedia (2013), "Check valve", [online]. Available at: http://en.wikipedia.org/wiki/Check_valve (Accessed: 30-may-2013)

[5] Do it yourself. (2013), "4 Common Touch less Faucet Problems". [Online]. Available at: http://www.doityourself.com/stry/4-common-touchless-faucet-problems#b (Accessed: 30-may-2013)

[6] Save the Water™. (2013), "Water facts". [Online]. Available at: http://savethewater.org/did-you-know/water-facts/ (Accessed 10-sep-2013)

[7] globalchange.umich.edu (2006) "Human Appropriation of the World's Fresh Water Supply". [Online]. Available at: http://www.globalchange.umich.edu/globalchange2/current/lectures/freshwater_supply/freshwater.html (Accessed: 10-sep-2013)

[8] Worldometers (2013) "Water consumption - sources and methods, world meters". [Online]. Available at: http://www.worldometers.info/water/ (Accessed 10-sep-2013)

[9] New idea homepage (2010), "Seesaw faucet saves water", [online], Available at: http://www.inewidea.com/2010/09/09/33489.html (Accessed 10-sep-2013)

[10] Heatherroesch.over-blog.com (2013). "Disadvantages of automatic faucets at home". [Online]. Available at: http://heatherroesch.over-blog.com/article-disadvantages-of-automatic-faucets-at-home-57678555.html (Accessesd 30-may-2013)

[11] TCK@ Automatic experts (2010) "Innovation of faucet". [Online]. Available at: http://oltsw.com/news_info.asp?id=7 (Accessed 10-sep-2013)

[12] Wikipedia the free encyclopedia (2013), "Material selection", [online]. Available at: http://en.wikipedia.org/wiki/Material_selection (Accessed: 30-may-2013)

[13] Wikipedia the free encyclopedia (2013), "Stainless steel", [online]. Available at: http://en.wikipedia.org/wiki/Stainless_steel (Accessed: 30-may-2013)