Technical Description: The Soap Dispenser

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Contents

INTRODUCTION

Think about how many times per day you have used a soap dispenser. From this simple, yet efficient, method of dispensing soap, soap can be accessed readily when needed and stored well when not used. Because of the effectiveness of soap dispensers helping maintain hygiene with the prevention of the spread of germs, they became ubiquitous; they are vital in public restrooms, healthcare facilities, and other communal spaces. A traditional soap bar sits on the side of a sink, moist, dank and more likely to harbor germs than traditional soap dispensers that have chugs of soap that are enclosed. Not only that, aesthetically speaking, soap bars can become mushy on the side of a sink in a public bathroom, which may cause the scene to be unappealing to users. Through all of this, a soap pump, that is connected to liquid soap, proves to be a better alternative to traditional soap bars that have always been around. From being more effective at maintaining hygiene and preventing the spread of germs to simply being more aesthetically pleasing to the eye, soap dispensers with liquid soap plays an important role in our day to day lives, but how many of you know how the pump works?

HISTORY

Soap dispensers have not been around for long. In fact, they have been invented for a little over a century. The main catalyst that allowed for the creation of the soap dispensers is liquid soap. With liquid soap, came a need for a soap pump. The world before the invention of the soap pump in the late 19th century was living with traditional bar soaps. The soap pump was not, however, made available to the public at first. It was only used commercially, in hospitals, healthcare facilities, and sometimes in public restrooms (Schwartz 2013). Not everyone had access to soap pumps at first. But, in 1978, a company named Softsoap popularized and introduced soap pumps with liquid soaps to the public on a large scale (Schwartz 2013). They accomplished this through a $7 million ad campaign (Schwartz 2013). Not only that, but the company also ordered 100 million of the soap pumps from manufacturers throughout the US, which is equivalent to a year's worth of inventory, forcing competing companies to wait over a year for soap pumps (Schwartz 2013). Through all of this, the soap pump mechanism, along with its components has not been significantly changed. Through the huge advertising efforts of Softsoap, household throughout the entirety of the United States have been able to put their hands on this simple, yet effective and efficient technology that improved the lives of many people.

COMPONENTS

EXTERIOR VIEW:

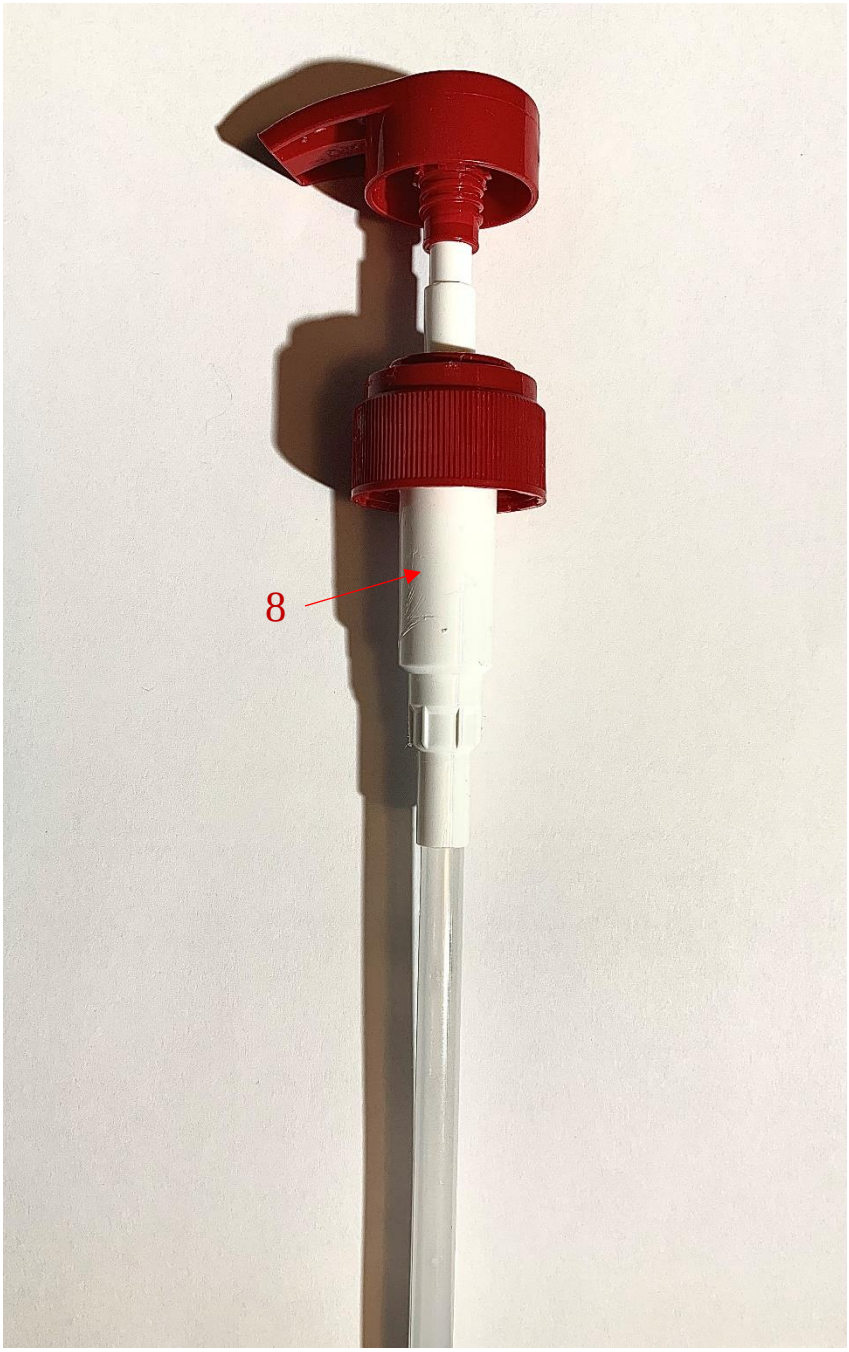

Figure 1 This is an exterior view of a typical soap dispenser. Although hidden, the components inside the chamber (8) allow for the soap dispenser to work.

BREAK DOWN OF COMPONENTS:

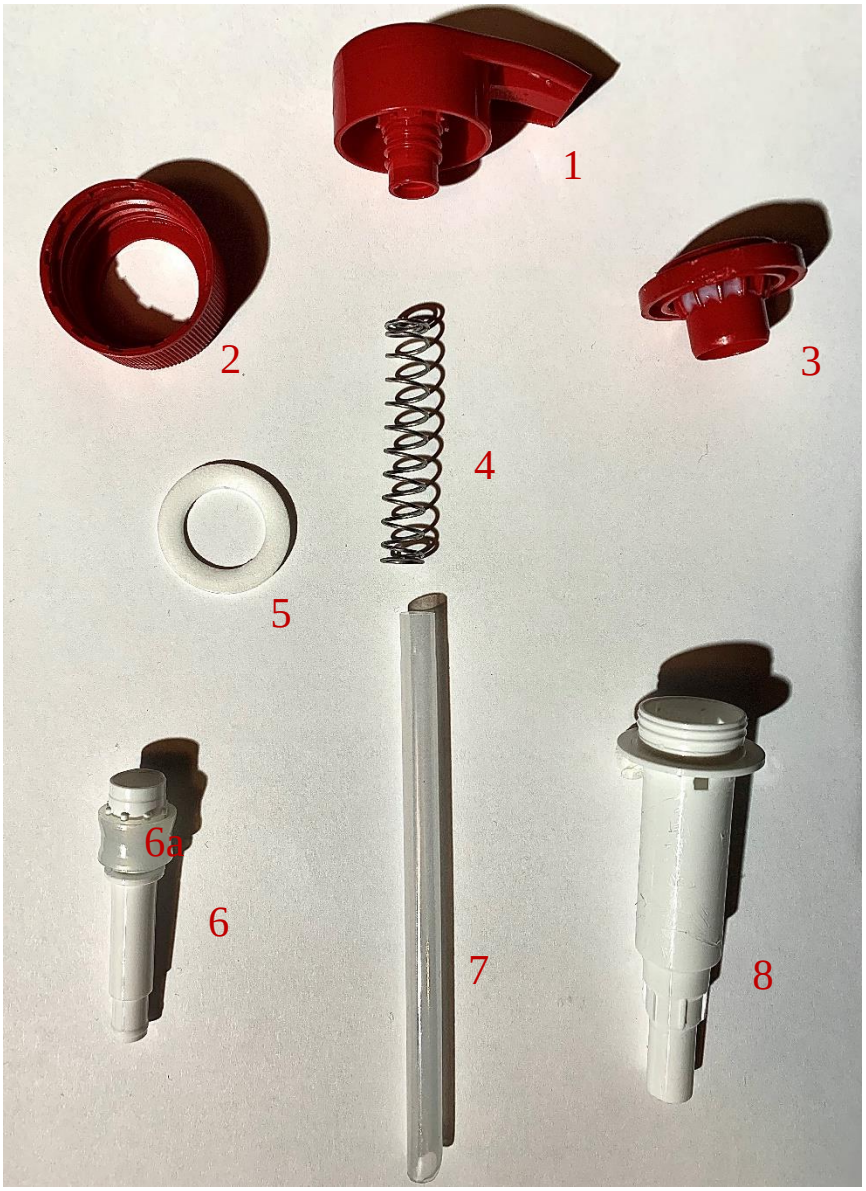

Figure 2 This is a breakdown of the components that are found within the soap dispenser. Each of the components has its number located to the right of the piece. Please note that a glass ball is typically found within the components of a soap dispenser but is missing from this specific dispenser.

INTERIOR LOOK

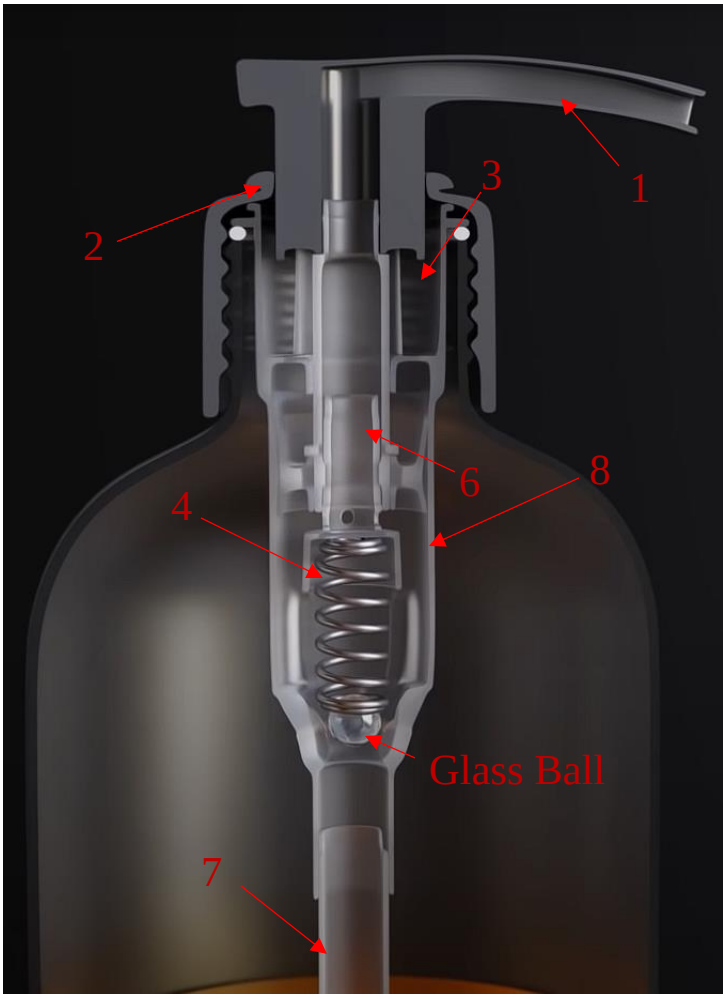

Figure 3 A snapshot of an inside look of the components of a soap dispenser assembled and ready for action (Branch Education 2021, 0:08).

DESCRIPTION OF COMPONENTS

Chamber/Pump Mechanism (8): This is the primary component of the soap pump dispenser that is responsible for dispensing soap. It usually consists of a piston (6a), which is the plastic piece that is on the tube, a tube (6), and a spring (4). Most of these components, excluding the spring, are typically made of plastic. This includes the chamber.

Dip Tube (7): This is a long, narrow tube that extends from the pump mechanism to the bottom of the soap container. The dip tube allows the soap to be drawn up and dispensed through the pump mechanism. This piece is typically made of plastic.

Collar (2), (3): This is a threaded ring that secures the pump mechanism to the bottle or container. It is typically made of plastic or metal.

Gasket or Seal (5): This is a small ring or disc that is placed between the collar and the bottle or container to create a seal and prevent leaks. Made of plastic.

Actuator/Nozzle (1): This is the part of the soap pump that is pressed down to activate the pump mechanism and dispense soap. It can be a button, lever, or other type of mechanism. This piece can be made from a variety of materials as it is part of the exterior of the dispenser but is mostly made of plastic.

Spring (4): This component helps push the piston back up into the chamber after soap has been dispensed. Usually made of steel.

Glass ball (found in Figure 3): This component is essential in ensuring that the soap does not go back out of the chamber when the mechanism is being compressed.

FUNCTION

Starting out from the only interactive exterior component of the soap dispenser, the nozzle. Force is directly applied to the actuator to where it compresses down in order to activate multiple other components found within the chamber. Assuming that the chamber is initially filled with air, when force is applied directly on top of the nozzle, air is being pushed out from the nozzle, and soap is entering the chamber housing from the dip tube. To explain the

mechanism that occurs with this simple click of the nozzle, it is best to breakdown the process into three steps: Applied Force, Equilibrium, and Spring Force.

APPLIED FORCE

Commencing with force applied to the nozzle (1), kinetic energy from the applied force is being stored as potential energy in the spring (4) that is found inside the chamber and is located under the tube (6). The energy starts out from the nozzle and gets transferred over to the tube (6), and then applied to the spring, where it is stored as potential energy in the spring. From there, the soap that is already inside the chamber (8) would have been pushed up and out from the nozzle due to the piston (6a). In addition to that, the glass ball (found in Figure 3), would ensure that no soap/air is pushed down the dip tube (7), but is rather, all pushed up and through the nozzle.

EQUILIBRIUM

During the stage of equilibrium, the nozzle is at its lowest point, meaning that it is pressed down all the way. This emphasizes the fact that the spring will also be pushed down all the way, maximizing the potential energy of the spring. In this stage, all the liquid soap that is in the chamber is already pushed out from the chamber through the nozzle, and the piston is at its lowest point, ready to replace the lost soap from other soap incoming from the dip tube. In the stage of equilibrium, the force that is applied by an individual dispensing soap is equal to the resistance exerted by the spring.

SPRING FORCE

After the applied force done by the user is stopped, the only component in the system that has energy is the spring. The spring has stored potential energy in the system that drives the system to replace the dispensed soap from the soap that is stored in a chug or bottle by the end of

the dip tube. Driving the system, the spring pushes the tube (6), and consequently the piston (6a) up the chamber (8), creating a low-pressure environment within the chamber. With the dip tube (7) being submerged by soap, soap will crawl up the dip tube, past the glass ball, into the chamber, where it will fill the low pressure area with itself. With the chamber filled with soap, it is now loaded and ready for the next shot of soap to be dispensed at the desire of the user. From here, the cycle repeats.

OTHER IMPORTANT INFORMATION

It is important to note that the components collar (2) (3) and the gasket (5) are components that depend on the dispenser manufacturer and the shape and size of the bottle/container that hold the soap. These components play no vital role in the mechanism of soap dispensing, rather, are only there to improve the user experience. For example, the gasket (5) helps prevent any leaks from occurring from the chamber to the outside as there are holes in the chamber designed to allow air to enter the chamber. Additionally, there are a few issues that are present within the system of the soap dispensers and how the components work together. For example, if the volume of the dip tube (7) is less than the volume of the chamber (8), then the amount of soap that is dispensed with each pump will only depend on how much soap the dip tube (7) can hold at a time. Therefore, it is important that the dip tube is either equal to, or greater than the volume of the chamber, in order to provide an efficient and more pleasing experience with dispensing soap for the user, all with less applied force. Furthermore, users need to note that thicker, more viscous soap may require more force to apply an equal amount if a thinner soap was used. To maintain the components, it is important that the user cleans out the system and ensures that no clogging occurs simply by rinsing the bottle/container in addition to the soap dispensing system.

CONCLUSION

The soap dispenser. A simple, yet efficient invention that improves the lives of millions, if not billions, people throughout the world. From the force applied to the nozzle, to the energy stored in the spring, soap is dispensed to the hand of the user at their wish. The three stages that the system of soap dispensing goes through is a cycle that starts when force is applied to the nozzle. To keep this cycle going, it is important that users use their soap dispensers carefully, and to maintain it from clogging. With their enclosed containers/bottles, soap dispensers have been able to prevent the spread of millions of diseases and germs between individuals. They have been vital in improving public health and hygiene especially in public spaces such as bathrooms, restaurants, and hospitals.

References

How A Soap Dispenser Pump Works. (2021, September 2). Www.youtube.com. https://www.youtube.com/watch?v=ba8J2BR4j7Y

How do Soap Bottle Pumps Work? || *Inside Animation of a Soap Pump Dispenser*. (n.d.). Www.youtube.com. Retrieved April 5, 2023, from https://www.youtube.com/watch?v=9kzC4CpPxSQ&t=8s

Schwartz, J. (2013, September 12). Robert Taylor, Who Put Hand Soap in a Bottle, Dies at 77. *The New York Times*. https://www.nytimes.com/2013/09/12/business/robert-taylor-who-put-hand-soap-in-a-bottle-dies-at-77.html