Group Presentation Technical Description of Fire Hydrant Cap

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Summary:

Current Fire Hydrants are opened easily in the community illegally and this creates many issues throughout the community. The idea behind our innovation of a new Fire hydrant cap was to create a hydrant cap that will allow for public access to the water in a fire hydrant without creating significant water loss that would affect the surrounding fire hydrants as well. The redesign to traditional fire hydrants will implement a sprinkler system that would allow the community access to the water on a hot day. It will also have a lever to control the water flow of the hydrant for the sprinkler system. This solves the issue with significant water loss from on illegally opened fire hydrants and still allows the public access to the water supply. It will also have a lock and key exclusive to fire fighters to be able to unlock and lock the full pressure of a hydrant this would allow for more effective actions from firefighters and a quicker response to fires in the community.

TECHNICAL DESCRIPTION: FIRE HYDRANT CAP

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Jawb Inc. announces proposal for an improved Fire Hydrant Cap
Engineering students create a redesign to traditional Hydrant Caps

Manhattan, NY: Jawb Inc., a group of engineering students seeking possible improvements in NY, announced a redesign to the Fire Hydrant Caps seen all over NY. Jawb inc., introduces a new Fire Hydrant Cap that would allow the public to have access to water during the hot seasons to cool off and firefighters more effective water pressure to fend off fires in the neighborhood.

" This redesign will greatly improve how firefighters will be able to fight fires during the hot seasons especially when others in the neighborhood seek water from the hydrants for some refreshing fun" says Alejandro Guadalupe, Group member of Jawb Inc.

Benefits from the Hydrant cap redesign include:

- A water control lever that will allow for better control over the water pressure released when opening a fire hydrant.
- A sprinkler head that will allow the public open access to the water from a hydrant during the hot seasons to cool off
- A Tubular lock accessible only to firefighters which will allow them to have complete access to the hydrants water pressure

About us: Jawb Inc., is a group of engineering students currently attending CCNY in Manhattan, NY. Jawb has been working to purpose improvements in NY that will benefit the residents that face the many problems in the city. Their main goal is to make NY a better city not for themselves but to all of NY as a whole.

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Introduction

Fire hydrants have been used for 100 years as a method to keep cool but are there any alternatives? In short words, yes, for the last 100 years fire hydrants have been open in urban areas to keep cool during the many heat waves in New York. However, in the 1950's the New York government banned and restricted the use of fire hydrants to save water.

While restriction was high many civilians in the urban areas continued to open fire hydrants for their enjoyment. During the same time as the ban, New York fire departments started giving out spray caps to help reduce the amount of water loss. Although this was implemented, people had little to none accessibility to these spray caps due the long procedures and requirements mandated by the state to obtain a spray cap. While fire hydrants were made for the purpose of fighting fires with the impact of the community and open hydrants it has caused significant water loss and a decrease in water pressure of the surrounding hydrants making it difficult to complete its task of assisting firefighters in fighting fires. What we hope to accomplish with our proposal is to provide the community with a more accessible sprinkler cap,

Figure 1: Open Fire Hydrant Losing Water
Mata, Jenny (2023). Figure 1. April 29, 2023

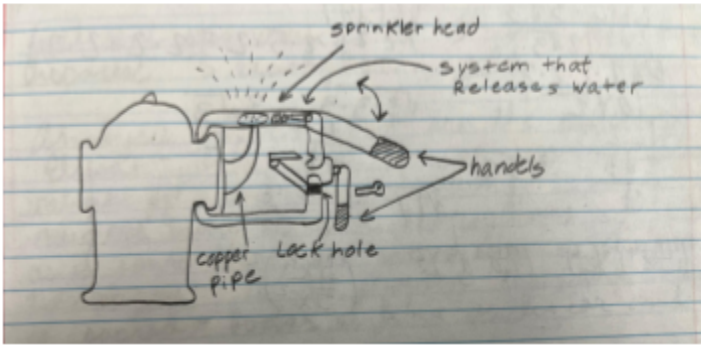

Figure 2: Initial Sketch of Sprinkler Cap
Gomezcoello, William (2023). Figure 2. April 26, 2023

allow for a better control of water pressure and water loss, and provide firefighters with a more effective water pressure to better fight fires in the community.

Technical Description:

Water Valve Seal and Copper Tube

Because New York is a dense region, our fire hydrants release 500 to 1500 gallons of water per minute which is precisely why the sprinkler cap is needed to reduce this loss. Firstly, the seal that grips the water valve is made of rubber to prevent any water from leaking from the sides of our design. This rubber seal has a large hole and is supported by a cast iron behind it. This is to create enough pressure against the fire hydrant while also maintaining a strong seal. Additionally, the strong seal complements the copper tubing attached to it. This tubing system is made of copper because this is what is used commonly in areas of plumbing. Water should flow with a decrease in pressure to the sprinkler head. This is because our valve seal will be small enough to only let a certain amount of water through the pipe, hence, decreasing the pressure. To explain in more detail, the object that the sprinkler cap is first to be in contact with water from the fire hydrant, will have a filter of sorts. It is described as a filter because it will be designed to look like a drain with small holes in it to only allow a desired pressure of water through. This will of course be directly controlled through a handle or lever that will be controlled by the public which will ultimately accomplish the goal of saving water.

Expanding on the mechanism of the copper tube, organization is a very important factor. This copper tube extends just outside of the valve seal, and it is about 2 inches in diameter. It is a straight pipe that curves 90° and goes directly upwards to the sprinkler head mechanism. Usually when copper pipes are curved to become 90° pipes, they require a curved piece in which both the pipes will be mounted to. This process is done through welding, which is when two metal

components are melted together through the use of a blow torch. The blow torch will heat up a welding stick that will cover the circumference of the pipes that will successfully seal them. If the copper tubing has no leaks, it will then be mounted onto our invention. Copper plumbing is very familiar with the use of threads on pipes that allow plumbers to screw things into each other tightly. That is why we will be utilizing these threads in our copper pipes. Our 90° three piece pipe will be screwed into the sprinkler head and the valve seal before the process of welding. This screwing feature along with the use of a water sealing tape called teflon, gives us an ample seal that prohibits any water leakage inside of our sprinkler cap.

Sprinkler Head and Gear System

Once the water travels through the valve seal, it then makes its way to the sprinkler head. The sprinkler head is pointed upwards and is also adjustable through the use of the lever. The sprinkler head is located on the left of the design that is directly above the valve seal. To prevent vandalism, this sprinkler head has a cast-iron casing which can only be penetrated through the use of power tools. One would have to use an angle grinder to possibly destroy our invention which people do not commonly have the knowledge to operate. Because this sprinkler head is adjustable, there are also limitations to its adjustments in the concern of safety. Through the use of the lever, the public can tilt the sprinkler head 90° to 45°. This feature has a wide range of benefits, such as people being able to wash their cars and children having the ability to refresh themselves from the hot sun. Firemen will be grateful for the increased pressure that they will have access to during emergencies. Hence, the sprinkler head creates numerous benefits to the

public and prevents a massive loss of water.

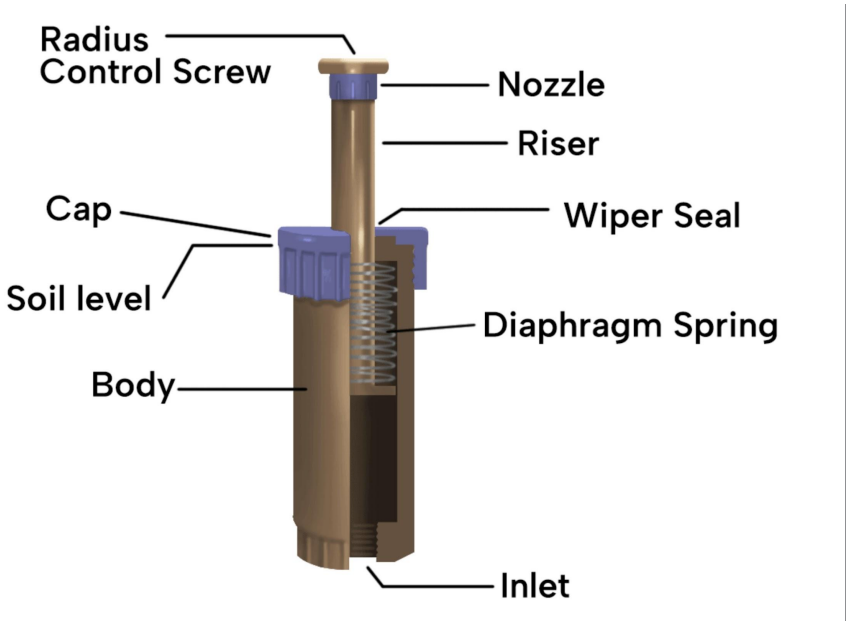

Figure 9: Sprinkler Diagram

Dykstra, J. (2023). 6 Different Types of Sprinkler Heads for Landscaping (Buying Guide). [Diagram]. https://www.homestratosphere.com/types-of-sprinkler-heads/.

The gear system behind the sprinkler head involves two simple components. One is the joint and the other is a lever. The lever will be placed on a joint which pivots at 90° to 45° in reference to the body of the sprinkler cap. Now in order for the lever to turn the sprinkler head, it will need to be geared up properly. This means that there will be a 1 inch gear mounted on the joint of the lever and another 1 inch gear mounted on the joint of the sprinkler head. These gears will then mesh together to create a mechanism that turns up and down. In order for the gears to mesh properly, they will need to have lubrication, which will be in the form of oil such as the oil that is used cars. The benefits of using this gear mechanism is that it avoids the consumption of electricity. The public will be able to use their own strength to operate this sprinkler cap, rather

than having to pay taxes to provide maintenance costs on electricity. This invention will quickly save the community large amounts of money through its almost nonexistent maintenance costs.

Casing or Body and Handle

The casing of this sprinkler cap perfectly compliments its interior components. On the far right of the case as shown in figure 2, cast iron surrounds the tubular lock making sure that the lock stays in place and works effectively. There are not many empty spaces in this build to prevent components from shifting in any way. When working with mechanical moving parts, such as gears, it is important that there is lubrication as well as proper organization. This is why, in figure 2, the gear systems are kept within the body of the sprinkler cap. They exist within the casing allowing the system to operate without unwanted contact between different components.

Furthermore, the teeth of the sprinkler cap that mounts onto the fire hydrant has threads on it meaning that there will be a certain grip on the cap. Other fire hydrant caps on the market have threats that screw on to fire hydrants hence, sealing water. However, our sprinkler cap has no plans to screw onto anything therefore we added the threads to the mound for the adequate friction we desired. Even though the sprinkler cap does not screw onto the fire hydrant, it will have threads that will penetrate the fire hydrant threads which will create an unmovable hold. The mount will be complemented by the lock system, which will be further described later in this technical description. The mount will be held very firmly against the fire hydrant through the use of a lock system.

Tubular Lock

For our sprinkler cap, we chose to implement a tubular lock to prevent civilians from opening the fire hydrants. A tubular lock was an ideal choice to prevent unauthorized opening of the hydrant's valve due to its non-traditional keyhole and pin quantity. Our tubular lock consists

of 8 sets of pins total. Pins are the main focal point of a lock's functionality as the pins are what allow a lock to open and close. A tubular lock's pins function a bit differently in comparison to traditional locks in the sense that tubular lock pins are moved horizontally as opposed to vertically (Douglas, 2016). The key pins of a tubular lock function similarly to a puzzle, the key pins must align the driver pins in a uniformed order so the shear line is not obstructed to prevent turning.The spring behind the driver pins are what reset the tubular lock back into it's locked state once the key is removed.

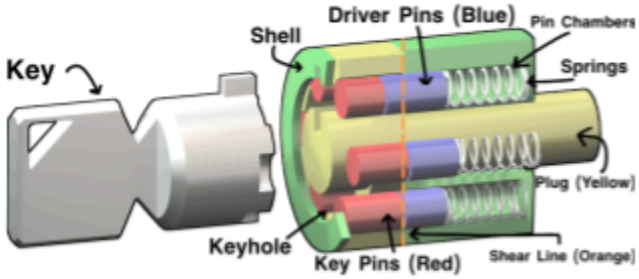

Figure 3: Inner Mechanics of Tubular Lock

File:Tubular locked.png. (2020, October 5). *Wikimedia Commons*. Retrieved 22:23, April 29, 2023 from https://commons.wikimedia.org/w/index.php?title=File:Tubular_locked.png&oldid=482198941.

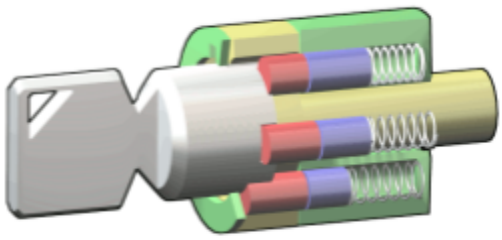

Figure 4: Key Pins of Tubular Lock Aligned

File:Tubular with key.png. (2021, February 18). *Wikimedia Commons*. Retrieved 04:31, May 1, 2023 from https://commons.wikimedia.org/w/index.php?title=File:Tubular_with_key.png&oldid=533742366.

Keyhole

The keyhole in a tubular lock isn't the traditional vertical shape most key locks have but is a circular hole instead. The circular hole makes it much more difficult to pick the lock as there are few items which might be able to fit to successfully pick the lock. Although not foolproof, its odd shape might discourage civilians from attempting to open the lock.

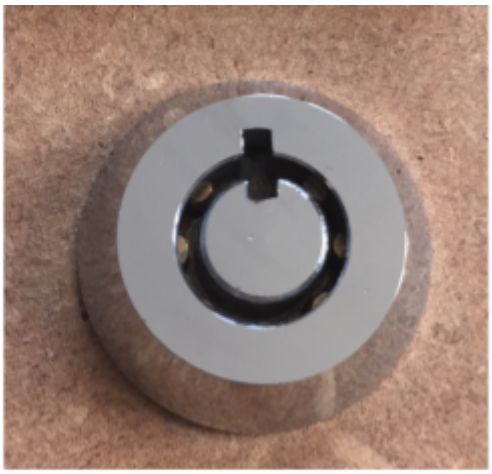

Figure 5: Tubular Lock Keyhole Close-up
File:Tubular Lock and Key.jpg. (2020, October 27). *Wikimedia Commons*. Retrieved 00:03, May 1, 2023 from https://commons.wikimedia.org/w/index.php?title=File:Tubular_Lock_and_Key.jpg&oldid=503691432.

Key

The tubular lock's key is a smooth cylindrical shaped key with rectangular ridges placed exactly where the key pins are placed in the interior of the tubular lock. The ridges are designed to move the key pins inwards, pushing the driver pins forward to align with the shear line. Once aligned to the shear line, the key will allow the lock to turn and open.

Figure 6: Tubular Lock Key Close-up

File:Tubular Lock and Key.jpg. (2020, October 27). *Wikimedia Commons*. Retrieved 00:03, May 1, 2023 from https://commons.wikimedia.org/w/index.php?title=File:Tubular_Lock_and_Key.jpg&oldid=503691432.

Lock Latch

The lock latch is crucial to the functionality of the tubular lock as it is what prevents the removal of the hydrant cap. The lock latch functions by swinging along with the motion of the key once inserted into the keyhole. The latch in theory would hold onto the ridges at the bottom of the hydrant's valve. Thus, preventing further water loss from the hydrant cap's removal.

Figure 7: Tubular Lock With Latch

JCBIZ, B. (n.d.-b). *Tubular Lock With Latch*. Amazon. Retrieved May 8, 2023, from JCBIZ, B. (n.d.). JCBIZ 16mm thread tubular cam lock keyed alike security ... - amazon.com. Amazon. https://www.amazon.com/JCBIZ-Security-Furniture-Hardware-Quincunx/dp/B07K7GDT35 .

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Lever

The function of the hydrant cap's lever would be to provide a support system for the firemen to be able to remove the hydrant in a swifter manner. The lever would be attached to the front of the hydrant cap. The lever would be made out of cast iron which is the same material as the hydrant cap itself. For comfort, the lever would also include a rubber grip as well.

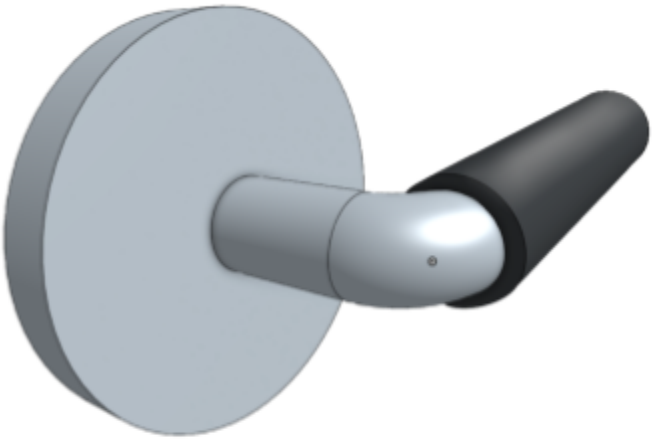

Figure 8: Lever Close-Up Left View
Mata, Jenny (2023). Figure 7. May 1, 2023

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Innovation Process

3.1 materials

Our innovation to the fire hydrant cap will consist of many different materials during the production process. The water Valve seal and Copper tube will be made of copper since it is resistant to water and its a common material used in plumbing. The lock system will be made of Nickel-Plated Zinc since it is a strong material that can also be a quickly locked an unlocked with a key allowing for a faster action from firefighters to access the water of a hydrant. The Hydrant cap and handle will be made of Cast iron like any traditional fire hydrant because it is heavy duty and can endure harsh conditions and rust. The gears are brass because thats a material that is resistant against rust which would allow for a longer lifetime. The grip and seal would be rubber to bring comfort to the cast iron handle and also keep water from leaking outside the hydrant during its use. In New York City there are around 110,000 fire hydrants so from a rough estimate of the cost of materials the budget of materials would stand at around 3.8 million dollars.

Description	**material**	**Cost**
Water Valve Seal and Copper Tube	**Copper**	**$3.90 per pound**
Tubular Lock	**Nickel-Plated Zinc**	**$1.2016 X $10.982 lb**
Key	**Nickel-Plated Zinc**	**$1.2016 X $10.982 lb**
Fire hydrant cap	**Cast Iron**	**$0.63 per lb**
Handle	**Cast Iron**	**$0.63 per lb**
Gears	**Brass**	**$1.76 per lb**
Handle Grip and seal	**Rubber**	**$1.27 per lb**

Total Cost:	**Total mounts:110,000 hydrants**	**3,804,013.66**

3.2 Labor Cost:

The labor cost for our innovation will consist of a group of plumbers that are licensed to service fire hydrants. They will be responsible for implementing our new hydrant cap to the fire hydrants around New York and they get paid 72 dollars per hour. Majority of the pieces to create our new hydrant will be bought from current suppliers with the prices ranging from as low as 6 dollars to 142 dollars. This allows for a quick manufacturing process since we can do a mass order of the parts. A transporter is also necessary in the process because they will transport the finished product to their designated area so that the plumbers can begin implementing the new hydrants around New York.

Description	**Labor**	**cost**
Service the fire hydrants	**Plumber**	**$72 per hour**
Moving the finish products to their designated location	**Transporter**	**$14-17 per hour**
The Hydrant cap supplier	**Hydrant cap Vendors**	**$73.47 per cap**
The Rubber grip on the lever	**Handle Vendors**	**$5.63 per handle**
The Shower head feature	**Shower Head Vendors (E)**	**$142.00 per showerhead**
The gears that control the water flow	**Brass Gears**	**$16.61 per gear**
Restricts the public from releasing the full force of the water	**Tubular lock and key**	**$40.96 per set**

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Benefits and conclusions:

Our innovation aims to solve the problem with the current fire hydrant caps, which adversely affect the community. When fire hydrants are opened, they release over 1,000 gallons per minute, causing a decrease in water pressure and resulting in less water being available for firefighters to fight fires. This situation is dangerous and can lead to unnecessary loss of lives. The purpose of our innovation is to create a fire hydrant cap that can avoid these issues related to water flow in hydrants. Our innovation seeks to provide public access to use and stay cool, maintain accessibility for firefighters, reduce water pressure in fire hydrants, and significantly decrease water loss. So to conclude this innovation does help not only the people in new york in hot and dry seasons but can help the fire fighters save lives and even reduce the mass watter loss.

Appendix:

	Alejandro Guadalupe	**Brandon Vasquez**	**Jenny Mata**	**William Gomezcoello**
Tasks done by 4/24	**Press release**	**Introduction**	**Tech description of the Lock**	**Tech description of water seal**
Task done by 4/26	**Innovation Process**	**Innovation Process**	**Tech description of the Lever**	**Tech Description of Hydrant body**
Task done by 5/1	**Innovation process**	**Innovation Process**	**Tech description of the key**	**Tech description of Sprinkler system**

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