Switch Adapted Water Gun

DESIGN RATIONALE

Introduction

This collapsable switch-adapted water gun was designed with the intention of being easy to transport, simple to set up, and fun to use.

Goals

G01	Be divided into multiple parts
G02	Quick and easy assembly and disassembly
G03	Pieces snap together snugly, and compactly in disassembled form

Functional Requirements

F01	Support the weight of the water gun
F02	Allow access to the trigger
F03	Allow for switch adaption

Ideation

Idea	**Decision**	**Justification**
Separate into 4 pieces	Proceed	This made printing easier, as it could be easily reprinted in pieces. Additionally, it made the design compact and easy to separate.
Make pieces snap together	Modify	This would've required precise measurements that were not achievable in the amount of print time available.
Introduce sockets to hold the supports	Proceed	This made the supports more sturdy and less likely to be damaged. It also was a way to secure them in place without snapping.
Use Velcro to secure the tubing	Abandon	This ended up being impractical and would require

		extra mobility to set up.
Split the base in two parts	Abandon	While this would have been helpful in testing and prototyping, and reduced reprint time, it would have utilized excess material, and introduced new problems of security.

Concepts

Four-Part Stand

The four-part stand consists of a main base piece with three sockets, two C-shaped supports, and another Y-shaped support. This was done in order to maintain collapsibility and easy assembly (G1 and G2).

Y-Shaped Support

The Y-shaped support sits underneath the barrel of the water gun, in front of the trigger. This keeps the water gun upright and aimed forward. Additionally, this leaves the trigger still accessible (F02).

C-Shaped Supports

The C-shaped supports are intended to hold the tubing at the back of the water gun. Without the C-shaped supports, the water gun would wobble from side to side, and additionally add more stress to the Y-shaped support.

Base

The base is designed to minimize material while still being able to accommodate the supports. The base supports most of the water gun's weight (F01), while the supports help stabilize it.

Sockets

The sockets were the most reasonable solution to holding the supports in place while having a margin of error for print-related measurement problems. The circular socket for the Y-shaped support was printed 2 mm larger than the Y-shaped support to allow for print errors. The sockets for the C-shaped supports are rectangular to maintain that same margin as the circular sockets. Additionally, the rectangular shape helps minimize material while not compromising security or functionality.

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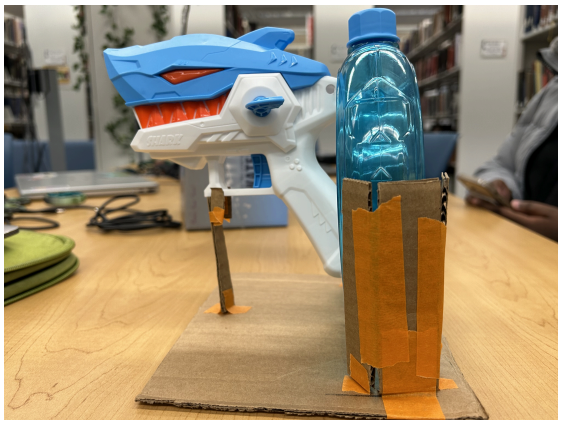
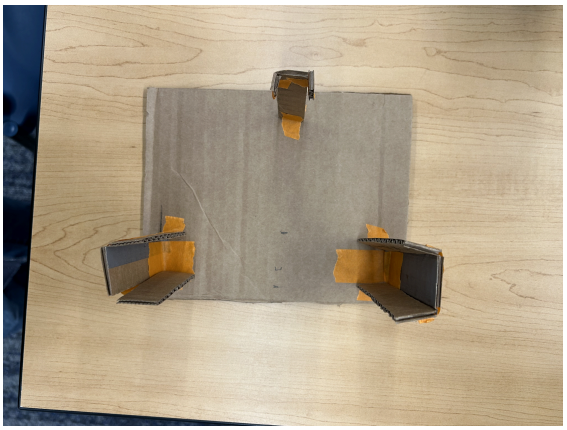
Prototyping

Cardboard Prototype

A low-fidelity proof of concept.

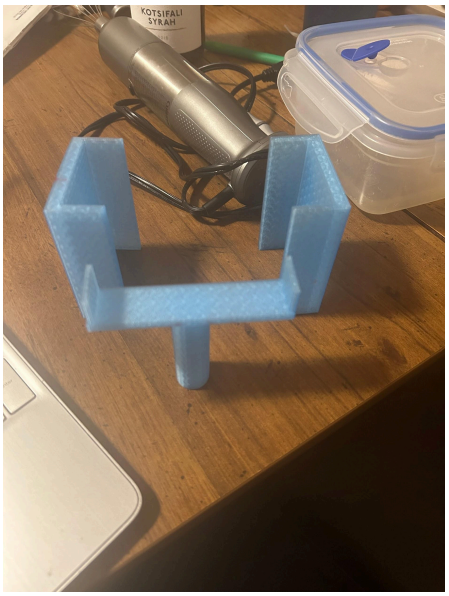




This prototype utilizes the 3 supports, and the back two utilize the C-shaped supports. The base doesn't use the T-shape implemented in the final design. Additionally, this prototype benefitted from the flexibility of cardboard, as well as the ability to be taped in place.

Support Prototype

Checking for fit and balance.



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This prototype was printed to check the measurements and balance of the 3D model. Upon testing this, it was discovered that the C supports were too wide, the Y support was too long, and not tall enough.

Full Prototype

Testing the base and sockets.

This prototype revealed more flaws in the measurements. The C-supports were too narrow, not allowing the tubing to fit in, and the walls on the Y-support were too tall. Additionally, the walls were too thin, and one ended up snapping off. However, this prototype proved that the sockets were functional and convenient.

Opportunities for Improvement

The measurements can still be adjusted to better fit the water gun, as well as improve integrity of the stand itself. Introducing a swivel mechanism would increase the play-ability of the water gun, but would likely also increase complexity of assembly.