PHONE CASE: super soaker

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design

fits and tolerances

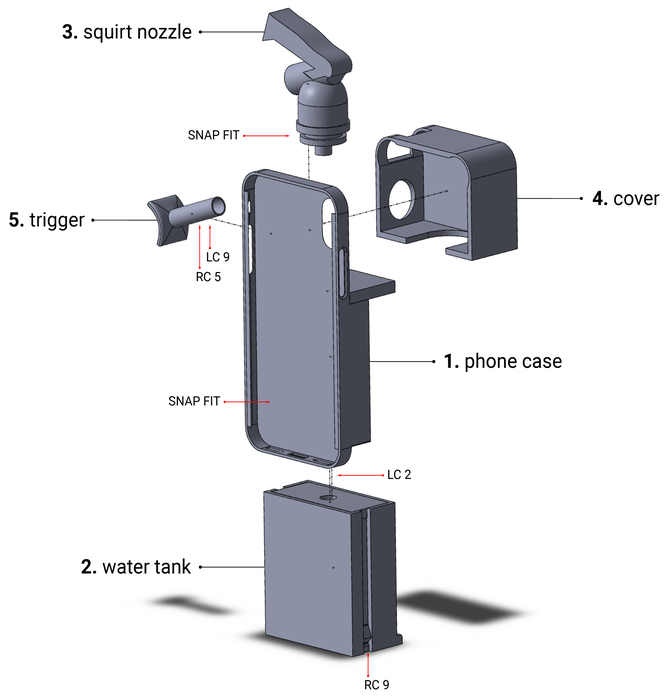
1 (case to phone): snap fit allows repeated fitting and removal without damage to the phone

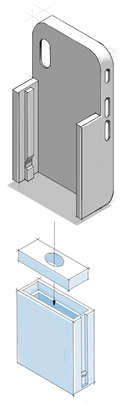
1-2 (tank to phone): sliding fit (intended RC9) into a snap fit allows easy insertion and securement of the water tank to the phone case

2-3 (tank to nozzle): Locational fit (LC2) almost interference ensures a watertight seal

3-1(nozzle to phone): snap fit

5-3 (trigger to nozzle): locational fit (LC9) running fit (RC5) maintains movement of the trigger



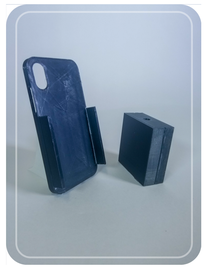


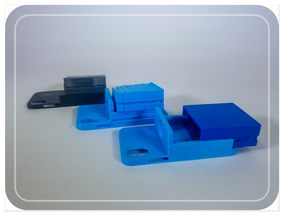
materials and processes

3D Printing: Ultimaker 3S
- Good for complex geometry
- Provides quality finish
- Allows for quick prototyping
- Requires little set-up

PLA Filament & Breakaway Support
- Inexpensive
- Recyclable
- Provided in various colors
- Support is quick to remove
- Does not require post-processing

Squirt gun nozzle is outsourced to ensure functionality & watertight seals





market need

problem

Our product's main function is for entertainment for children. As technology increasingly affects our lives, the age that children receive phones is becoming younger and younger. Our product conveniently allows children to have fun in the sun with water guns and play on the cell phone!

users

Potential users is approximately 1.6 million children in first world countries under the age of 15.

differentiation

This is the first product of its kind to integrate a functional water gun into a phone case.

scaling up

We used 3D printing for our entire prototype; however, it is not an efficient method for mass production; plastic injection molding is better suited to produce the water gun as a single component. The ability to have assembly lines would increase production speed and volume. In addition, we would switch PLA with ABS for better durability and impact resistance to ensure the water tank is not damaged by everyday use. For a better fitting to the phone, we would switch to a flexible plastic for easier removal and fitting. Finally, we would incorporate rubber gaskets between components for better waterproof sealing.

reflection

One of the main lessons we learned is that 3D printing is heavily orientation dependent because...

- **Strength:** the direction the layers are set creates different points of weaknesses
- **Print time:** length is affected by the number & size of components per file
- **Error:** printing components individually showed an improvement in quality
- **Material:** reduction of overhangs decreases support material & its removal
- **Design:** the water tank needed to be designed in 2 parts as it would have been difficult to remove the support material if it was a single part

We also learned that different 3D printers have varying accuracy. For example, Type A printers produce more errors than Ultimaker printers. Type A's produce shifted layers, tighter tolerances, and rougher finishes. In addition, we created a lot of our own custom fits because the printer's inaccurate and unpredictable tolerancing produced parts that did not conform to standard ANSI fits.

In the future, we would definitely use vacuum forming to add a plastic layer to the water tank with the addition of rubber gaskets to create a better water tight seal because 3D printing on the Ultimakers did not produce the desired level of watertightness. We would also create our own interior nozzle and spray because the outsourced nozzle made the product too bulky.