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CASE-X

Progress Report

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REVIEW OF GOALS

The goals and objectives set in the last report include using engineering analysis techniques to alter the design of a conventional glasses carrying case so that it will be able to store the necessary cleaning materials. Another one of the objectives was to build the case with all of the working mechanisms, but since choosing the design and materials it was determined that it would be more feasible to construct the design using AutoCAD Inventor software in order to demonstrate all of the working mechanisms.

WHAT HAS BEEN ACCOMPLISHED

Some of the goals accomplished since the last report include determining the dimensions for the case and compartments, choosing the materials to build the case, creating AutoCad sketches (Appendix B, Page 4), and beginning the process of pricing the case. Some difficulties encountered by the group include the lack of available information on the materials and dimensions of standard glasses cases, due to the fact that there are so many varying designs available online. The solution to this problem was to decide what the ideal design was for this product, more specifically to tailor the case to allow for the mechanical components to be added. To do this, a basic glasses design was chosen [1] as a basis to begin calculations (Appendix A, Page 3) so that a conceptual design could be created.

CONSULTATIONS

Steve MacDonald was consulted regarding the design and inner mechanics of the case and also about the possibility of 3-D Printing a working model, however when talking to him it was discovered that there is no 3-D Printer on campus. He provided valuable insight on the materials available to construct the case, which were quite limited due to the small size of the case. It was from this consultation that the idea arose to design the components of the case using online software to ensure all of the interior mechanisms could be shown.

OUTLINE OF REMAINING GOALS

For the remainder of the project, a digital prototype will be created using the Inventor software. This will give an in depth look at each of the components, as well as a completed design of the final project. It will show each layer of the design, giving a better look at each of the individual components of the case, as well as how all components interact with each other. The idea of animating the design in order to view the internal mechanics working will be explored as well.

CASE DIMENSIONS

The perfect size for most eyeglasses and sunglasses is a standard size of 15 cm in length, 6 cm in width, 3.5 cm in height. This product will use all of these dimensions except for the height. The total height will include the height of a spray nozzle with a diameter of 1.8 cm used for the fluid compartment. The compartment is underneath the area where the actual glasses will sit. This concludes that the case will have a height of 5.8 cm. The shape of the case will be mirrored to a rectangular prism, but will feature smoother edges and corners. Measuring the thickness of a hard

leather case that the group was able to obtain with similar characteristics to the Case-X design resulted in a thickness measurement of ~4.5 mm.

FLUID COMPARTMENT

The compartment that will hold the cleaning solution will be a 8.80 cm x 6 cm x 1.8 cm plastic casing capable of holding 95 mL of fluid. A plastic casing will keep the cleaning solution from leaking into the glasses compartment of the case. It was estimated that the 95mL of solution will last the user over a month and a half. An assumption made was that a person would on average clean their glasses 5 times per day, at an average of 6 sprays per clean, where the average spray nozzle of our caliber dispenses 1 mL per 12-15 sprays. As a side note to these assumptions and calculations, it is important to note that these numbers would vary from user to user, due to the fact that there are many different durations of time for which people wear glasses.

MECHANICAL COMPONENTS

A rough sketch that shows what the mechanical components inside the glasses case will look like can be seen on page 4, Appendix B. The dimensions of the interior mechanical components are still to be determined as the creation of a 3-D model on Inventor is still in the works. See Appendix B for the AutoCAD sketches.

PROJECTED TIMELINE

March 3rd - 10th	- Build each part of the design using inventor - Complete calculations for internal mechanics (spring, pushpin, etc.)
March 10th - 17th	- Complete calculations of fluid mechanics for nozzle system - Determine how we will demonstrate the internal mechanics
March 17th - 24th	- Assemble all inventor drawings to visualize the internal mechanics - Complete total cost evaluation
March 24th - 31st	- Finish final report - Prepare for final presentation

APPENDIX A: CALCULATIONS

The basis used for these calculations is the case shown in [1].
Volume of material needed for outer shell:
Outer volume calculation: $L * W * H = 15cm * 6cm * 5.8cm = 522cm^3$
Inner volume calculation: $(L - 2t) * (W - 2t) * (H - 2t) = 14.00cm * 5.10cm * 4.90cm = 349.86cm^3$
Total volume of material needed: $V\,outer - V\,inner = 522cm^3 - 349.86cm^3 = 172.14\ cm^3$

Additional Mass due to cleaning solution
Standard mixture of glasses cleaner [2] consists of:
~5% rubbing alcohol, 94% water, 2 drops of cleaning detergent

Weight calculation: $Percentage * Total\,fluid * (cm^3/mL) * Density$

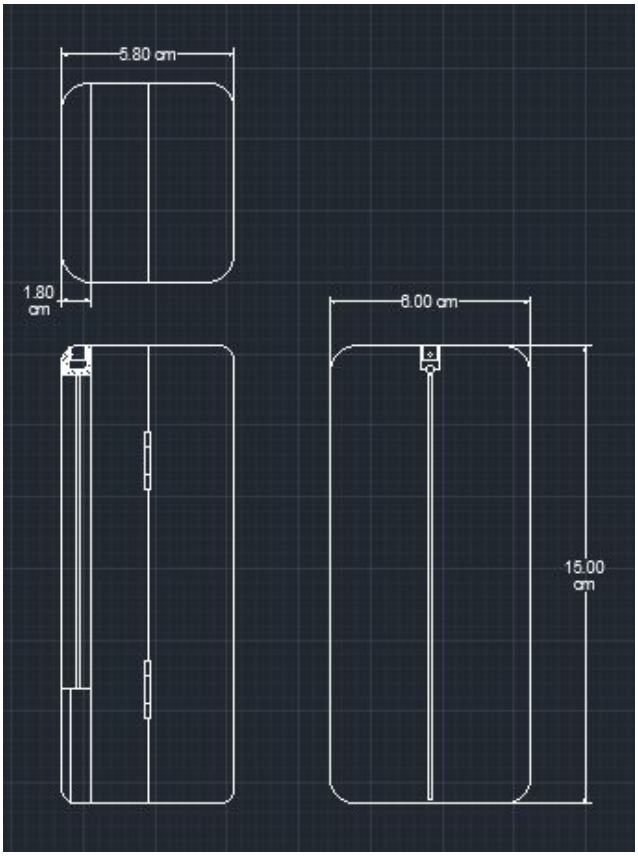
- $Alcohol : 0.05 * 95ml * 1cm^3/mL * 0.78509g/cm^3 = 4.75g$
- $Water : \ 0.95 * 95mL * 1cm^3/mL * 1g/cm^3 = 90.25g$
- $Soap : 0.1mL * 1cm^3/mL * 0.801g/cm^3 = 0.0801g$
- $Total\ Weight \ = \ 95.08g$

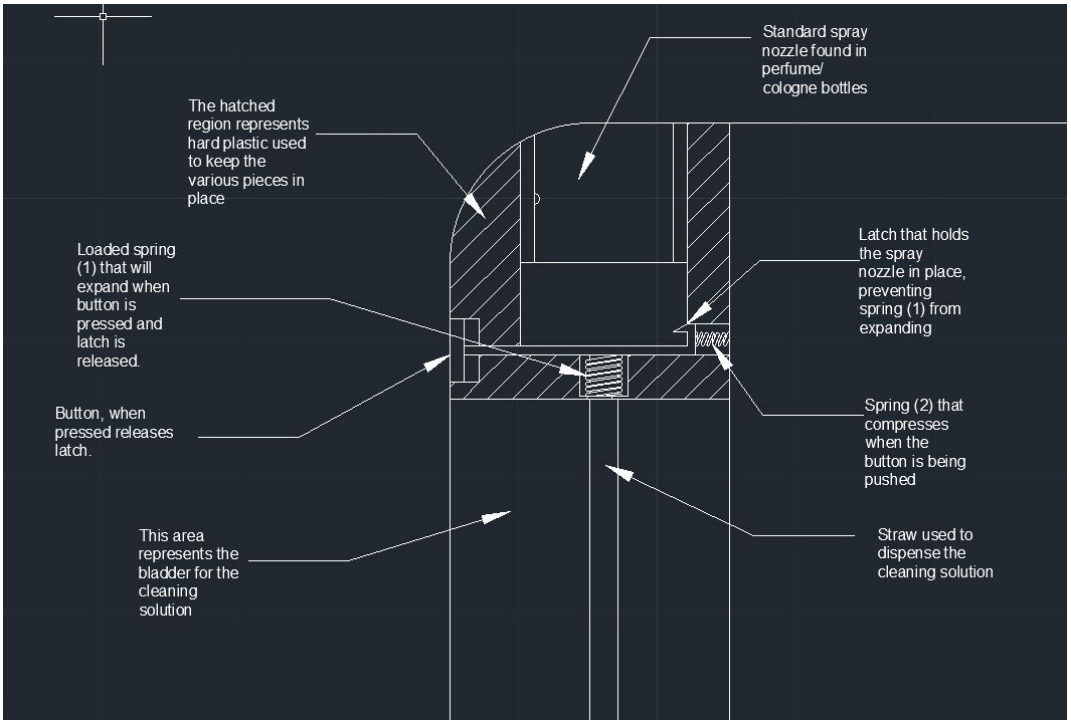
How Long will a fill up last?

- $5\ cleans/day * 6\ sprays/clean = 30\ sprays/day$
- $30\ sprays/day\ /\ 15\ sprays/mL \ = 2\ mL/day$
- $95mL \div 2mL/day = 47.5\ days$

*These calculations were based on assumptions made regarding how often the average person would clean their glasses. These numbers definitely vary however as there are many different uses and frequencies at which people wear their glasses that would impact how often they clean their glasses.

APPENDIX B: DRAWINGS





REFERENCES

- [1] https://www.amazon.ca/Portable-Eyeglasses-Sunglasses-Protector-Protection/dp/B07B4YYG7S/ref=sr_1_17?dchild=1&keywords=glasses+case&qid=1583448046&sr=8-17
- [2] Safety Data Sheet on Lense Cleaning Solution http://lkstevens-wa.safeschoolssds.com/document/repo/a3a90286-4531-42b1-baba-506b41eb5db5
- [3]Measurement of leather glasses case for reference.