GNG2101

PROJECT DELIVERABLE J

Submitted by

TEAM B21

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Abstract

Throughout the design course, we were asked to find a solution to help a person with hearing problems in order to make the device more functional. In addition, certain constraints must be respected such as the budget restriction which was $ 100 as well as the time constraint. To do this, it was important to apply concepts learned in this course in order to come up with a good product design. So we did three different prototypes to end with a final product: The Auditus. We therefore created a rechargeable, water-resistant hearing aid. We did this by covering the electrical circuit with a layer of nail polish and covering the microphone with a waterproof fabric and adding a magnetic USB-C charger to the device.

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Introduction

People with hearing problems who wear hearing aids are often constrained in their day-to-day life because they are not adapted to their daily lives. In fact a study in 2011, showed that 4.6 million Canadians had hearing problems and only 25% wore a device since the device is not suitable for everyday life (Statistic Canada). Furthermore, some people have to remove their hearing aids under the rain because they aren't waterproof. This can make their security in danger, because if they walk and don't hear noise, that means that they can't hear a car or a person coming at them. Also some hearing aids have disposable batteries that need to be changed often so some people will turn the hearing aids off to save the battery when they are at home. In fact we can see that hearing aids can be very constrained. Morevere, presently in the market the hearing aids are either water resistant, but way too expensive, or less expensive but not very functional. That's why, it's important to design functional and affordable hearing aids that can be worn in everyday life without any constraints to offer a better quality life to people suffering from hearing losses. To do this, our group design Auditus, the waterproof, rechargeable hearing aids. Our product is better than what it's on the market for several reasons. First, Auditus is waterproof and really affordable. The cost of the hearing aids is less than 100$ compared to the one the market who are 1000$ and over. Moreover, our hearing aids are rechargeable so don't need to change the battery anymore, and people will be able to charge their device during the night. Also the autonomy of Auditus is up to 48 hours so no stress if you wear the device all day long. Secondly, our concept can apply to any type of hearing aids, then if someone really likes their model of hearing aids and don't want to change their device, they can still buy our kit to waterproof them. As we can see, Auditus is not only a device, it's a concept, that means people can buy a kit including all the material needed to waterproof their device and they only have to follow the instructions video. In fact, our concept can be very versatile and it can reach a lot of people. Knowing all the advantages of our product we can say that Auditus really improves the quality of life for a lot of people.

Main Body

Features:

- **Microphone:** The small microphone in the hearing aid picks up sound that is sent to the amplifier and then fed into the speaker. It can be set to pick up sound at higher or more regular frequencies.
- **Speaker:** The earbud shaped speaker in the hearing aid receives and projects sound inputs from the microphone amplifier. It has a range of volumes from 1-4 that it can produce sound at.
- **Charger:** The charger is a magnetic USB-C charger that has been super glued into the hearing aid. The magnetic part of the charger connects to the cable of the charger and a small green light by the charging port of the hearing aid turns on to indicate when the hearing aid is being charged.
- **Waterproofing:** The hearing aid is waterproofed using clear nail polish, superglue and silpoly. The nail polish was used to coat all the electronics and cover all the seams to make the hearing aid impermeable. Silpoly and superglue were used to cover the hole in front of the microphone to stop any water from touching it.

Instructions:

1. Unscrew all screws in the hearing aid (keep track of which screw goes where as they are different).
2. Separate the three parts of the body.
3. Use several coats of nail polish to cover all the electronics inside the hearing aid.
4. Close the hearing aid back up and screw all the screws back in.
5. Use several coats of nail polish and superglue to cover all the seams on the outside of the hearing aid.
6. Use nail polish to cover the speaker.
7. Use superglue to stick a strip of Silpoly on the top of the hearing aid, covering the microphone.
8. Plug in the magnetic charger and super glue it into the charging port.
9. Use a couple coats of nailpolish to cover the magnetic charger that is already plugged in.
10. Connect the charging cable to a power source and charge the hearing aid and turn it on.

Health and Safety:

- Follow the safety guidelines on the superglue and nail polish.
- Beware loud frequencies and feedback from the speaker as it is deep in your ear and could cause long term or permanent damage.

Conclusions and Recommendations for Future Work

There were many lessons learned throughout the designing process of the hearing aid. It was very interesting to learn how effective the nail polish was at waterproofing the electronics. The only issue in the designing process was the microphone. It was not fully waterproofed by the nail polish so it was covered with Silpoly and superglue. After applying these materials, the microphone however was no longer picking up sound through the intended hole but rather through any opening in the hearing aid that it could find. This caused the hearing aid to have feedback if it is turned on before being inserted into the ear. If inserted and then turned on, the hearing aid will work fine however the sound quality of the microphone has deteriorated a bit due to it being covered by Silpoly.

Bibliography

Statistic Canada. (2020). *Rates of hearing loss among Canadians aged 20 to 70*

Retrieved from : https://www150.statcan.gc.ca/n1/pub/82-003-x/2015007/article/14206-fra.htm

Appendices

Table 1: Bill of materials

Item number	Part name	Description	Quantity	Unit cost	Extended cost
1	Hearing aid	Digital hearing amplifier	2	$29.99	$59.98
2	Polish	Clear nail polish	1	$2.47	$2.47
3	Charger	Magnetic micro-usb charger	1	$9.90	$9.90
4	Silicon glue	Transparent caulking	1	$2.17	$2.17
5	Waterproof fabric	Black neoprene fabric 56x18"	1	$16.99	$0.85
				Total	$75.37

The figures below is what the kit consists of:

Figure 1: Nail polish

Figure 2: Magnetic charger

Figure 3: Silicone

Figure 4: Super Glue

Figure 5: Hearing aid

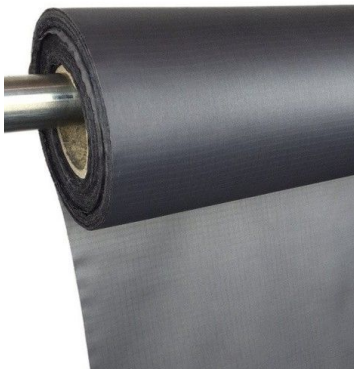

Figure 6: Silpoly fabric