GNG 2101

**Design Project User and Product Manual**

**\*Fog Off! : Universal Mask Fitting**

Submitted by:

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**List of Acronyms and Glossary**

**Table 1. Glossary**

|  |  |  |
| --- | --- | --- |
| **Term** | **Acronym** | **Definition** |
| Blurz | N/A | Company Name |
| “Fog Off!” | N/A | Name of Product |

Introduction

The objective of this project was to create a product that would enable people who wear glasses and a mask to effectively navigate public places or situations throughout the pandemic. Our product is essentially a securing mechanism that secures the mask of a user tightly over there face. This reduces air flow to a users’ glasses and increases visibility. In this report an overview of the problem statement will be given followed by instructions regarding the application process. Next, trouble shooting of the product as well as a detailed fabrication process will be described. Finally, an explanation of the testing and validation performed on the product will be explained followed by a conclusion to summarize the product’s success.

# 1. Overview

Navigating the Covid-19 pandemic has proven difficult for many demographics. In particular, glasses wearers have great difficulty navigating the pandemic while wearing a mask. Due to people's breath and the combination of mask and glasses, glasses wearers are subject to an accumulation of condensation on their glasses. This simultaneously reduces people's visibility and increases people's anxiety as they cannot perform simple tasks as efficiently as they could outside of the pandemic. For example, to read they may have to remove or wear their mask improperly. This increases anxiety levels and their exposure to a highly contagious virus.

Through client meetings, the client's needs were determined. It was specified that the product must increase visibility for glasses wearers, reduce the anxiety of the users, encourage people to wear their masks properly, be comfortable, affordable, easy to use, compatible with all mask types, washable or disposable, and have an eye-catching/appealing design.

The “\*Fog Off!” meets all the client's needs and wants, keeping glasses from fogging without sacrificing style or comfort. The product differs from the others on the market in many ways. First it is composed of two pieces and ensures equal efficiency for all face types. Second, it is also unique as it uses magnets on the top piece to press the mask to the under piece to prevent fogging. The piece underneath is made of medical grade silicone adhesive which adheres to the skin without gaps to prevent the air or moisture from rising from under the mask and to the glasses.

Though some solutions to this problem exist on the market they did not completely meet the needs of the client. Some examples are tapping the bridge of the mask, a nose clip on top of the mask and a moldable plastic piece that clipped to the mask. The main issue with these products was the lack of effectiveness, the products are reviewed to not entirely stop fogging. They were also not adjustable to all face types or shapes. The product “\*Fog Off!” is comfortable, adjustable to different faces and noses, is reusable and provides an effective solution to the fogging problem, “Keeping glasses clear, for no more fog\*ing problems.”



**Figure 1:** The final Product “\*Fog Off!”

“\*Fog Off!” is composed of two parts. The first part adheres to the face under the mask and the second worn on top of the mask compresses the two pieces together. The inside part is made of medical grade silicone adhesive and contains a steel wire to help it take the shape of the face of the user. The silicone sticks to the face creating a seamless barrier to prevent fogging. The top part is made of nylon with magnets sewn in. The magnets stick to the wire and hold the mask down to ensure that there are no gaps. This methodology maximizes the reduction of condensation on glasses.

## 1.1 Cautions & Warnings

This product is licensed under the Creative Commons - Attribution - Non-Commercial. This means individuals are free to share the product and the concept with others and adapt the product or portions of the product for any use. These actions may be taken under the conditions that attribution is given to the Team such as providing a link to the license and stating the adaptations that they have taken. Individuals outside of the Team may not use or reproduce this product for commercial use and legal terms may not be applied to restrict people from doing things that the license permits.

A warning while using the product, when removing or placing the top part on the mask be sure to not allow magnets to “click” together, this can damage the magnets and cause potential injury health hazards.

2. Using the System

“\*Fog Off!” consists of two main components or pieces, the silicone piece and the magnetic piece. Together these two components provide a moisture tight barrier and fit to the users face in order to prevent the fogging of glasses while wearing a mask.

The following sub-sections provide detailed, step-by-step instructions on how to use the various pieces of the “\*Fog Off!” product as well as how they work.

## 2.1 Silicone Portion

The silicone potion of the “\*Fog Off!” product is the piece worn underneath the user's mask. This piece adheres to user's face using medical grade adhesive on the medical grade silicone sheet to create a barrier and prevent fogging. Inside the medical grade silicone are pieces of steel wire.

2.1.1 How It works

The silicone piece works by creating a moisture tight seal. This is achieved by pressing the medical grade silicone adhesive to the face. The medical grade adhesive on the silicone sticks well and can be worn for hours on the face. The steel wires inside the silicone are used to help attach the magnetic pieces to the silicone piece, this will be further discussed later. These pieces of wire are also used to help the silicone keep and form to the exact shape of the users face and nose.

2.1.2 How to Apply

To properly apply and wear the silicone piece of the “\*Fog Off!” product remove the protective layer from the apparatus and hold aside for future use. Carefully hold the silicone piece by the edges careful to not touch the “sticky” side containing the medical grade adhesive, this will prolong the life of the product. Smile, then place the product on the bridge of the nose, gently press the wire into shape and hold the piece on the nose and cheeks for five (5) seconds to ensure a proper seal is created. Smiling when applying the apparatus ensures that the silicone will remain adhered to the face when moving and speaking, though it is encouraged for maximum efficiency it is not required.



**Figure 2:** Steps to Apply and Remove the Silicone Piece of “\*Fog Off!”

To remove the silicone portion carefully and slowly peel off face, this should be done gently to maximize the comfort of the user.

2.2 Magnetic Portion

The magnetic potion of the “\*Fog Off!” product is the piece worn on top of the user's mask. This piece is composed of nylon with stitched compartments. Inside these compartments or “pockets” are magnets. The purpose of the magnetic portion is to attach to the silicone portion and complete the seal to keep moisture off glasses.

2.2.1 How it works

The magnetic portion is a piece of nylon with magnets sewn in. The apparatus prevents fogging due to the magnets on the magnetic portion attaching themselves or “sticking” to the wire inside the silicone piece. This completes the seal by ensuring that the mask is held tightly against the silicone (which is tightly held to the face).

2.2.1 How to Apply

To properly apply the magnetic portion, ensure that the piece is flat and that magnets are not stuck together. If magnets become stuck together DO NOT pry them apart, instead carefully slide them off of each other.



**Figure 3:** How to Properly Put on a Non-Medical Mask [1]

After properly putting on the mask (over the silicone portion) holding either end of the magnetic portion line it up with the mask in the approximate location of the silicone piece (underneath). Lightly press magnets to ensure proper adhesion.



**Figure 4:** How to Properly Apply Magnetic Piece

To remove the magnetic portion, hold both ends and gently slide the piece off the face. Then remove mask as normal. Gently remove the silicone piece from skin, starting with the edges. Once removed wash the silicon using water and neutral soap. After it is cleaned, it can be dried by patting the silicon using a dry cloth or letting the silicon air dry. Finally return the silicon piece back to its original protective plastic.

# 3 Troubleshooting & Support

## 3.1 Product Care and Maintenance

The “Fog Off!” product consists of two parts that could potentially encounter error through the use of the product. First, the medical grade adhesive silicon has the potential to lose its ability to stick to a user's face. This can occur if the user does not properly clean the sticky surface of the silicon. It is suggested to use simple cleaning dish or hand soap to clean this surface. Gently dry the surface by patting it with a dry cloth or, letting it air dry, then place the silicon back on the protective plastic when not in use. If the user follows these cleaning instructions after every use, they can expect 200 uses out of the product. Second, the strip of nylon containing the magnets tends to like to attract its own magnets. It is important to be delicate and careful with this piece as small jarring can cause the magnets to detach.

## 3.2 Support

In the situation that the product breaks or is destroyed, Blurz offers a 30 day warranty on the “Fog Off!” product. Users have 30 days from the day of purchase to return the product and replace their broken product with a new “Fog Off!”. After the end of the warranty period, Blurz will not be held responsible to replace said product.

# 4 Product Documentation

## 4.1 Prototype One

The first prototype was made of materials found around the house. This allowed for the group to test the adhesive of the silicone as well as the seal it creates to prevent fogging. Finally, this prototype had the goal of communication, this allowed the client to be able to visualize the product.

4.1.1 Equipment List

In order to develop and create the prototypes as well as final product. Outlined bellow is a list of the equipment required.

* Scissors
* Pliers/clamps
* Needle
* Thread

4.2 Prototype Two

The second prototype was a high feasibility prototype and allowed for the comfort, visibility and adjustability/versatility to be tested. Below the materials used and instructions are outlined, the equipment used is the same as outlined in 4.1.1 .

### 4.2.1 BOM (Bill of Materials)

The bill of materials outlines the materials needed to create the prototypes. This ensures that the project stays on budget and allows for prices to be compared and all information to be organized.

**Table 2:** Bill of Materials

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Material | Cost | Additional Costs | Use in Design | Link to Material |
| Medical Grade Adhesive Silicon | $16.99 | Shipping (free over $35 shipped by amazon)  Tax (13%) $2.21 | To prevent fogging and stick to face (silicon layer) | [Amazon.ca](https://www.amazon.ca/PHCOMRICH-Silicone-Pads%EF%BC%8CResuable-D%C3%A9collet%C3%A9-Wrinkles/dp/B07X3RTL1C/ref=pd_bxgy_img_2/145-1165422-2854850?_encoding=UTF8&pd_rd_i=B07X3RTL1C&pd_rd_r=aae53307-3b97-4690-aed1-a87bfdf0f708&pd_rd_w=cCdGl&pd_rd_wg=JY9Bq&pf_rd_p=42339929-297e-4141-b7b2-fe55db70f4b7&pf_rd_r=3DHH957ZAMY3GF2X847A&psc=1&refRID=3DHH957ZAMY3GF2X847A)  Two pack |
| Magnets | $14.99 (150 small round) | Tax free shipping over $35 | To stick bottom piece to top piece and hold mask | [Amazon.ca](https://www.amazon.ca/Deryun-120pack-Refrigerators-Whiteboard-Miniature/dp/B085Y6P3CR/ref=sr_1_28?crid=1SRPDO9SIX4MD&dchild=1&keywords=strong+small+magnets&qid=1612665791&sprefix=strong+sma%2Caps%2C359&sr=8-28) |
| Metal Wire | $1.75 (Craft wire) | Tax (13%) $0.16 | To help silicon hold its form and form to users face shape | Dollarama  Pack of many (approximately 50?) |
| Gorilla glue | $8.48 | Tax (13%) $1.10 | To attach and secure magnets to silicone and metal wire | [Amazon.ca](https://www.amazon.ca/gp/product/B07W47FCSR/ref=ppx_yo_dt_b_asin_title_o01_s00?ie=UTF8&psc=1) |
| Nylon | (Found at home) |  | Encase magnets in outside layer |  |

### 4.2.2 Instructions

For the second prototype the silicone pieces were first cut to size, approximately 3x15 cm. Four wires with the length of 15cm were glued to the non-adhesive side of the silicone piece, length wise. The wires are glued in a row halfway up the height of the silicone piece.



**Figure 5:** Subsystem 1 of Prototype 2

The second subsystem included smaller circular magnets that were glued to a piece of fabric that is 15cm long. The magnets were stacked in twos and attached to the fabric just over 1.5cm apart. Ensure all glue is dried fully before using the product.



**Figure 6:** Subsystem 2 of Prototype 2

For the final prototype the only modification that was made was to the second subsystem. The magnets were arranged in the same orientation but instead of being glued to a piece a strip of fabric, the magnets are incased in nylon. They are sewn in order to prevent magnets from sticking together, as well as increasing the aesthetic of the product by making the magnets more discrete.



**Figure 7:**  Subsystem 2 of the Final Prototype

## 4.3 Testing & Validation

4.3.1 Testing the First Prototype

The objective of testing the first product was to confirm that the product was effective. Aesthetic considerations were not applied to this prototype. The focus was to confirm that the product could limit the amount of condensation that occurred on the glasses of the wearer. To test the product one of our team members wore the product for one hour and provided the rest of the team with her observations. It was confirmed that the efficiency of the product far exceeded our expectations and that minor changes would have to be brought to the second prototype.

4.3.2 Testing the Second Prototype

The second prototype was constructed to be more comfortable on the wearers face, calculate overall cost and necessary pricing as well as determine finishing touches that would be brought to the official product. The second prototype consisted of a medical grade silicone embedded with metal wiring to attract the small magnets that were attached to a strip of nylon. The second prototype proved to be mildly more effective than the first prototype. It was tested by 2 of the team members as well as 2 family members of a team member. The family members wore the product for about 2-3 hours each. Feedback was received in the form of a survey from the two family members and it was concluded that the product required a user manual for details on application and it would be preferable if the magnetic pieces were more concealed. To solve these issues a nylon strip was added around the magnets to conceal them and a user guide was created.

# 5. Conclusions and Recommendations for Future Work

In conclusion, the project was a remarkable success and our client was pleased with the final product. Throughout the semester the iterative design process was explored through actual application. We learned that the “problem identification” step and the “solution generation” steps were the most important steps as they helped us accurately solve the problem in the most efficient way possible. Furthermore, we also learned to stay in close contact with our client to ensure that we did not stray from the problem definition. After this semester we understand that creating a detailed, long-term, and adjustable schedule is important to stay on top of deadlines and meet requirements. The reason our team was so successful was because of our focus and our open mindedness. We were able to concentrate on solving the problem statement and generate solutions accordingly. In fact, our solution was initially derived from the idea of implanting magnets into a user's face. From this ridiculous idea we were able to make it realistic by using adhesive silicone. With a few more months of work, our team would have been able to establish a more effective way of mass producing this product. The current method of fabrication consists of using glue to attach metal wires to a silicone adhesive cut out. This obviously requires a lot of man power to mass produce as the products would need to be fabricated by hand. This method also results in a lot of waste as much silicone would be discarded. To reduce the necessary man power and waste it would be preferable to have a mold in which we could embed metal wires or powder into silicone.

# 6 Bibliography

[1] Brown Bird Design. *Https://Www.scientificamerican.com/Article/How-to-Use-Masks-during-the-Coronavirus-Pandemic/*, Scientific American .