HARSH SOKAL

Hi, I am Harsh Sokal, 2nd year student of Bachelor of Design, Delhi Technological University, Delhi and a quick learner. I am a responsible person with a positive attitude. I try my best to finish any work within the time limit. I like making new friends to improve my socialising skills. Model making, product sketching, listening to music and songs creation. I am also food lover and try making new dishes whenever I am at my home.

A Redesigned form of Electric Iron

Abstract

The main aim of the project is to improve the method of ironing the cloth to reduce creases.-Iron can reduce the creases by adding heat, pressure, and moisture to flatten it. Steam and dry iron are the most common irons used around the world. Other than these, streamers and ironing boards are also there. For tonnes of cloths, big ironing machines are there for faster production. Despite the fast and smart technology change and development, method of ironing remains the same as that of first iron. Smaller configurations have been made since the first steam function introduced in the 1920s. Since then only the angle of handle changed and with the more refined streamlined shape made up of plastic. Therefore, there is a scope of improvement in the way of ironing.

Introduction

As we know, clothing is part of life. As every human need care, clothes need to be taken care of as well. Before the discovery of cloth iron, its principle was discovered by the Chinese.-They ironed their silk cloths with coals placed in a pan. This principle continued until the discovery of electric iron in 1882. Technology changed over time, from the use of external water to the steam station, hence improving results over time. Some of the benefits of ironing clothes as follows:

1. Removes the smell of detergent from cloth.
2. Ironing makes clothes look better and fresher.
3. Kill germs and remove creases from the fabric.

In order to find problems in present cloth iron, a student was while ironing their clothes.

The observation started from plugging the iron to storing it after cooling down
Difficulty in ironing between the buttons as button stuck between the soleplate and body.

1. Many a times the tank overflowed as there was no indication of water level.
2. Change in hand posture according to handle which is not comfortable. May strain the hand while using it.
3. Cord holder has oscillatory motion in up and down direction. Ironing in random movement-causes problems as strain may be observed in the wire. This may be the reason for wear and tear of insulation at the junction of the cord holder.

Solutions need to be found in order to address the following issues: To tackle the button issue, the gap may be increased between the soleplate and the body so that it will not be stuck.

1. For water tank, instead of the small gap to fill water, a transparent water tank may help the user can get the idea of water level.

2. For the handle, Inspiration was taken from an existing product used by a carpenter to cut the wood. The handle looks more comfortable than the existing one.
3. For the cord holder, Inspiration was taken from the cord holder of hair products like straighteners with 360° rotating base which will help the user while ironing in any pattern.

Need Statement

The need for this project is to design an ergonomic steam iron that will enhance the user experience.

Objective

Main objectives of this project are:

1. To generate a solution to solve the challenges of ironing.
2. The solutions are generated through user research and evaluation of present ironing methods and tests.
3. The designs are done keeping in mind the ergonomics and aesthetics.

RELATED WORK/ BACKGROUND STUDY

Heat: Heat energy is transferred in fabric bond so that bonds can transform themselves from wrinkle state to the original state. If the wrong temperature is chosen, the fabric can shrink, degrade, or can lose its color. That's why heat controller is marked with dots on it representing the type of fabric along with it.

Moisture: Moisture is needed so to get better ironing results. Intermolecular bonds weaken when the fabric absorbs the water. Users with dry iron use external spray for moisture source while today's steam iron contains both moisture and spray functions which ease the method of ironing.

Press: Together with heat, moisture, and pressure, one gets the desired results of Pressing clothes. In the Earlier irons, the handle was at the back of the iron body. So the effect of the press could only be done by the end part of iron, i.e. center of gravity is at the end of the iron. But today's iron has handled in the middle. So the center of gravity is in the middle, and better results are observed.

ERGONOMICS

Ergonomics means the completion of any task by avoiding risk to the user's health. Factors such as posture and other aspects are needed to be taken care of while designing the handle of any product. Hands, upper arms and shoulders should be given extra attention while designing the handle for an iron. The plane created while the hand moves towards little finger are known as deviation plane. More the angle between the wrist and little finger, more will be the strain on the user's hand.

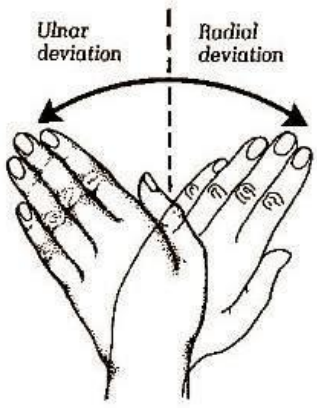

Figure 1. Deviation Plane

DESIGN HISTORY OF IRON

The main change after the discovery of first electric iron in the 1880s is the change in the design of iron and not the functions.

Figure 2. One of the first steam irons

The principle remains the same but handles and materials have changed over the period of time. One can observe that the early Irons looked bulky and their handles were also extended as heels. With time the rest of the body became curvier, and the handle became more comfortable which in turn increased the speed of ironing.

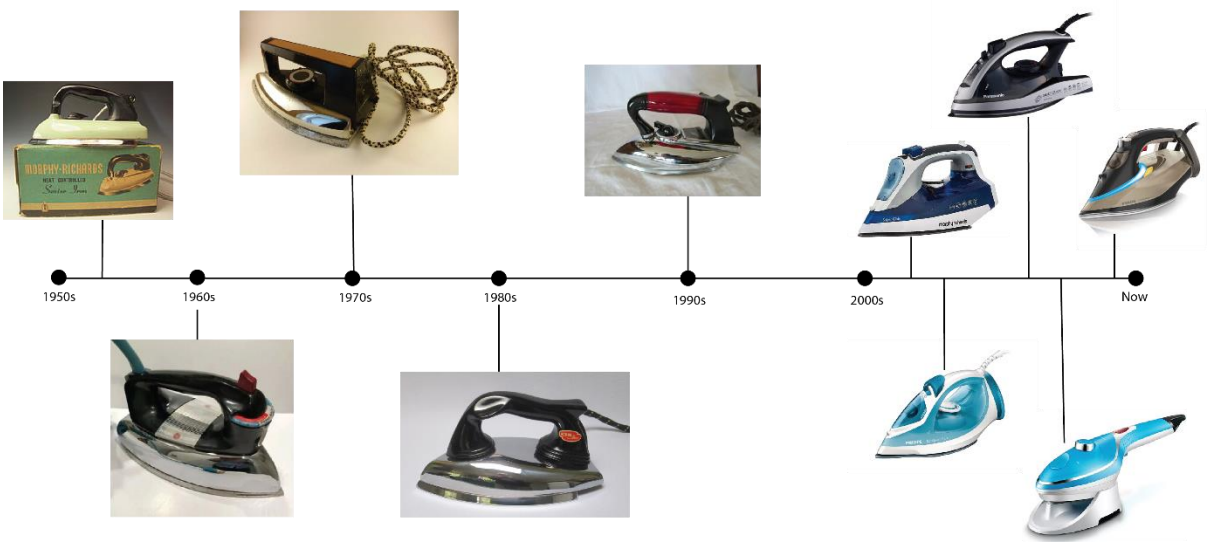

Figure 3. Design development of iron since the 1950s till now

MARKET STUDY

The leading brands in the market are Phillips, Morphy Richards, Bajaj, Havells, and USHA, etc. All these brands offer some solutions such as dry irons and steam irons. But Phillips has done innovative work by introducing OptiTemp function thing which automatically sets the temperature by detecting the type of fabric.

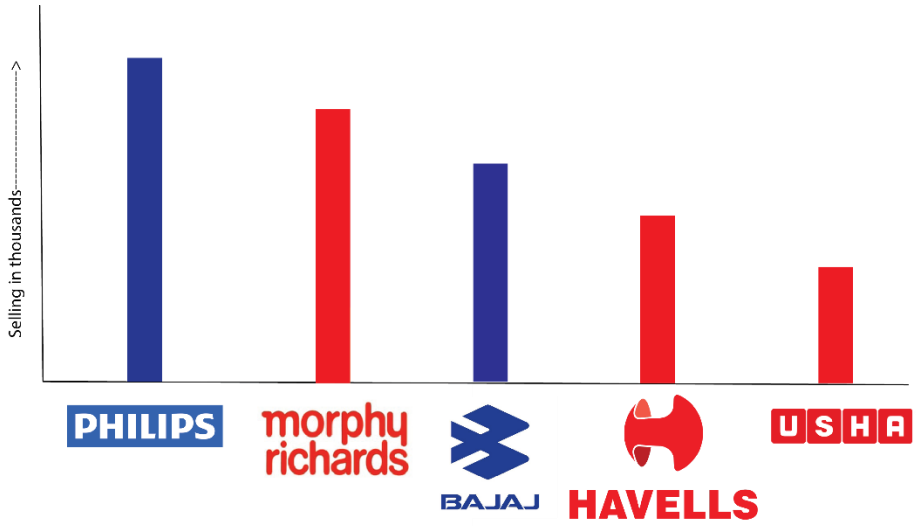

Figure 4. Sales of different iron companies in 2019

USER STUDY

SURVEY

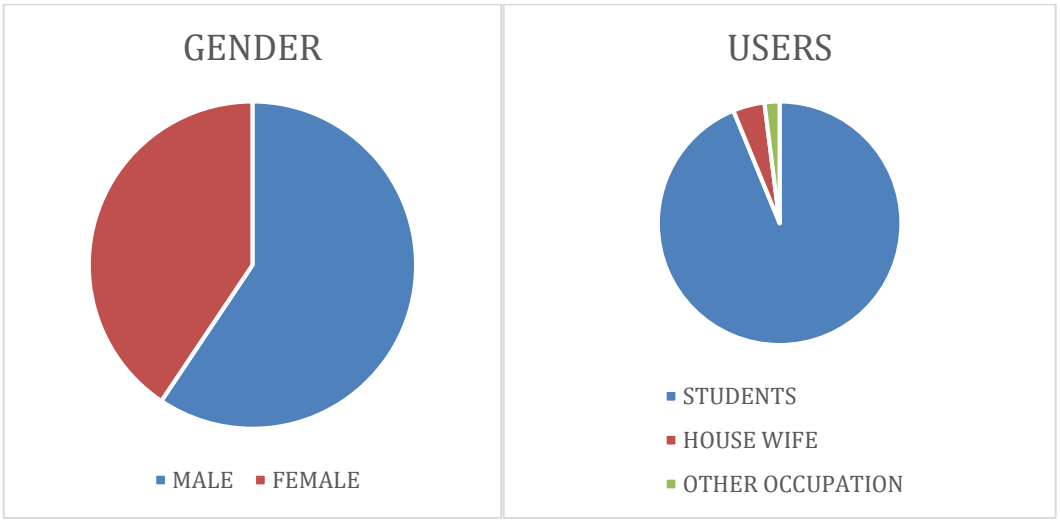

Figure 5. Left from right- Gender distribution and Occupation distribution

Survey Analysis

A survey was done amongst 50 participants within the age group 15-30 years.

An equal distribution of females and males members were there.

90% of the participants were students and the rest of them housewives and other professionals.

60% of users iron their own cloth.

60% of users use dry iron or not steam iron.

60% of users use iron in side by side pattern and the rest of them in circular loops and random patterns.

Appearance and safety are the aspects that are users want in their next buy.

Survey main findings

Most of the users think ironing is a time-consuming task, whereas some find it relaxing.

Users don't want to try steam iron as there is more functionality in steam iron than in dry iron which needs caring and services.

Most of them want more ergonomic iron, want better results, and wanted something for the cord problem.

TASK ANALYSIS WITH OBSERVATION

Main findings of task analysis

- User completes ironing while sitting all the time. So they bend while ironing and wrist are at the stomach level.
- User held the iron in a way that might strain their hand.
- Most of the users lifts the iron so that they can get better precision while spraying.
- While filling the reservoir, some users find it difficult as there is no idea of water level in the tank due to the translucent body. They stopped only when water-filled till the brim.
- There is no proper display for steam control. That's why some users only use spray and regulator for this task.
- There is a strain in the wire while ironing in a circular pattern as the cord holder is limited to back and forth direction.

1. PERSONA

Paul Wilson

Figure 6. Paul Wilson (Shutter stock)

- Paul Wilson is a 1st-year student B.Sc. nautical science of navy. He needs to wash his navy uniform daily and iron it daily. He tries to keep his uniform neat and clean. Usually, he wears T-shirts which he irons once in a week. He recently bought Bluetooth headphones with neon color to look different from others, and he controls his headphone with his phone. He tries to buy electronics which are cordless.
- Quote: "I don't want the crease to spoil my personality."

2. INTERVIEW

Main findings of the interview

- Refilling of the water tank and using spray is an issue.
- An iron which will use less energy and should give good result in less time.
- Heel rest should be stable enough as most of the Indian users iron their cloth on bed.
- The part which gets damaged the earliest is the cord holder as it gets twisted and the insulation gets removed over time.

AREA OF IMPROVEMENTS

- Handle/ergonomics
- Light
- Cord holder
- Buttons
- Design
- Water reservoir

1. **DESIGN BRIEF**

   A neat and clean product with attractive appearance and offer the user a more ergonomic and comfortable way to remove crease from the cloth without giving strain on the user's wrist.

2. **INSPIRATION FROM OTHER EXISTING PRODUCT**

   This machine is used by a carpenter to cut wood. Its handle looks more ergonomics when seen from the point of ironing clothes. It is also used in the same manner as that of cloth iron.

Figure 7. Bosch GST 150 BCE jigsaw

3. **INSPIRATION BOARD**

Figure 8. Mood board of design

Concept Generation

Handle Development

The handle should be developed in a way that it would be comfortable in the user's hand and easy for the user to place the iron in standing position.

Types of handles

1. **Horizontal handle:** This handle is positioned over the iron body just like in trolley bags and pushed in the same manner. This handle is used in early irons.
2. **Joystick handle:** The handle consists of engravings on it which had a potential of adding comfort while using it.
3. **Pistol grip handle:** this handle has a natural tendency for moving back and forth movement with hand. Also, with this, it is easy to stand the iron.

Figure 9. Types of the handle that can probably use as a handle in iron.

Rejecting horizontal handle and joystick handle as it is hard to stand iron with horizontal handle and joystick handle and also not close to the natural posture of the hand.

The pistol grip handle was chosen with palm rest.

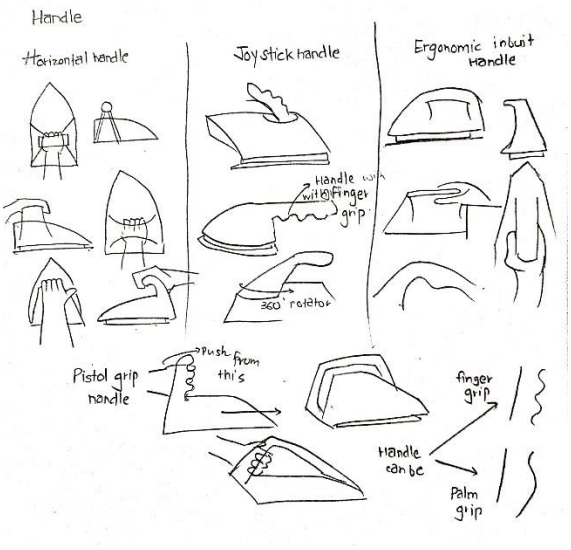

Figure 10. Sketches are showing the reason for selection of pistol grip handle.

After choosing the pistol grip handle, different ways through which the pistol grip handle could be used were studied.

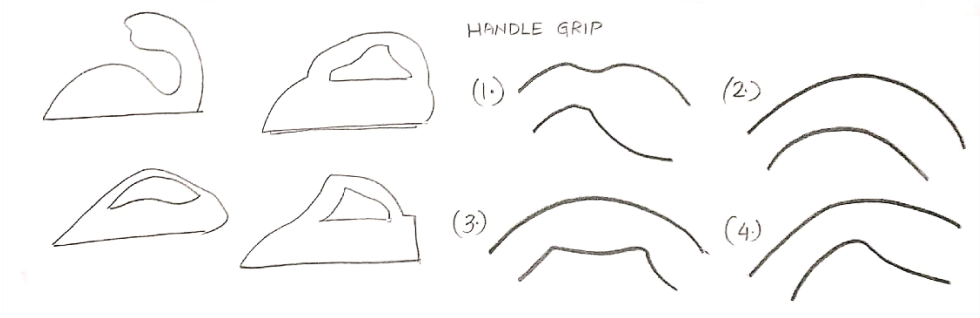

Figure 11. Possible ways of adding pistol grip handle in iron.

Choosing no. 4 handles as there is a place for index finger and position for a sprinkler button. Also handle looked more comfortable and ergonomic in user's hands than the present one. Also, the angle between the iron body and handle should be 30º which is the natural posture of the hand.

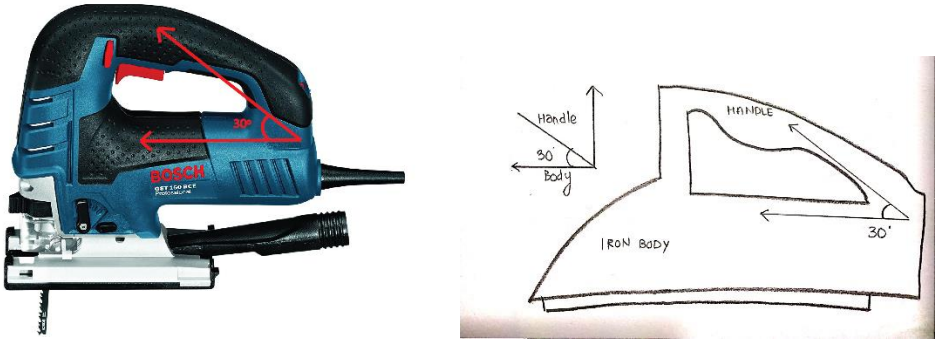

Figure 12. Left to Right- inspiration from existing product and implementing it in our product.

Body concepts

This helped in developing the design of iron through sketches and proceed for model making.

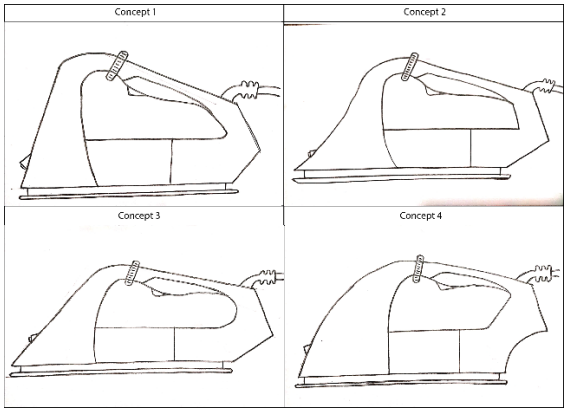

Figure 13. Some of the interesting concepts

Each concept is explained and further, on new concepts are generated during this process.

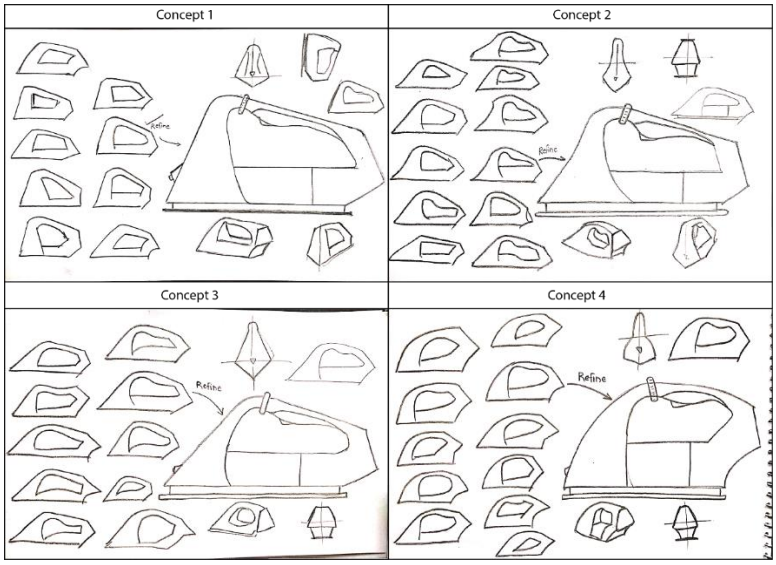

Figure 14. Versions from the above-mentioned concepts.

Rejecting concept 1 as it kind of look bulky. Concept 2 and concept 3 had so many curves in the body which would increase the price of manufacturing — hence finalizing concept 4 as it was somehow related to the shape of the existing present product.

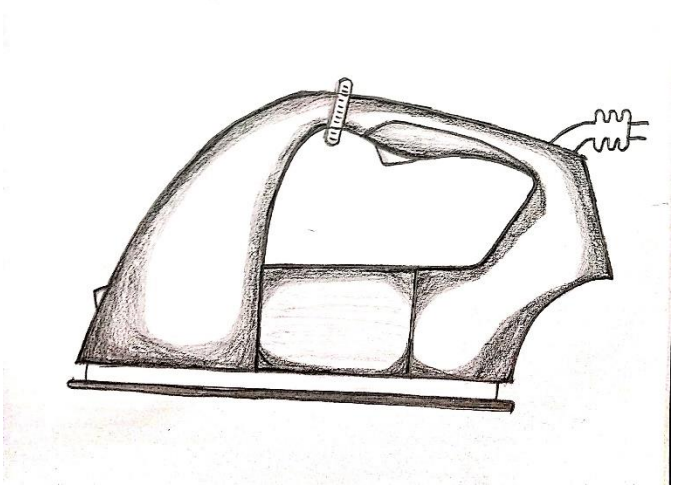

Figure 15. The final detailed concept of cloth iron.

This concept has a tank with a large tank where the top lid could be opened and closed by the user and water could easily be filled through a large opening.

Final concept

The final concept was made in CAD. 3D CAD model is divided into the front and back part, a soleplate, buttons, temperature regulator, water tank and cord holder. Base body of iron took

more time than excepted. Making of handle and heel rest was easy, but the placing of the water tank was quite complicated.

Figure 16. The final concept.

The final concept consists of several details described in the list below, guided by the numbers in figure 17.

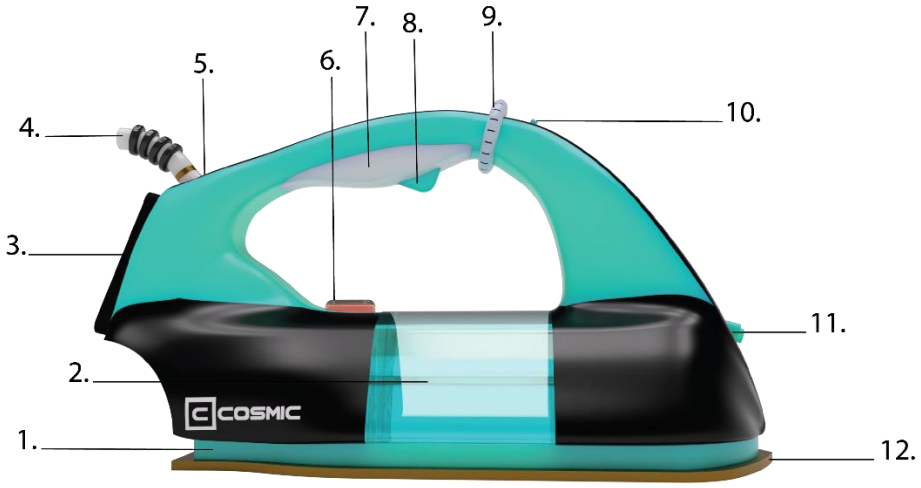

Figure 17. Final design with details.

1. There is enough gap between the soleplate and iron body so that buttons will not stick any more while ironing between them.
2. A water reservoir with a capacity of 280ml that is enough for 4 to 5 uses. It has a lid on its top part through which user can easily fill water. Also, the tank is transparent through which user can get the idea of water level.

3. A stable heel rest with rubber on its boundary that will provide extra grip while placed in standing position.
4. A cord of length about 1.5 meter that is enough for a user to iron cloths away from the socket.
5. Cord holder with 360º movement that will make the ironing task easier. As a result, cord interruptions will not be there while ironing the clothes.
6. LED that will glow red when the iron is not ready to use. It will automatically turn off when the iron is ready to use.
7. A comfortable and ergonomic handle that will enable the user to iron with his/her natural posture without adding any strain in the user's hands.
8. Press button that can be controlled by the middle finger while holding the iron and is used to control sprinkler.
9. Temperature regulator in the shape of donuts that will enable the user to set the temperature according to the fabric. It has a display near it where the type of fabric is displayed according to which a user can set the temperature according to him.
10. Steam control with sliding function and the user can select between less to more steam by sliding button through them.
11. Sprinkle at an optimal position that will sprinkle on a large area.
12. A non-sticky soleplate that will allow the user to iron any type of fabric according to him.

Figures below show all different perspectives of cloth iron for better understanding.

Figure 18. Left from Right-front and isometric back view.

Figure 19. Left to Right- top and standing view.

The iron has variant of two colors. Neon Blue and Neon Pink.

Figure 20. Design with two color versions.

Iron has a height of 172mm and length of the handle is 129mm with a diameter of about 37mm. Also, the tank has a capacity of 290ml.

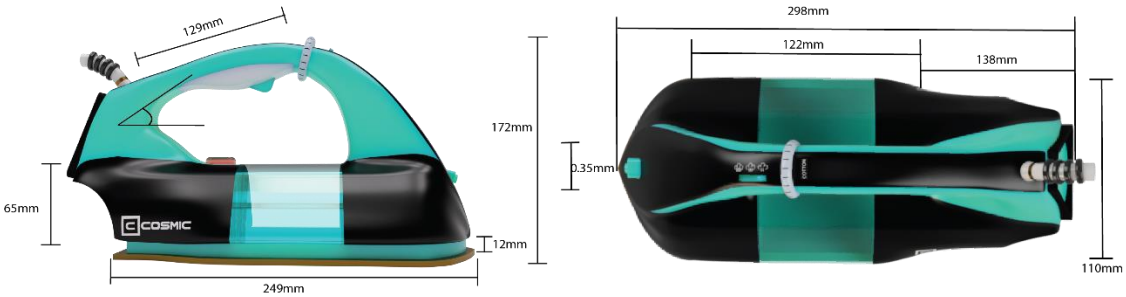

Figure 21. Measurements of iron design.

On its handle, there is a temperature regulator which can be rolled by the thumb. Also, there is a display in front of it which will show the type of fabric needs to be ironed.

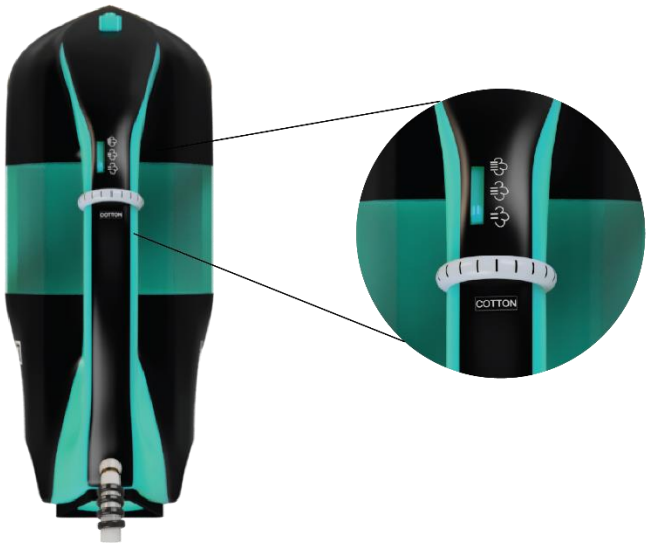

Figure 22. Placement of temperature regulator and steam control.

Also, steam control is placed forward to temperature with the sliding function. User can decide the amount of steam by sliding the button.

Conclusion

User study

The final product is a result of every single research done for this project which includes surveys, interview, research, etc. All decisions were based on the user study in order to meet the needs and aspirations of the user.

Ergonomics

The ergonomic handle was a result of research and user tests. The result was a good comfortable ergonomic handle which can enhance the user experience.

Design

Design concepts are developed from the interview, sketches, and research work. The result was to get a user-friendly iron that would increase user experience while ironing.

References

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