



# DESIGN AND DEVELOPMENT OF COMBINATION OF STEAMER AND DRYER

*The combination of 4 in 1 product whereas the garment steamer and dryer is the primary functions and hair dryer and steam inhaler is the secondary functions.*

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**Abstract:** This device is a four-in-one tool that includes a cloth steamer and dryer, as well as a hairdryer and steam inhaler. Product is built using QFD and PDS methodologies. The problem statement is primarily derived from travelers and bachelors. It is claimed that if COVID is dispersed through steam inhalation, COVID would be reduced. Also, many individuals carry too many gadgets, such as a hairdryer and steamer during their travel. To solve the problem mentioned this product is made. Before a digital render is made, a concept selection phase is carried out. The virtual model is then built and exhibited, together with the concept, context, and exploded perspective. If any changes are needed, they will be made; otherwise, the procedure will continue. A four-in-one steamer and dryer eliminates the problem of bringing too many gadgets with you on a trip. This product can also be used to remedy the problems of clothes not drying during the monsoon season. Because it is multi-functional, it can perform multiple tasks at the same time.

**Index Terms -** ABS(Acrylonitrile butadiene styrene), CAGR (Compound Annual Growth Rate), dryer, PDS(Product Design Specification, Product, QFD(Quality Function Deployment)

## I. INTRODUCTION

Travelers found it difficult to take a large amount of clothing with them, and that the clothes tended to become entirely crumpled as they were stored in the bag. Some individuals used to travel to rainy locations where their clothes would not dry and would begin to stink.

The difference between ironing and steaming is as follows. As the clothes are wrinkled if heat is provided in term of steam them the clothes becomes stiffer and more ironed. Steamer is basically used to remove wrinkles from the clothes, while ironing is for getting rid of wrinkles. Ironing a single fabric takes more effort than steaming clothes. To get proper stiffness, iron must be repeated in the same position and at the same locations. Ironing garments takes some work, but it also takes a long time - and a lot of patience. So, steaming is better when compared to ironing.

A steamer is more convenient to use than an iron box since steaming is lighter than ironing. The steamer removes wrinkles from the fabric more readily because the water heats up and converts into steam, which is pressed against the clothes, making them stiff. Electric clothes dryer produces hot air, which dries the cloth as it comes into touch with it. Water evaporates when heated air percolates through the fabric. As a result, the cloth becomes dry and does not stink. Steam inhalation can help to relieve cold and cough symptoms, open clogged nasal and sinus passages, relieve bronchitis symptoms, and remove mucus. Other applications include beauty care, such as deep washing and purification of the skin. A hair dryer is an electronic device that dries damp hair. Ambient air is drawn in through the fan blades, and the air is passed through the hot coil. The coil heats the air to a temperature and blows hot air, which dries out the hair.

## II. LITERATURE SURVEY

Secondary research can be used to generate new ideas and products that will benefit society. Product study, product parts etc. are being studied in this section. In terms of aesthetics, the model's components, the mechanism by which the unique product operates, comparisons with other items on the market, and so on. There are various types of steamers such as horizontal and vertical steamers.

Aesthetics are the four categories that make up aesthetics - color, visual effects, form, and texture. With its decorative appeal, the most appealing and distinct product will attract the eye of the consumer. It should also be functional as well as pleasing, which plays a vital psychological pleasure role. Aesthetics play an essential role in the subconscious decision-making process while selecting a product. Most of them chose white color for their product and descending order of color preferences is as follows black, blue, cyan, red, brown, orange, yellow, green and purple [12].

The neutral and pastel colors seen in the figure are currently in style with modular designs. Modular designs are those that allow you to reuse a product in multiple ways while also allowing you to use it in diverse ways. With subtle texture and lines, the minimalist design is also quite trendy. In the past, a steamer's appearance was simply composed of basic shapes. But nowadays, a product's appearance is elegant and sophisticated, with lines, colors, and textures, as well as a material finish that is pleasing to the eye - especially in high-end shops.

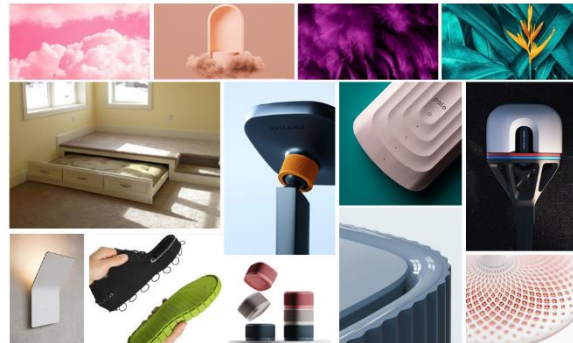


Fig. 1. Trend Board

Material is divided into two basic components: natural and manufactured fibers. Steaming linen necessitates a high level of pressure as well as the hot nozzle touching the cloth for a satisfactory finish. When steaming silk clothes, the hot plate does not need to touch the fabric, and steamers are quite effective on silk. Suede and velvet materials must be heated from behind to obtain a clean finish.

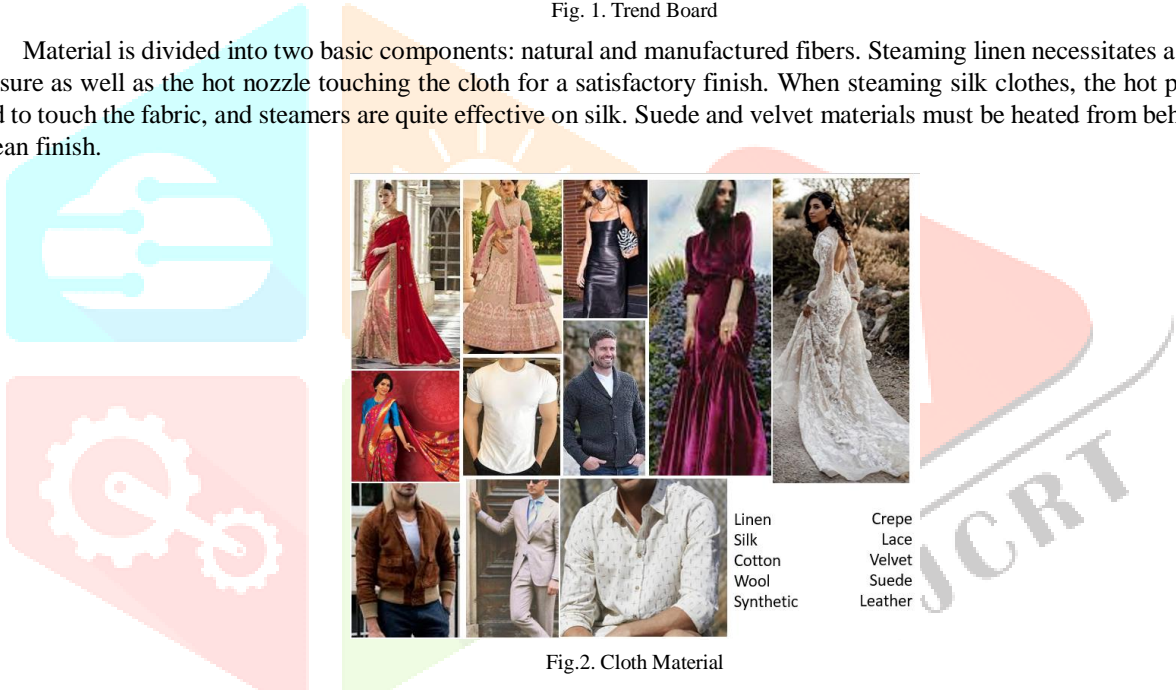


Fig.2. Cloth Material

Material treatments include matte with black stainless steel and high gloss with black slate or plastic. Stainless steel is the most popular material for appliances, while ABS plastic is commonly chosen for the outer body. Heat shield is supplied inside the ABS plastic to prevent heat from being transferred to the outside body, which is mica, a mineral.

Garment steamers, fabric dryers, steam inhalers, and hair dryers were all investigated as part of the product study. This research concentrated on the current market's specifications, forms, and characteristics.

*Summary of Literature Survey*

Color, visual effects, form, and texture are the four categories that make up aesthetics. The most appealing and distinct product will catch the consumer's notice due to its decorative appeal. The most frequent material for appliances is stainless steel, although ABS plastic is commonly used for the outside body. For a satisfactory finish, steaming linen requires a sufficient amount of pressure as well as the hot nozzle hitting the material.

**III. PROBLEM DEFINITION AND OBJECTIVE**

- The objective is to have a total of four functions, including two primary (garment steamers and dryers) applications, as well as two secondary (steam inhaler and hair dryer) applications.
- To create a product that fulfils the activities as intended while also being aesthetically pleasing, ergonomically correct, and having an easy to understand and use user interface.

IV. METHODOLOGY

The methodology involved:

- To conduct primary and secondary research, on existing product that is on steamer, dryer
- To concept generation is made using QFD and PDS.
- To ideate sketches and select concepts using Pugh's matrix.
- To 2D and 3D renders are made after one concept is selected.

4.1 Parts of steamer and dryer:

The water tank is the most significant portion of the steamer, but the steam nozzle is also important because the water is used to turn it into steam, and the nozzle is used to channel the steam and appropriately project it on the garments. The steam hose and steam nozzle handle are provided so that we can easily grip and utilize the product, while the host is provided so that this theme can be followed. The steamer nozzle is equipped with a hanger attachment, which allows the hose to be supported by it.

The dryer is used to remove water from soaked clothing or hair. There is a fan blade and a motor in front of it, as well as an oasis, so that the hot air may travel through. There is a hole behind the front nozzle via which cooler air flows inside the components and heated air exits. The components of the dryer are the cable the copper wiring is being used, the electrical motor, the fan blade, switching mechanism and other electrical components.

- Garment steamer – 150 to 200 degrees F
- Steam inhalation – 140 to 203 degrees F
- Cloth Dryer – 125 to 135 degrees F
- Hair Dryer – 80 to 140 degrees F

4.2 Concept generation method:

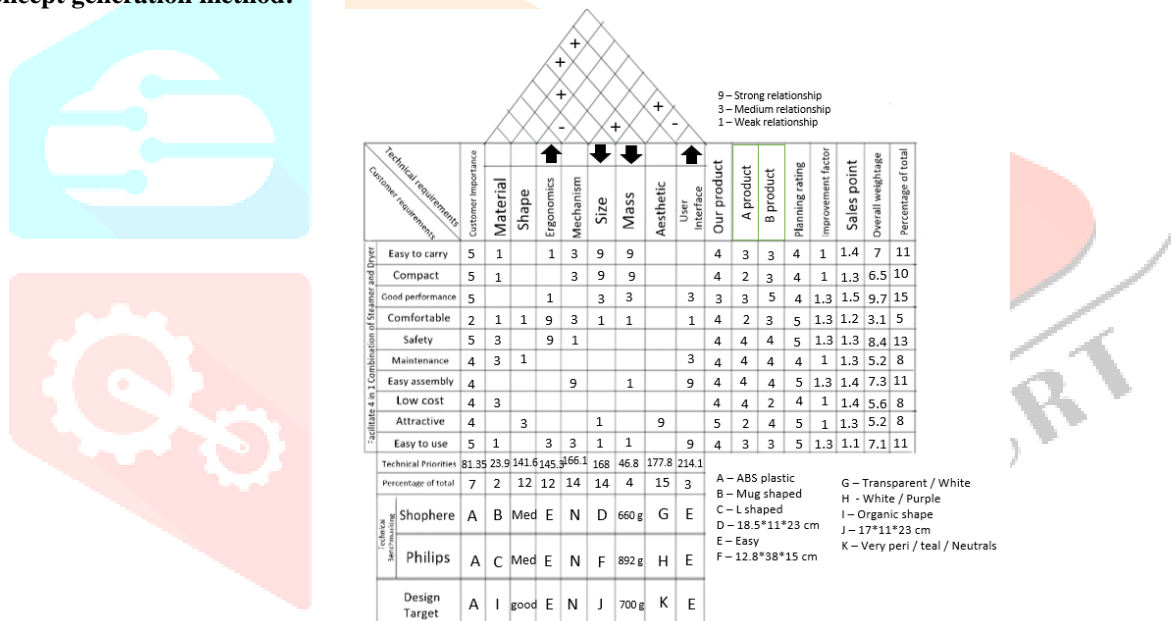


Fig. 3. QFD

QFD the design goals that have been met and compared to the leading brands. When compared to other plastic materials, the material formed of abs plastic has many advantages, including chemical and electrical qualities. We need to create shapes using organic shapes because there are no organic shape products available on the market. The product's ergonomics must be on point in order for it to stand out from the crowd. The product's size and weight must be kept as little as possible in order for it to be portable.

4.3 Product environment:

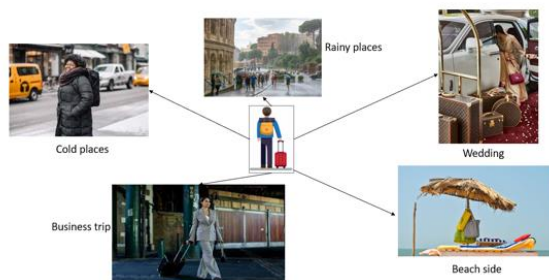


Fig. 4. Travelling

When we travel with clothes, the clothes become damp and also don't dry sometimes, which causes the clothes to stink. If the fabric is dried, there is no stinking scent that will be formed. The steamer as well as the cloth dryer will be utilized with the hair dryer to create a sophisticated and clean environment.



Fig. 5. At home

The individual utilizes a steam inhaled for both beauty and health reasons. When clothes are crumpled and scrambled, steaming can be used to stiffen them and give them a crisp appearance. When the garments don't dry during the monsoon season, the dryer is used to dry them in the product environment at home.

**4.4 Theme Board:**

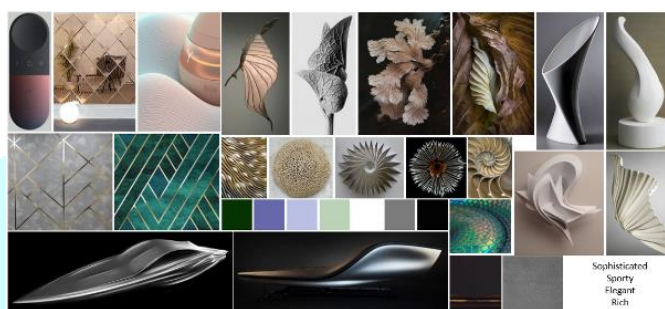


Fig. 6. Theme Board

The main focus is on having a basic design that isn't overdone. The purpose of the curved lines is to make a product appear smart, stylish, rich, and aesthetic. Also being examined are fast shapes, and the colors being considered are largely pastels and Very Peri.

**4.5 Mood Board:**



Fig. 7. Mood Board

The mood board is designed to give the customer the exact feeling they want after or while using the product. The product must be easy to use and enjoyable to work with so that it does not cause any problems during or after use. It should also have a smart and luxurious appearance to appeal to a wide range of demographics.

**4.6 Concept Generation:**

The appropriate nozzle is fitted and utilized depending on the application. Different nozzles are used for steamer and dryer applications. As in a steamer, the steam must be narrowed down so that you may apply pressure and strike the clothes to achieve the desired crisp finish. Dryer requires more space since hot air is forced out, causing the material or hair to dry faster.

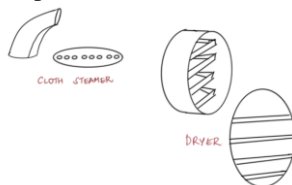


Fig. 8. Nozzle

*1) Concept 1*

The main components of the product are switching element that is used to switch on and off the whole product. All of the application buttons, such as steam inhalation, clothing steamer, and hair dryer, are located on the top of the device so that changing applications is not a problem. The handle is made in gold plated so that product has the sophisticated and rich look.

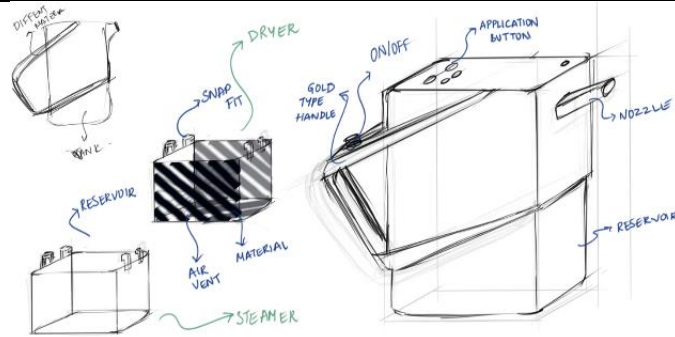


Fig. 9. Concept 1

### 2) Concept 2

The handle is located exactly adjacent to the main body's electrical components. The regulator button is used to change the application that is to be utilized, and there is a on and off water switch on the top of it. The nozzle attachment, which is longer, is present. This attachment is to create a link between the main nozzle and the body.

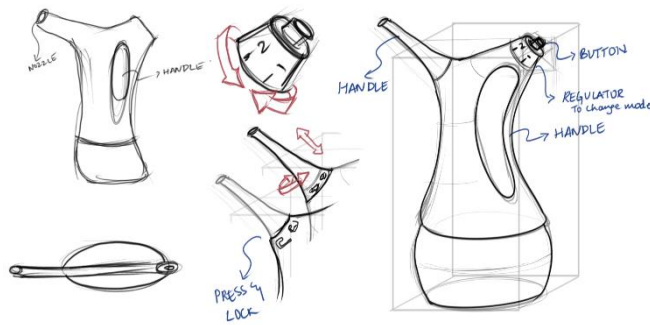


Fig. 10. Concept 2

### 3) Concept 3

The water reservoir is hollow and formed like a bottle, whereas the dryer reservoir has an open top and a different design for the air vents. The on/off button, as well as the push type on the other side of the L, are incorporated. Along with the start and stop buttons, the program switching button is situated at the bottom of the screen.

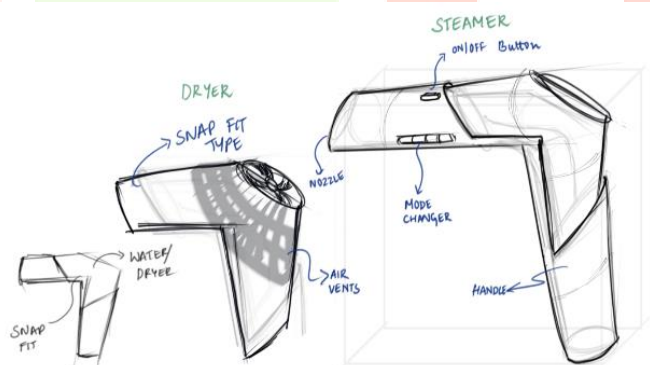


Fig. 11. Concept 3

### 4) Concept 4

There will be no additional projecting features, and it will be smaller and less space-consuming than prior concepts. Similar to earlier designs, there is a water reservoir as well as a motor reservoir. Depending on the application, that specific section is placed, and it's all managed wirelessly via an app.

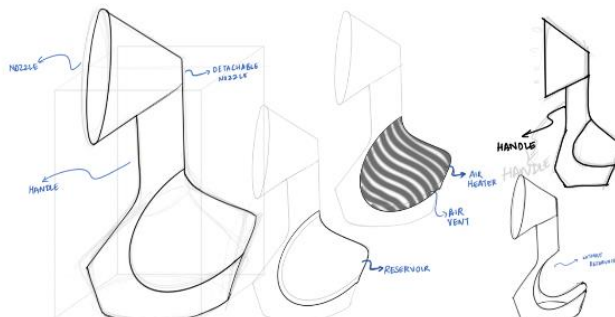


Fig. 12. Concept 4

5) Concept 5

The shape is inspired by a diamond, and the accompanying handle can be inserted inside so that it appears to be a continuous diamond. The handle is primarily of the push kind in order to save space and make it more compact. Designer vents have been put on the air vent that is the motor reservoir. The nozzle and reservoir are attached to the product according to the application.

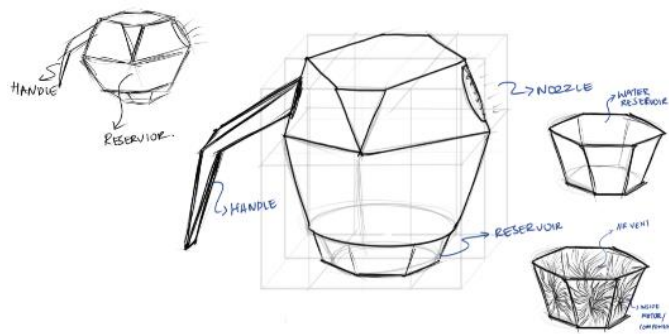


Fig. 13. Concept 5

6) Concept 6

On/off control is given by a slider, and the main body's surface is kept clean. Water level is also supplied so that if the water level falls below that limit, additional water must be added to the reservoir. A symbol is offered for each and every application by for steaming or drying the clothes shirt symbol. For a hair dryer, a hair flowing sign is offered, and for steam inhalation, a person wearing a blanket on their head and inhaling this steam sort of a symbol is provided.

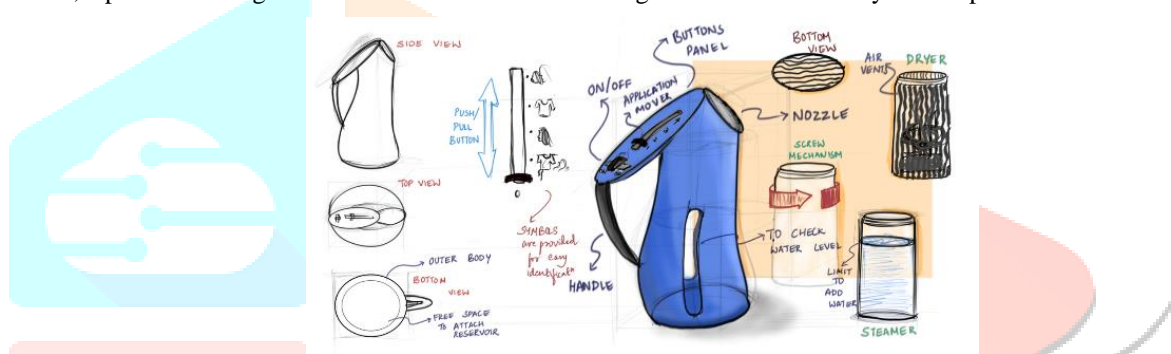


Fig. 14. Concept 6

7) Concept 7

The buttons are seamless, just like the touch-type clothes available for the application. They also control movement within the main product; pushing it locks it; pulling it back unlocks it. The motor dryer vent has a diamond shape cut out to give it a rich feel, and the main body has a diamond type cut to enable more air vent.

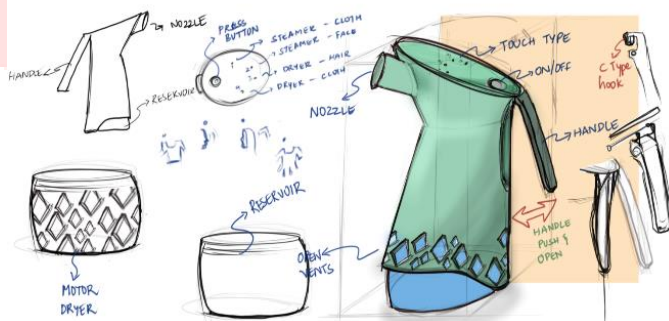


Fig. 15. Concept 7

8) Concept 8

The water tank is first attached to the main body of the product, and then a cover is supplied on the top of the water reservoir tank, which is open, and the water is filled. Because we will be holding the product in one hand, a push lock type mechanism is employed for the reservoir cap. This makes it easier to open and close. There are two nozzles included, one for steam and the other for drying applications.



Fig. 16. Concept 8

9) Concept 9

The product's handle is designed in such a way that when placed inside, it merges with the product and becomes seamless, taking up less room and providing more combat as compared to the product when opened. The power button is in the corner of the product, and the application changer is on the top of the handle. The Water Reservoir is given with a cap so that the reservoir may be kept first and then the water can be poured into it.

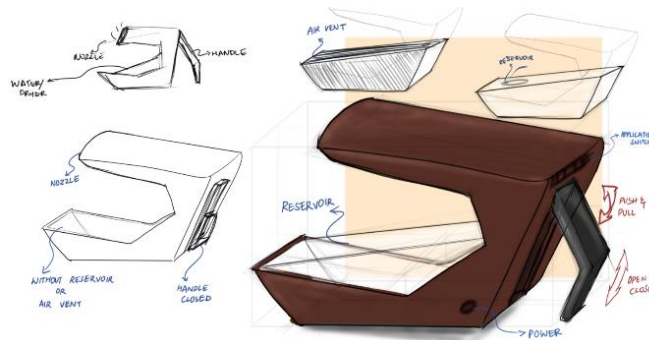


Fig. 17. Concept 9

10) Concept 10

The product diminishes in size when the handle and reservoir are removed, compared to how it was when it was in use. A level watcher is also on hand to keep an eye on the water level. There is an on/off button on the top of the product, and a sliding button on the other application.

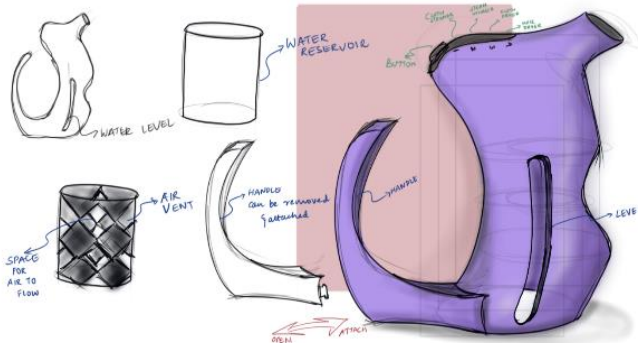


Fig. 18. Concept 10

V. RESULT AND DISCUSSION

Table 1 – Pugh’s Matrix

		Philips	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
1	Easy to carry	S	+	+	+	+	-	+	+	+	+	+
2	Compact	S	-	+	-	+	-	+	+	-	-	+
3	Good performance	S	+	+	+	+	+	+	+	+	+	+
4	Comfortable	S	+	+	+	-	+	+	+	+	+	+
5	Safety	S	+	+	+	+	+	+	+	+	+	+
6	Easy assembly	S	+	+	-	-	-	+	+	+	-	+
7	Low cost	S	-	-	-	-	-	-	-	-	-	-
8	Attractive	S	-	+	-	+	+	+	+	++	-	+
9	Easy to use	S	+	+	+	+	+	+	+	+	+	+
	Total +	0	6	8	5	6	5	8	8	8	5	8
	Total -	0	3	1	4	3	4	1	1	2	4	1
	Total score	0	2	7	1	2	1	7	7	6	1	7

Pugh's matrix is intended to make concept selection more straightforward. The concepts 1 through 10 are added to the matrix, with pluses for improvements and minuses for no improvement. The highest overall score goes to concepts 2, 6, 7, 8, and 10. Because the concept has more appealing values, a certain form is taken into account while designing the final product.

1. Final Concept and Mechanism:

The nozzle would be located at the front of the product, with the circuit and fan located in the back. The screw mechanism is employed for the Reservoir tank's cap. The clockwise screw mechanism locks the part, whereas the anticlockwise screw mechanism opens it. The screw mechanism is also used to connect the water reservoir to the steamer (the steaming plate). Also, even though the water reservoir is built or made up of screw mechanism, the cap for the driver must be added when it is not in use. The cap for reservoir, water reservoir and cap for dryer all these three uses the screw mechanism technique.

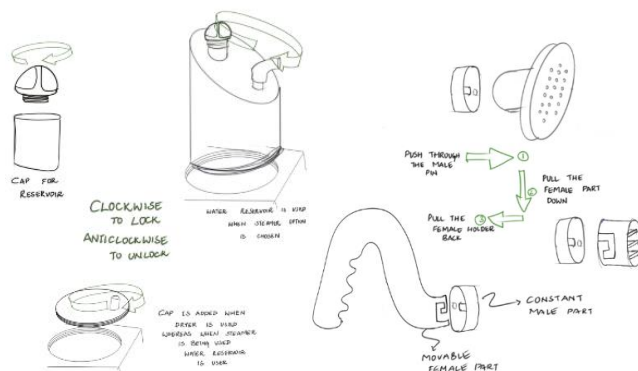


Fig. 19. Screw Mechanism and push pull type mechanism

When operating the steamer, we keep the steam nozzle, as well as the water, away from the cap that fills the water. A separate type of mechanism is utilized to attach the handle and nozzles. We employ a push turn and pull mechanism to place that precise path, turn it around, and draw it back so that the extruded part from the main body may go inside it and lock itself.



Fig. 20. Final Product

2. Final rendered product:

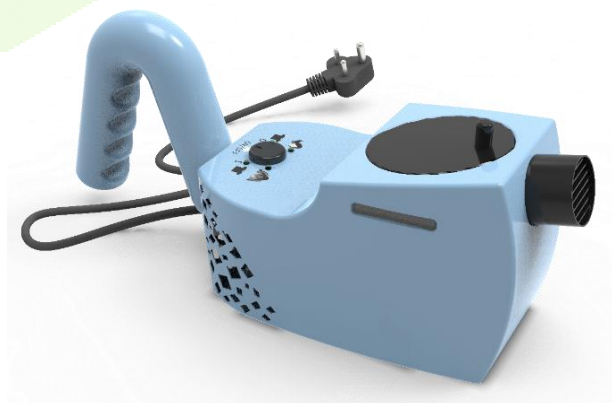


Fig. 21. Dryer

The dryer uses the separate nozzle as well as the cap needs to be added so that the hot air does not go outside in all the directions. The flow is directed towards one specific hole that is for the nozzle.



3. Final Parts and materials:

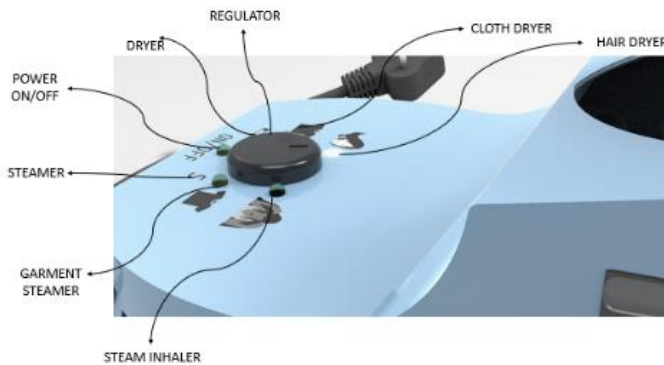


Fig. 22. Button representation

Buttons are being added as per the applications. The on and off switch is provided with the other application switches. When the specific application is needed the regulator is turned towards that and the light gets lit on that specific part.

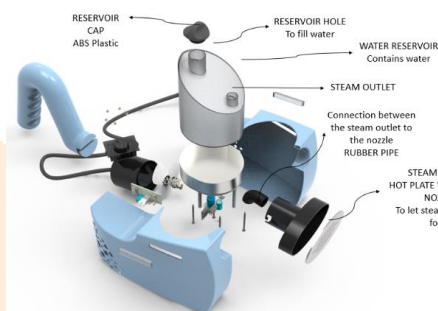


Fig. 23. Steamer Exploded view

According to the applications the parts are being assembled and used accordingly. As per represented the nozzle is different for steamer as well as the dryer cap is removed and the water reservoir with the cap for the reservoir is added.

4.

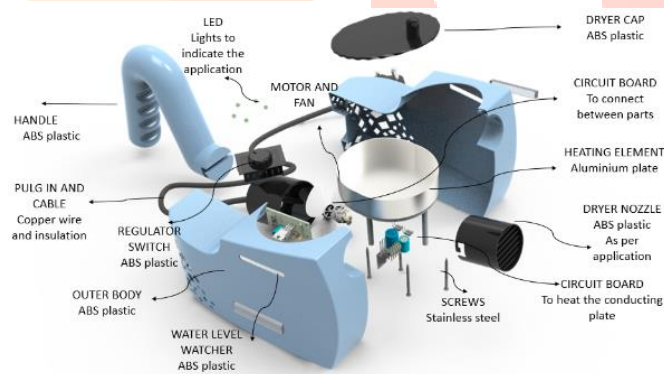


Fig. 24. Dryer Exploded view

Each and every part and their material description is provided. The component name and its material are provided.

4. Context Render

Context render is added so that we can understand the proper view as well as the understand the product way it looks as well as how it would look when the user is using the product. In the fig 25 the product is held by a person wherein he is holding the product and using it. He/She is using the dryer application so that dryer nozzle and cap is being added.

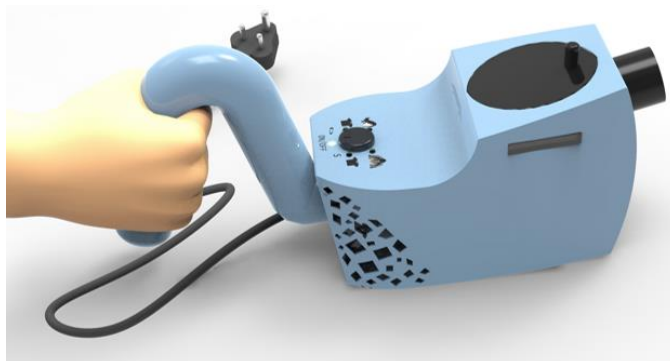


Fig. 25. Person holding product

All the parts and components are placed the dressing table to see all the components. And also, each and every component is separated from each other to get the overall view of all the components of the application.



Fig. 26. Product kept dissembled product

Different color variations is provided as the each and every user will have different color preferences so the different variations is provided so that the user can decide on which color they would like to use. The trending colors are being used wherein the pastels as well as neutrals colors are being used. The colors used are Cyan-Blue, Light blue, Light green, light grey and black.

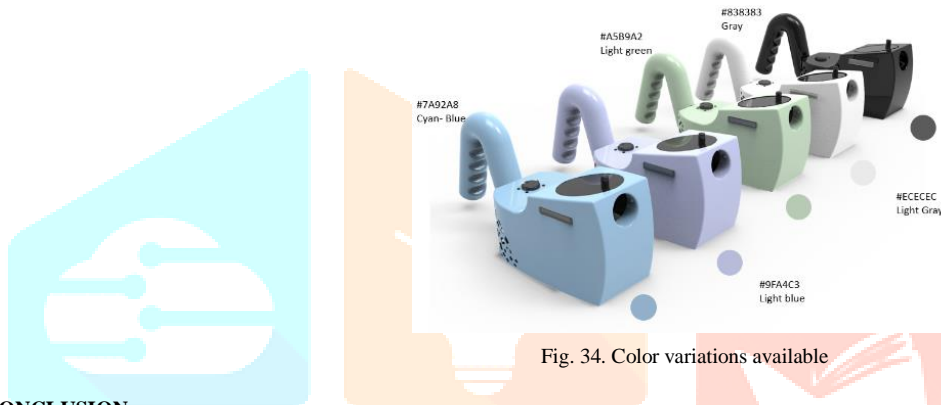


Fig. 34. Color variations available

## VI. CONCLUSION

The product is made in such a way that it is aesthetically beautiful and has an advantage over other products on the market. By taking into account the product's surroundings, such as travel and home use, the product is designed to be utilized both while travelling and as a home appliance. The application of 4 in 1 product solves most of the problems such as Too many gadgets can be reduced with one single product.

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