IDC School of Design अभिकल्प विद्यालय IIT Bombay

Project II

Designing a Hydrothermic device for children to help relief from common cold

Guided by Prof. Purba Joshi

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216130006 (2021-2023)

Acknowledgment

I would like to take this opportunity to sincerely express my deepest gratitude to those persons who full-heartedly suported and helped me achieve the success of this proect. First of all, I would like to thank my Guide Prof. Purba Joshi for her constant motivation and invaluable advice. Her guidance and time-to-time inputs gave me a larger perspective to look at.

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My special thanks to my friend Mugdha Dengle, Snehdeep Singh, Aditya and my parents for supporting me throughout this project journey.

In the end, I would like to thank the workshop staff of IDC for their kind cooperation and help.

Declaration

The written submission is a part of my report, "Designing a Hydrothermic device for children to help relief from common cold" is done as a Project - 2 for post-graduation program at IDC, IIT Bombay, under the guidance of Prof. Purba Joshi.

I hereby declare that the thoughts, ideas, and words in this document are original, and appropriate references are cited wherever due. I understand that the violation of the above can cause disciplinary action by the institute.

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Approval

This is to certify that the Industrial Design Project entitled "Designing a Hydrothermic device for children to help relief from common cold" by Susovan Gupta is approved for partial fulfillment for the Master of Design degree in Industrial Design.

Signature of the Project Guide: Digital Signature Purba Joshi Joshi (i09042) 26-Jul-23 10:41:29 PM

Signature of the Chair Person:

Signature of the Internal Examiner: 13.12.2022

Signature of the External Examiner: 13-12-2022

Abstract

This project initially started when I got frustrated with my use of a cheap steam vaporizer. But as I research more into the topic and market, I started looking at one big gap or you can say a big danger that needed to be solved. One thing that came to my notice, again and again, is that small children are severely suffering from scalds caused due to steam inhalation.
As parents the very important goal is to do whatever they can do to safeguard and improve their child's life. For that knowing the right thing to do and make sure the general safety is maintained is crucial. But very often mishap occurs. And that in my opinion can be solved through design.
Every day almost 100 children present to the emergency department with burn injuries in the UK. During the covid 19 lock-down, a 30 folds increase in burn injuries in the pediatric department.
But these incidents occur due to their natural child characteristics, such as:

- curiosity
- limited understanding of danger
- limited ability to react quickly to contact with hot liquid or steam

Therefore, I understood and took up this project to design a device as an alternative to a dangerous steam vaporizer to help relieve the common cold. Also, as there is already a presence of nebulizers and other medicine-delivering devices I want to design the device where not necessarily medication is needed.

Initial Brief

Redesign the Vaporizer with an affordable price range with improved usability. The design has to be safe enough to be used for children. A system for regulation of the heat to protect the nose and eyes from burning has to be implemented. The purpose of this project is also to enhance its versatile using scenarios.

Usability

Enhanced usability by providing attachments, cable, switches etc.

Safetv

Ensuring absolute safety for all users, especially children.

Versatilitv

The Product will be used in different use case like skin care etc.

Affordabilitv

The design solution has to be affordable for mass consumer.

Initial Product Gap

Product Gap

Price Range - 200 -400

- Very cheap manufacturing
- Mostly for medical uses
- Bad quality safety
- Unorganized market

Price Range - 1500-3000

- High quality plastic
- Good quality safety
- Big companies' area
- Marketed as skin care products

Literature Study

Traditional Hydrotherapy

Hydrotherapy, formerly called hydropathy or water cure, is a branch of alternative medicine (particularly naturopathy), and physiotherapy, that involves the use of water for pain relief and treatment.

Hydrotherapy has been used for thousands of years. It is not commonly used these days because it can be inconvenient, for example, taking an antibiotic pill is easier than arranging a Hot Bath. It is very effective. It leaves the patient feeling comfortable and actually strengthens the body.

Hydrotherapy Effects

Hydrotherapy effects are mainly are of two class:

- Excitant
- Sedative

All the hydrotherapy aims to cause one or more of the following three reactions in the body locally or generally.

- Thermic Reaction - increased heat and increased metabolism within cells and more generally such as increased healing, digestion or `phagocytes
- Circulatory Reaction - increased blood and lymph flow
- Nervous-system Reaction - feeling refreshed and energetic.

The reactions mentioned above are the Excitant or stimulating effect. If a sedative, depressing effect we need, decreased metabolism or blood flow or pain relief and sleepy.

Both heat and cold will produce Excitant or Sedative effects depending on the length of time it is applied and whether it is the Intrinsic effect of the heat or cold, or the Reactionary effect as the body responds to the heat or cold.

- The Intrinsic effect is the result of the action of the heat or cold itself - Heat is Excitant, Cold is Sedative.
- The Reactionary effect is a series of changes set in motion by the body to counteract or overbalance the Intrinsic effect of the heat or cold. The Reactionary effect of Heat is Sedative, Cold is Excitant.

So to achieve an Excitant effects we use,

- Short Heat - intrinsic effect (feel refreshed after a quick hot shower)
- Short Cold - reactionary effect (feel refreshed after a quick cold shower, or Cold-Mitten Friction)

To achieve a Sedative effect we use,

- Long Heat - reactionary effect (feel sleepy after long hot bath)
- Long Cold - intrinsic effect (pain relief after an ice pack)

Techniques of Hydrotherapy

There are numerous techniques which comes this hydrotherapy. The techniques are different by there their time of application, place of application, the temperature of water, the form of water e.g. liquid or vapor, anything additional added to the solution etc. There are different results are to be expected depending upon the method adopted. Feelings related to the techniques applied are to be expected either temporarily or long term.

The followings are some of the techniques more or less related to treatment of cold.

- Steam Inhalation
- Tea tree oil rubbed under nose as inhalation or gargle.
- Alternate hot and cold lung compress.
- Nasal irrigation.
- Scotch douche.
- Fomentation.
- Heating compress to throat and chest.
- Ice packing, general and local.
- Hot air and steam bath.

Steam Inhalations as Hydrotherapy

Breathing may be made harder by blocked nasal passages brought on by a cold or sinus infection. It can occasionally interrupt sleep as well. Inhaling steam is one of the greatest natural therapies you may attempt for quick relief from nasal blockage.
Simple steam inhalation involves breathing in steam through your nose. The dry mucus membranes in the nose and throat receive moisture from the warm vapor. A bowl, pan, or steam bath filled with hot water are all options for doing steam inhalation.

Steam inhalation is one of the most widely used home remedies to soothe and open the nasal passages and get relief from the symptoms of a cold or sinus infection. This relieves chest congestion and assists in liquefying mucus. The warm, moist air is thought to work by loosening the mucus in the nasal passages, throat, and lungs.

Systemic delivery of drugs to humans via inhalation

Inhalation offers an enormous absorptive surface area for rapid drug absorption. Since many decades ago, clinical experience has demonstrated that inhalation is a well-established method for treating respiratory illnesses. On the other side, using inhalation to treat systemic disorders is an unique treatment modality. Due to insufficient understanding of the physiological basis of inhalation, inadequate inhaler technology, and poor breathing technique, the delivered doses lacked accuracy, efficiency, and reproducibility for a long time. But these issues have been resolved in recent years, and modern aerosol delivery systems now enable the creation of an aerosol with a defined and optimal particle size in combination with an optimizer breathing technique and optimization of the technology's efficacy.

Different devices for inhalation

- Steam inhaler
- Nebulizer
- Respimat Inhaler
- MDI (Metered dose inhalers) use the propellant hydrofluoroalkane (HFA) to deliver medication to the lungs
- DPI (Dry Powder Inhaler)
- Nasal spray

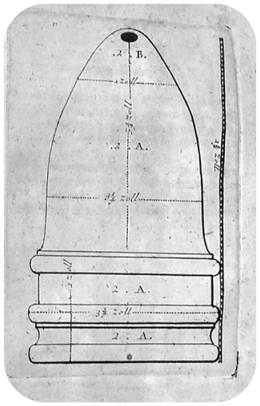
History of Steam Inhalation

Ancient Egyptian papyrus scroll dating back to ~1554 BC.
It describes patients struggling to breathe are inhaling herbs placed in jar with a hole at top.

Ancient Roman public baths.
The public baths were modified to be medical centers for physical therapy. They introduced new medicinal plants in this form of therapy for the treatment of nasal, throat and respiratory troubles.

Charaka Samhita describes in his first century AD medical book a range of asthma therapies

Greek physician, Hippocrates (460–377 BC), describes a device for enabling the inhalation of various vapors for the treatment of a number of maladies. This device consisted of a pot with a lid that had a hole through which a reed could be placed to enable the vapors to be inhaled.



The oldest known therapeutic inhaler device developed in 1654 by the English physician Christopher Bennet.

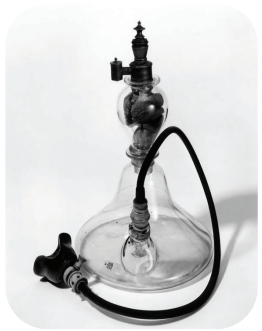
A drawing and photo of the Mudge Inhaler. (17) As the patient inhaled through the flexible mouthpiece, air was drawn through the three holes on the handle and the air was bubbled through the medicated liquid before exiting the mouthpiece. The right side of the drawing shows the valve configuration, which utilized a small cork that moved and allowed the exhaled breath of the patient to exit the tankard.

A significant development in the delivery of therapeutic aerosol was the invention and refinement of devices that reduce a medicated liquid to fine droplets for inhalation. The pulverisateur developed by Jean Sales-Girons in 1858

Historic inhalation device for self-use, wood engraving, published in 1895

Photograph of a Morton-type ether inhaler with sponge, circa 1860
From the Collections of the Boston Medical Library

Dr. Nelson's Improved Inhaler was sold by S. Maw & Sons, London. It was earthenware and several forms were available. This type and others had no heat source, rather they were simply filled with hot water and may be used with or without the addition of medication. Such inhalers are from the second half of the 19th century, and were popularized in England with some imported and sold by American pharmacies.



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Modern medicine would not be possible without anesthesia. An early form of anesthesia was first used at Massachusetts General Hospital in Boston by dentist William T.G. Morton and surgeon John Warren on October 16, 1846.

Devilbiss Pulmo-Aide Compressor Nebulizer System works to convert the medication to a high-quality mist of fine particles that penetrates deep into the lungs. It includes an AC powered air compressor that provides a source of compressed air for home health care use. The compressor is used in conjunction with a jet nebulizer to convert certain inhalable drugs into an aerosol form. Devilbiss Pulmo-Aide Compressor Nebulizer System is used for inhalation therapy, treatment of asthma, bronchitis, cystic fibrosis, emphysema and other upper respiratory tract disorders.

Steam Inhalation

A vaporizer is a type of humidifier: its purpose is to add moisture to the air in your room. A vaporizer uses electrodes to literally vaporize water in the unit's water chamber. This vaporized water then comes out as a warm, pure steam for you to breathe in – and relax in!

Why use a vaporizer?

A warm steam vaporizer provides multiple benefits, especially when you feel sick:

The moisture of the steam helps relieve your cough and reduce congestion in your chest and sinuses. Proper humidification with a vaporizer can also reduce the irritation in your nose, eyes and throat, triggered by a cold or allergies. The steam's heat provides extra comfort when you're unwell (AKA when you need it most), wrapping you in warmth. For fast, medicated relief from your cough, you can also put Vicks VapoSteam in the medicine cup that's built into your vaporizer. Breathing in the warm moisture plus the Vicks VapoSteam, a medicated cough suppressant, is like a one-two punch to break up your congestion.

When To Do Steam Inhalation?

While steam inhalation may not cure an infection and completely eliminate, it may help to comfort you a lot when you are trying to fight with your body. But with any other home remedies, it is important to learn the best way to practice steam inhalation.

- Your voice feels tired, sore or hoarse
- Your throat feels dry
- You have an irritating persistent cough or thick mucus
- You have been out in a noisy/dry/smoky environment
- You have used your voice heavily
- You have common cold
- You have flu (influenza)
- You have sinus infections (infectious sinusitis)
- You have bronchitis
- You have nasal allergies
- You have headache
- You have congested (stuffy) nose
- You have throat irritation
- You have breathing issue caused by airway congestion
- You have dry or irritated nasal passages

How do you use a vaporizer?

Vaporizers are extremely simple to use – just fill with water and turn the unit on, and out comes the comforting steam you want. Plus, there are no filters to replace. Here are a few things to keep in mind when using your vaporizer:

- Fill the water chamber with tap water, not distilled water – the water needs to have minerals in it in order for the unit to produce steam.
- If you don't see steam after 10 minutes, your water may not have enough minerals – add 1-2 pinches of salt to the water to encourage steam production.
- A vaporizer works by boiling water during usage: for safety, always keep your vaporizer on a firm, flat, water-resistant surface that is at least 4 feet away from the bedside and out of the reach of children.

How they're cleaned?

You'll want to clean out your vaporizer daily while it's in use. The key is to keep ahead of any mineral and bacteria build-up.

Daily. Empty the tank and dry all surfaces. Refill with fresh water.
Every third day. Empty the tank and scrub all surfaces with mild dish soap and water to remove scale and other debris. Refill with fresh water.
If storing away. Follow cleaning directions in the manufacturer guide. Remove any dirty filters and toss them out. When all parts are dry, store in a dry place.
Similar cleaning rules apply to steam vaporizers, but the risk of mineral buildup and mold is less of an issue.

Daily. Empty tank and dry all surfaces. Refill with fresh water.
Weekly. Empty tank and fill with 3 1/2 inches of white vinegar for 10 minutes. Clean any residue off unit with a mild detergent.
If storing away. Follow weekly instructions and make sure all parts are dry before storing away in a cool, dry location. Discard any dirty filters before storing.
All humidifiers are different. Be sure to follow any specific instructions from the manufacturer when taking care of your machine.

How safe they are?

Steam vaporizers don't emit as many harmful minerals and other contaminants into the air. That's because they boil water and release pure steam. The main safety concern with these machines is risk of burns from steam or spilled water. Try sitting four or more feet from a steam vaporizer when it's in operation to avoid these risks.

On the other hand humidifiers is with the mineral deposits, mold, and other contaminants they may emit into the air. Inhaling these things over time may irritate airways and create further breathing issues.

Can you use a vaporizer when you're not sick?

Vaporizers aren't just for times of illness! You can use a vaporizer just like you would a regular humidifier to help add moisture to your air. In fact, using your vaporizer year-round can help you:

Breathe more comfortably at night by keeping your nasal passages and throat moisturized, so you can have a more restful sleep.
Keeping your humidity levels between 40-60% helps reduce the survival of flu and certain viruses in the air and on surfaces.*
Make your room cozier and more comfortable – you can even use Vicks VapoPads or essential oils with your vaporizer to enjoy a relaxing scent.

How well it works for allergies?

While added moisture may ease irritated airways, humidity may also cause indoor allergies. Dust mites are the number one indoor allergen, and they thrive on moisture from any source.

Mold may also develop if humidity levels in your home are too high — over 50 percent — or if your humidifier's filter isn't clean. Consider purchasing a hygrometer to measure the level of humidity in your home to ward off common allergens.

The vapor produced by steam vaporizers doesn't contain as many contaminants, possibly making it a better choice for those dealing with indoor allergies. Check with your allergist or immunologist for specific recommendations.

How well it works for congestion?

A steam vaporizer may help with cold and flu congestion. Why? The benefit comes from the humidity reaching irritated nasal passages and lungs.

It adds moisture to the air and can achieve the same levels of humidity.

That said, experts recommend people to be careful with children because steam vaporizers have risk of burning from steam or spills.

Process of Traditional Steam Inhalation

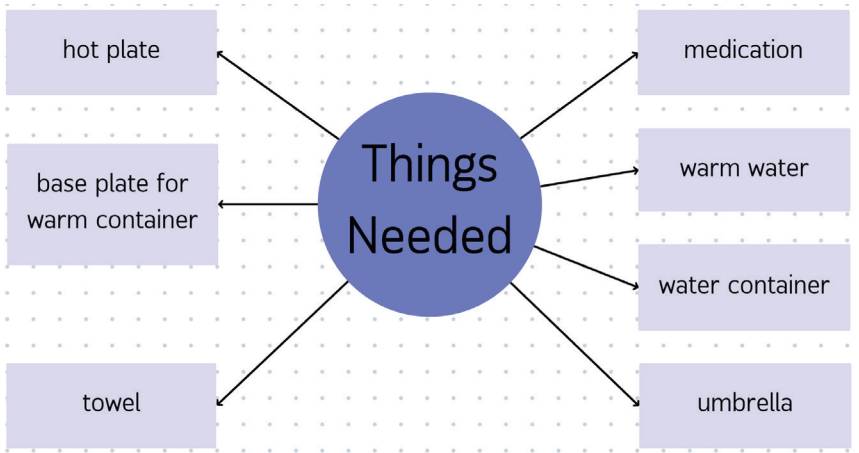
You'll need the following materials:

- A large bowl preferably flat base.
- Approx 500 to 700 ml water
- A pot or kettle or electric kettle
- A stove or microwave for heating up water
- Towel to cover the head

Here's the process:

1. Heat up the water to boiling.
2. Carefully pour the hot water into the bowl.
3. Drape the towel over the back of your head.
4. Turn on a timer.
5. Shut your eyes and slowly lower your head toward the hot water until you're about 8 to 12 inches away from the water. Be extremely careful to avoid making direct contact with the water.
6. Inhale slowly and deeply through your nose for at least two to five minutes.

Don't steam longer than 10 to 15 minutes for each session. However, you can repeat steam inhalation two or three times per day if you're still having symptoms.

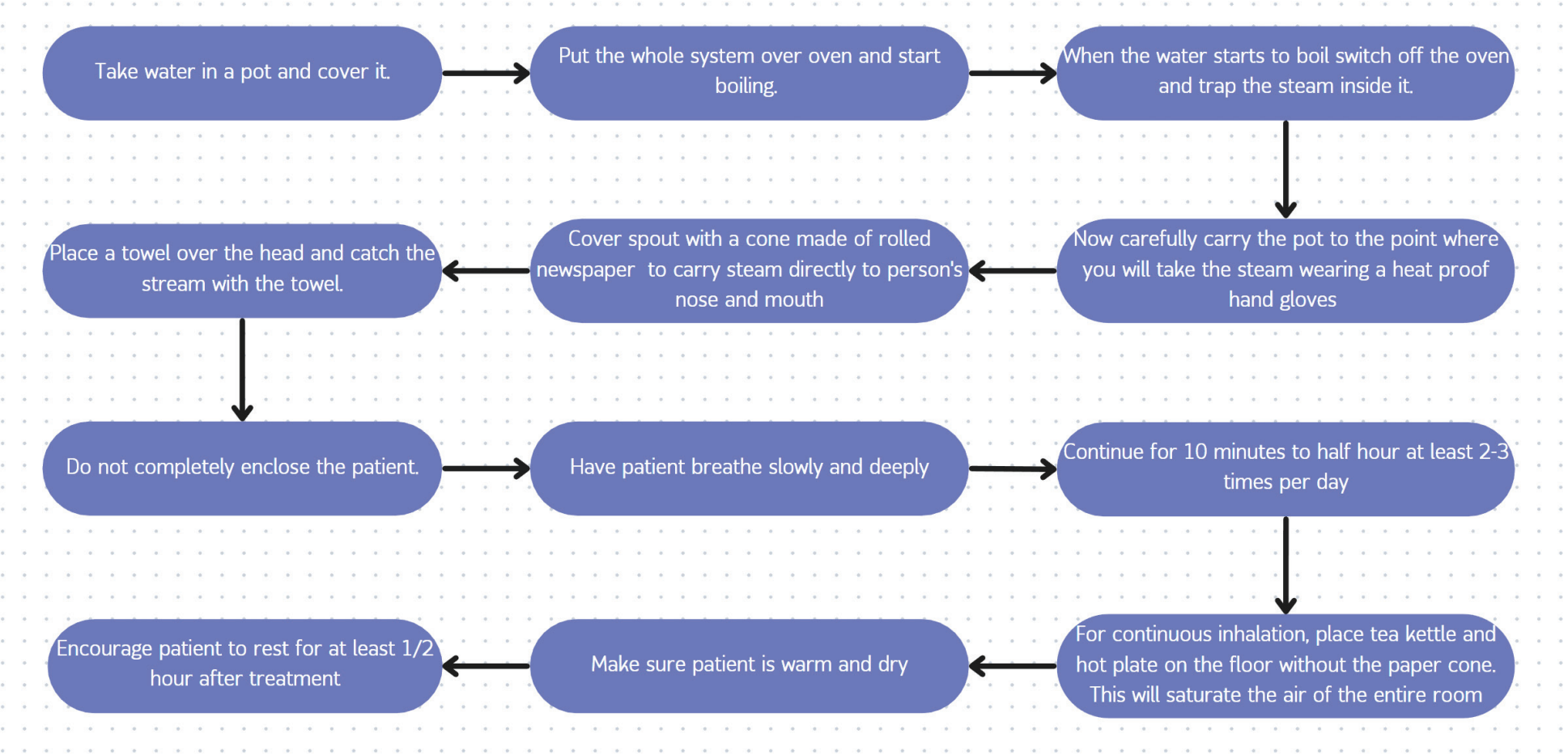


Itineraries required for steam inhalation

Electric steam inhaler also called a vaporizer is readily available, which is simple and handy to use. The vaporizer uses electricity to make steam that warm before leaving the machine. Some vaporizers come with a built-in mask that fits around the mouth and nose. You will have to wash and clean vaporizer to prevent any bacterial or fungal growth.

Steam vaporizers can get dirty with germs quickly, so you'll need to wash it often to prevent bacterial and fungal growth. Wash the bucket and filter system every few days during use, too.

Process of Steam Inhalation



Steps With Electronic Steam Vaporizer

Healthgenie vaporizer machine is unique in nature it is useful for both health and beauty. This vaporizer is highly effective and easy to use. It is ideal for the purpose of inhalation during cold or respiratory problem. The vaporizer is convenient in carrying while on the go as well as at home. It has a plastic body which is shock resistant and comes with a long cord. The vaporizer has one more advantage, it can be used as a beauty purpose with sauna, you can use the steamer during facial, clean up or in removing clogs out of the face.

"NOTE: Some may experience slight odour of burning plastic due to heating and settling of virgin plastic at initial use. Hence it is highly recommended to wash the vaporizer with lukewarm water before first use, Not Ideal for Cardiac patient".

Healthgenie Steamer inhaler is designed keeping in mind many safety factors like water sprinkling and kid' s safety. It has a plastic body that keeps you safe from having any electric shock. One must always have a steamer or vaporizer with them as it helps in clearing the blockages of the nose and also with the steam you can get glow on the face.

With this, you can easily control the amount of steam by adjusting it to your comfort level. You can relieve yourself from any inflammation and respiratory congestion.

Healthgenie Imported Steam Sauna Vaporizer Machine, Facial Steamer And Steam Inhaler

Item Dimensions (LxWxH): 16.6 x 19.6 x 19.6 Centimeters

M.R.P.: 3,299.00

Steps With Electronic Steam Vaporizer

Step 1: Fill clean water in the inhalation container

The container comes with markings to indicate water level. Fill it up till the mark as mentioned with clean water. Ensure that the container is completely clean. Once you have filled the water. Fix the overhead compartment that allows the water to steam.

Step 2: Add additional relievers (optional)

This is an optional step and you should only do it if your doctor has advised. Additional relievers include adding soothing ointments such as Vicks Vaporub and others. Do this only when your doctor is advised. Another thing you can do is rub these ointments in your forehead and nose and then take steam.

Step 3: Place a towel over the back of the head and neck

Once you have assembled the vaporizer then put a towel on the backside of the head and neck. Assembling a vaporizer requires 3 things- filling the water compartment. Attaching the overhead heating element, and the last step is attaching the mouthpiece to inhale the steam Once you have assembled all these, put a towel and plug in the vaporizer.

Step 4: Plugin the vaporizer & wait for vaporization to start

After the above steps, plug in the vaporizer and wait for the water on the container to boil, and convert into water. It would take a few minutes for the vaporization process to start. If your vaporizer has a timer then use it to have proper steam inhalation Generally, 10-15 minutes twice or thrice a day is sufficient or as mentioned by your doctor.

Step 5: Maintain a distance and start inhaling hot air

Maintain a distance of at least 7 -8 cm from the mouthpiece and your mouth to avoid hot surfaces. Inhale the hot air from a distance I and continue doing it for the time directed by your doctor.

Step 6: Discard and clean the container

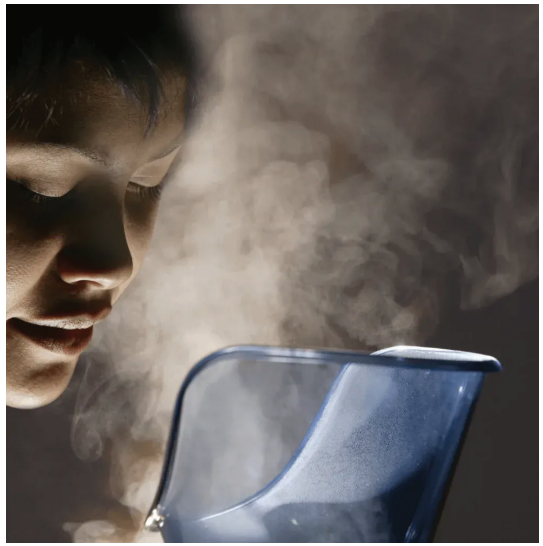
Once you have completed steam inhalation, let the water in the container cool and then throw it away. Clean the container with warm running water and soap and let it dry for next use or before someone else uses it Keeping the container clean is a must.

How does Steam Inhalation help?

During the body's normal or healthy condition, body cells are sensitive to external heat of any kind (steam or hot application). During any disease, the cells have inflammation, and during such inflammation, external heat by steam inhalation, hot pad, or hot application helps reduce the inflammation and promote early healing.

A stuffy nose is triggered by inflammation in the blood vessels of the sinuses. The blood vessels can become irritated because of an acute upper respiratory infection, such as a cold or a sinus infection.
The main benefit of breathing in moist, warm steam is that may help ease feelings of irritation and swollen blood vessels in the nasal passages. The moisture may also help thin the mucus in your sinuses, which allows them to empty more easily. This can allow breathing to return to normal, at least for a short period of time.

American Lung Association states that steam inhalation could help ease respiratory symptoms.



Steam inhalation may provide some temporary relief from the symptoms of:

- The common cold
- The flu (influenza)
- Sinus infections (infectious sinusitis)
- Bronchitis
- Nasal allergies
- Headache
- Congested (stuffy) nose
- Throat irritation
- Breathing problems caused by airway congestion
- Dry or irritated nasal passages
- Cough

Benefits of Steam Inhalation

Why is Steam Inhalation so famous?

Just like any home remedy, steam inhalation is widely known for its non-invasive relieving features. A stuffy nose, sore throat happens due to inflammation of the blood vessels, hot and moist air cleans the mucus that causes these inflammations and helps reduce it.

Steam inhalation is not the only treatment for a nose/throat infection. Use it to relieve inflammation while your immune system fights the infection. Seek a doctor's advice before taking steam inhalation. Your doctor may prescribe you the number of times, duration, and method to take the steam.

1. Improves Respiratory Health

Dirt and pollution in the air can cause lung infections and respiratory diseases. Regular steam inhalation can help treat respiratory infections and improve respiratory health because heat can kill bacteria or viruses in the nasal path. According to a study, steam inhalation was also considered an effective treatment for Covid-19 patients. Another study suggested that steam inhalation therapy helps reduce respiratory tract infection symptoms in children.

2. Helps Provide Relief from Bronchitis

An old study suggests that steam inhalation in bronchitis patients eases respiratory distress for a short time.

3. Helps Cure Sinus Issues

According to research, steam inhalation can also help calm sinusitis symptoms like sore throat, headache, and blocked nose. However, it does not help with congestion.

Steaming promotes blood circulation

By opening up pores on your face, taking steam increases perspiration. As a result, your blood vessels get dilated, and blood circulation enhances. When more oxygen gets delivered to your face, it ends up looking more youthful and healthy.

Steaming facilitates dead skin removal

One of the salient benefits of face steaming is the removal of dead skin. By acting as a natural exfoliator, steam eliminates dead skin cells to reveal glowing skin. Moreover, it helps reduce wrinkles and other signs of aging.

Adverse Outcome of Steam Inhalation

Although steam therapy is helpful for colds and sinus problems, it can also be dangerous if you are not careful.

There's a risk of scalding yourself if you make contact with the hot water. The biggest risk is accidentally knocking over the bowl of hot water into your lap, which can cause severe burns in sensitive areas.

1. Burn or Injury

During steam inhalation, you should avoid using hot or boiling water. Steam inhalation with extremely hot water can cause burns on the face or nasal region. Burn injuries due to steam inhalation are more common in children. According to a study, several children had been admitted to emergency care because of burn injuries caused by steam inhalation during Covid-19.

2. Eye Infection

Steam inhalation without taking proper precautions can also potentially cause harm to the eyes. Overdoing steam inhalation or adding essential or homemade oil to the water can reduce blood supply to the eyes and cause swelling or redness in the eyes.

Adding any medication, oils while doing steam inhalation can invite eye-related issues. They may reduce blood supply to eye muscle and cause future major eye-sight problems. Steam can cause swelling of the eye, redness of the eye, dry eye, continuous watering of the eye, etc.

3. Cell Damage

Steam inhalation for long may also damage the throat and nose cells. Hot vapor can also make the nerve cells numb or damage them. This weakens the immune system.

4. Skin Issues

Steam inhalation for a long time can make your skin dry as it opens the pores. This can lead to bacterial growth on the skin and cause acne, redness, and itching.

5. Nose and Throat Cells

Continuous steam inhalation damages the nasal and throat cells and never damage of organ

6. Nerve Cells

Continuous steam or hot application damages the texture of nose and throat cells and nerve cells damage. It causes numbness or impaired function of cells. It also reduces the blood supply to the cell, further damaging the cell chemistry. The body's healthy cells have an adverse impact due to external heat for an extended period.

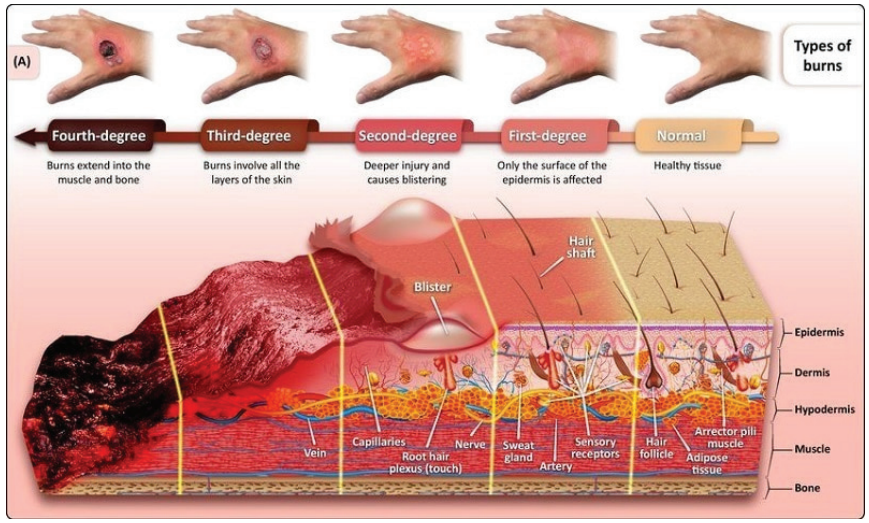
7. Loss of Smell

Steam inhalation for sufficient time opens nasal passages and can help you get back your sense of smell. However, excessive steam inhalation can damage the nose cells or numb them. This can cause a temporary loss of smell.

Dangerous for Children

After my literature study and mapping out the most common problems related to steam inhalation one big and dangerous problem with giving steam to the children. Most parents are used to the traditional method of inhaling steam and when it comes to the giving steam to their children

- Steam inhalation is considered a safe home remedy if done right, but it's possible to hurt yourself unintentionally if you're not careful.
- There's a risk of scalding yourself if you make contact with the hot water. The biggest risk is accidentally knocking over the bowl of hot water into your lap, which can cause severe burns in sensitive areas.
- Steam inhalation isn't advised for children due to the risk of burns. However, you can have your child sit in a steamy bathroom while you run hot water in the shower for a similar effect.
- Other than that skin irritation, nasal sensation, migraine from smell and many other problems occur for lack of awareness.



Severe scalds as an adverse side effect

- Burns from steam inhalation increased over past 3 years.
- Recently seen a 30-fold increase in children with scald burns who have been using steam inhalation to prevent corona virus.
- A burn injury can be defined as a thermal injury where the temperature of the tissue (the skin commonly or any other organ) has exceeded the harmful level and the tissue gets damaged or dies. For the human skin, the pivotal temperature often mentioned is approximately 43 °C. Also, the relationship between time and temperature is crucial.
- Many young children are more likely to be injured by scalding because of their natural child characteristics, like Curiosity, Limited understanding of danger and limited ability to react quickly to contact with hot liquid or steam.
- Most of the victims are children under age 16.
- Scalds occurred predominantly in sensitive body areas like lower abdomen and genitals, often necessitating bladder catheterisation.
- The average total body surface area burned was 5–11%.
- The reason mostly by hitting the container by their feet or by hand.
- Adult supervision is a must during steam inhalation in children to avoid such mishaps.

Table 1

Admissions of patients with scalds due to steam inhalation therapy between 1998–2007

	Burn centre A	Burn centre B	Burn centre C	Total
n	9	13	9	31
Age <16 years	5	9	5	19
TBSA (%)[a]	6.3 (4.0)	6.1 (3.1)	5.1 (3.7)	5.8 (3.6)
Location				
Head/face	1	0	3	4
Upper extremity	4	2	1	7
Trunk (abdomen)	8 (7)	4 (3)	3 (1)	15 (11)
Genital	6	7	3	16
Lower extremity (thigh)	8 (6)	13 (8)	6 (6)	27 (20)
Bladder catheter	6	7	1	14
Surgery	1	3	2	6
Length of stay[a]	9.8 (7.3)	7.7 (5.5)	12.0 (9.7)	9.8 (7.4)

Ope

Effective temperature for steam and bath

For an optimal temperature to be safe and effective for children and kids several study have been made.

- Treatment consisted of two 20-minute sessions, during which the patient inhaled saturated, hot (42° to 44°C) air through the nose
- Temperature of the mist should be as the normal temperature of the body
- Most adults and babies feel cool but comfortable at the recommended temperature of 68° and 72°F (20° to 22.2°C), especially when appropriately dressed.
- The Temperature range could be 35*C (95*F) to 45*C(113*F)
- An ideal temperature could be the temperature of normal human temperature 98* F

Dr Kellogg says...
Hot or Cold?

Often the patient's feeling are a good guide as to whether heat or cold should be applied. The organic intuitions of the body are marvelously correct guides in the application of rational and physiological measures. It is a common thing to hear a patient say, when a correct hydriatic prescription is made, "That will do me good, I am sure." And it does. Nature is a wise teacher and a watchful nurse. p 786

User Interview

During this phase of research I have interviewed to several user of traditional and electric steam inhaler and tried to understand their pain points and ultimately how to better design for children.

Questionnaires for Interview with Medical Personnel

- What are the main symptoms kids come with in cough and cold
- Which age is good to recommend for steam inhalation treatment
- What do you recommend below that age
- Any problems or restrictions for prescriptions in relation to that age
- Which method of steam inhalation do you recommend (traditional or machined)
- What kind of medication you recommend if any
- If you recommend any medication than what and why if not than why not
- What temperature of treatment do you recommend
- How long and how many times of treatment you recommend
- For which all symptoms do you recommend steam inhalation
- When do you prefer nebulizer and in which way it is better
- Can I use nebulizer for steam inhalation
- Cool mist or Warm mist what do you recommend, when and why
- What type of products or brand in the market do you recommend

Pediatrician Interview

Age Categorization

Growth in child is very rapid and different in the first 5 years from birth. And with that, problems related to human proportion and health issues changes. For the treatment and design of any product for such sensitive user group the age categorization has to be understood well.

Child development can be broken down into five stages:

- Newborn (0-3 months)
- Infant (3-12 months)
- Toddler (1-3 years)
- Preschool age (3-4 years)
- School age (4-5 years).

At each of these stages, children reach different milestones. Also the challenges during these stages of child's growth is different and should be tackled with utmost details.

Milestones During Different Stages

For each age group there several milestones are to be achieved. The milestones are following.

Newborn (0-3 months):

Domain of Development	Characteristics of the Stage
Communication and Speech	• Coos • Makes eye contact • Cries for different needs • Listens to your voice
Physical	• Increasing amount of • control over arms, legs, hands, and head • Turns towards sounds • Follows objects with eyes
Social and Emotional	• Starts to smile between 2-3 months
Cognitive	• Shows interest in human faces and objects

Infants (3-12 months):

Domain of Development	Characteristics of the Stage
Communication and Speech	• Babbles with increasing variety of sounds • Listens when spoken to and might respond with babbling - learning about conversation. • Reacts to noises (especially sudden ones). • Recognizes sound of own name. • Looks at objects or people when you name them.
Physical	• Greater control over arms and legs. • Able to sit upright • Can turn over or roll over • Explores the world, e.g. banging objects and putting things in mouth • Can grasp object with one hand. • Starts to crawl • May be walking when holding to furniture. • May be able to stand briefly without support.
Social and Emotional	• Laughs when happy and cries when annoyed or frustrated. • Starts to recognize families faces • Responds to facial expressions and tones of voices. • May be more clingy and anxious in the company of others. • Shows distress when someone else is upset • Can give hugs and loves receiving them
Cognitive	• Notices music From 7 months • Enjoys dropping things and watching them fall (cause and effect) • Arranges objects into patterns and shapes • Concentration can last for up to 1 minute • Adapts learn strategies to new situations • Looks for hidden objects in the right place

Toddlers (1-3 years):

Domain of Development	Characteristics of the Stage
Communication and Speech	• Says first word • Build up to using 5-10 different words by 18 months • Responds to questions From 18 months: • Uses at least 50 words • Names objects and pictures • Begins to use two-word phrases. Speech is telegraphic • Can follow two-step directions • Enjoys listening to stories • Talks about what they're doing as they do it.
Physical	• Has a preferred hand • Makes marks on paper • May be able to stand and walk a few steps alone • More confident moving around • Can use a spoon to eat • Can mostly dress/undress • Can use toilet alone • Avoids obstacles

Domain of Development	Characteristics of the Stage
Social and Emotional	• Able to recognize self in mirror • Starts to develop object permanence • Emotions are easily visible • Wants to do things when they want to • Roller coaster of feelings – trying to work out who they are. • Plays alongside other children, not together yet. • More confident with strangers
Cognitive	• Can point to named body parts • Can identify familiar things in picture books • Much better at solving puzzles • Can name colours • Recognizes some letters • Can group similar objects together • Copies others gradually. • Knows their own name

Preschool Age (3-4 years):

Domain of Development	Characteristics of the Stage
Communication and Speech	• Masters difficult sounds, like the following: judge, watch, and thing • Speaks more clearly – strangers can understand them • Asks lots of questions (e.g. 'what?', 'why?', 'how?' • Still makes errors with tenses
Physical	• Can use a tricycle and other wheeled toys • Can use a toothbrush and scissors • Scribbles start to look more like letters • Walks up and down stairs unsupported • Can catch a ball from a short distance away • Can draw a circle and a square • Can use a fork and a spoon
Social and Emotional	• More at ease with others • Begins to participate in games in small groups • Shows imagination • Sees self as having a body and mind with feelings • Talks about feelings • Cooperates with other children • Role-plays (e.g. as mummy and daddy) • Knows when they have done something wrong
Cognitive	• Memory is much better – knows if you sing a song or tell a story incorrectly • Can concentrate for up to 3 minutes • Looks through a book alone • Knows numbers 1-10, but not necessarily in order • Knows full name, gender.

School Age (4-5 years):

Domain of Development	Characteristics of the Stage
Communication and Speech	• From 4 years: Uses more complex sentences (e.g. two clauses with 'and' in the middle – 'you will be the prince and I will be the princess' – or subordinate clauses – 'they go to sleep when it's bedtime') • From 5 years: May be able to tell stories that stay on track • Can answer simple questions about stories • Recites nursery rhymes and sings songs
Physical	• From 4 years: Can dress, eat and wash mostly independently • Holds pencil properly • Can brush hair • Can walk along a straight line on the ground • Draws more complex 'people'
Social and Emotional	• Likes to initiate conversations with others • Makes friends • Has fewer arguments with other children • Talks about likes and dislikes • Uses lots of props in imaginative play • Can take turns and share • Shows anger through words and actions • Responds to reasoning • Comprehends danger
Cognitive	• Knows what is right and wrong • Knows what it is to tell a lie • Still has some difficulty separating reality and pretend play • Basic grasp of numbers, colours, size and time • Interest in life and death – deeper questions • Understands routines • Understands comparisons like 'bigger', 'faster'

Infants and Toddlers

- Children start to get colds after about six months of age when the immunity they received from their mom fades and they have to build up their own immune system.
- Infants get common cold 6 to 12 times in the first year.
- Again in their first year of school 3 - 6 years they fall sick more frequently.
- Many young children are more likely to be injured by scalding because of their natural child characteristics, such as: curiosity, limited understanding of danger, limited ability to react quickly to contact with hot liquid or steam
- A buildup of mucus behind the eardrums may cause dulled hearing or mild earache.
- Excessive medication at early age proves to be harmful in long run.
- Burns from steam inhalation increased over past 3 years.
- But at the same time Steam inhalation has gained Popularity in recent years among all ages.

Preventive Measures During Inhalation

- Maintain a safe distance –Keep the steam inhaler at about 10 inches distance
- Adults must check and ensure that the hot water is not spilling out while children are using
- It's best to make children sit with a thick towel on the lap to safeguard from any spillage
- Don't repeat more than twice a day
- Limit inhalation time up to a maximum of 10 min
- Before they start, wait for the steam to take a more regular flow. Bring the face near the nozzle only after the steam flow is stable
- overdoing steam can make your face and neck dry, which can lead to fungal or bacterial infection
- Your baby's hair and clothes are likely to get damp after a steam session, so dry his hair and change him to a fresh set of clothes afterwards.
- put nonslip mats on the floor.
- Avoid allowing the steam to make contact with your eyes. Your eyes should be closed and directed away from the steam.
- Most paediatricians do not recommend using vapor rub on babies and toddlers younger than two years of age
- Don't put any essential oils unless advised by your doctor.

Colds in Children

What is the common cold in children?

The common cold (upper respiratory infection) is one of the most common illnesses in children. Each year it leads to more healthcare provider visits and missed days from school and work than any other illness. Millions of people in the U.S. will get a cold each year.

- Most children will have at least 6 to 8 colds a year. Children who attend daycare will have more.
- Colds may occur less often after age 6.
- Children are more likely to have colds during fall and winter.

What causes the common cold in a child?

Colds happen when a virus irritates (inflames) the lining of the nose and throat. Colds can be caused by more than 200 different viruses. But most colds are caused by rhinoviruses.

To catch a cold, your child must come in contact with someone who is infected with one of the cold viruses. The cold virus can be spread:

Through the air. If a person with a cold sneezes or coughs, small amounts of the virus can go into the air. Then if your child breathes in that air, the virus will stick inside your child's nose (nasal membrane).

By direct contact. This means that your child touches an infected person. A cold is easy for children to spread. That's because they touch their nose, mouth, and eyes often and then touch other people or objects. This can spread the virus. It's important to know that viruses can be spread through objects, such as toys, that have been touched by someone with a cold.

Which children are at risk for the common cold?

All children are at risk for the common cold. They are more likely than adults to get a cold. Here are some reasons why:

Less resistance. A child's immune system is not as strong as an adult's when it comes to fighting cold germs.

Winter season. Most respiratory illnesses happen in fall and winter, when children are indoors and around more germs. The humidity also drops during this season. This makes the passages in the nose drier and at greater risk for infection.

School or daycare. Colds spread easily when children are in close contact.

Hand-to-mouth contact. Children are likely to touch their eyes, nose, or mouth without washing their hands. This is the most common way germs are spread.

What are the symptoms of the common cold in a child?

Cold symptoms start from 1 to 3 days after your child has been in contact with the cold virus. Symptoms often last about 1 week. But they may last up to 2 weeks. Symptoms may be a bit different for each child.

In babies, cold symptoms may include:

- Trouble sleeping
- Fussiness
- Congestion in the nose
- Sometimes vomiting and diarrhea
- Fever

Older children may have:

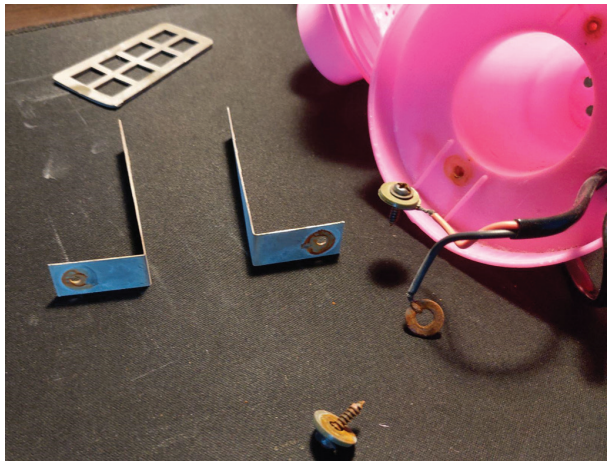
- Stuffy, runny nose
- Scratchy, tickle throat
- Watery eyes
- Sneezing
- Mild hacking cough
- Congestion
- Sore throat
- Achy muscles and bones
- Headaches
- Low-grade fever
- Chills
- Discharge from the nose that thickens and turns yellow
- Extreme tiredness (fatigue)

Study of Technology

Regular Steam Vaporizer

This is a regular steam vaporizer mostly priced between 150 to 300 rupees. This steam vaporizer is pretty cheaply built. The built material is mostly plastic with two metal inserts for heating.
The main working mechanism is that the two heating metal inserts are placed at a certain distance. The metal inserts are therefore connected to main electricity connection. When electricity passes through the tap water the minerals and salt particles carries the electrons to successfully generate heat which in turns vaporizes water to create steam.

Mostly all the parts are plastic material and has a lower melting point. The connection is direct making it dreadful.



All the parts are separately studied for corrosion and strength study. This is extremely risky to operate.

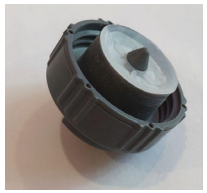
The two metal inserts are separated by a small plastic part and connected to main electricity connection. The whole system thereafter submerged to water for steam production.

Dr. Trust Steam Vaporizer

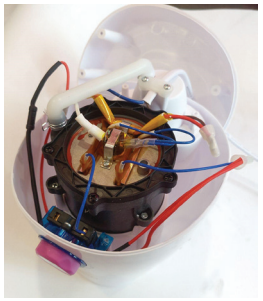
This is a Dr. Trust steam vaporizer mostly priced between 2000 to 3000 rupees. This steam vaporizer is pretty costly built. The built material is mostly plastic with more complex circuit for controlled heat and water supply.
In this device a separate water container holds the water while providing required water steadily. The heating is done through a heating plate instead of two plates. The complex circuit helps control heating with a knob.
The plastic quality is decent and chance of accidentally getting electric shock is less.

Plastic inner Part to hold water and produce steam

The heating plate and the knob got connected to the circuit.

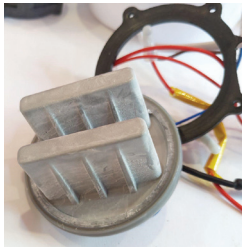


It screws to the water container and have a valve system to flow water.

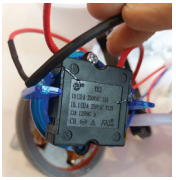


The circuit for controlling heat and indication of power

All the part separated to show the internal components. Here we can see how the heating plate is connected to the controller, the system is water tightened with the help of gasket. And the wiring.



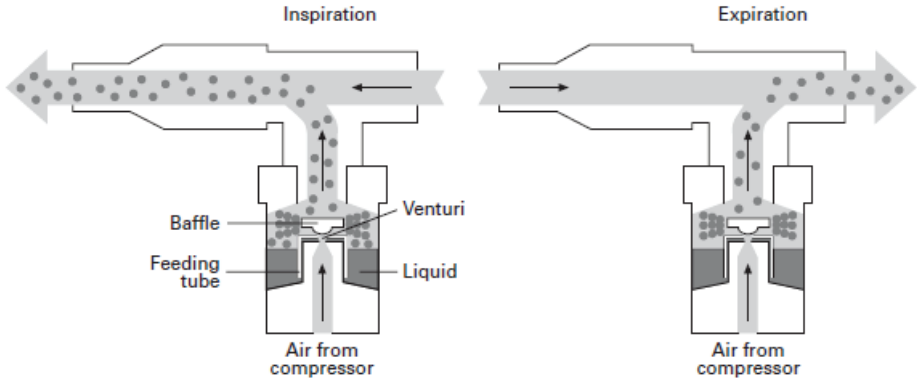
Heating Plate



Foe Heat regulation

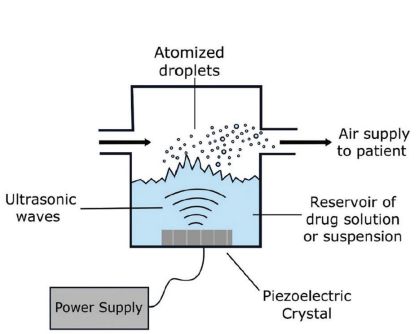
Jet Nebulizers

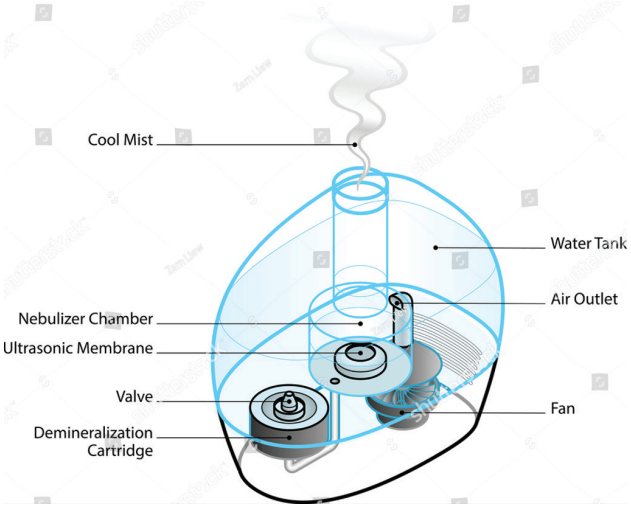
Jet nebulizers are based on the venturi principle. Conventional pneumatic, or jet, nebulizers use compressed air or oxygen to break up a thin film or jet of fluid into droplets suitable for inhalation. The nebulizer bowl is filled with drug in aqueous solution or suspension. Compressed air or oxygen is applied to the jet inlet and, traveling at a high velocity, exits through a narrow orifice, creating an area of low pressure at the outlet of the adjacent liquid feed tube. This pressure differential causes fluid from the reservoir to be drawn up into (i.e., the Venturi effect) and out of the tube. The liquid is then shattered into droplets of various sizes by the nebulizer walls or internal baffles. The larger droplets are returned to the fluid reservoir, whereas the finer droplets are carried out of the nebulizer to the patient by the flow of air.



Ultrasonic Nebulizer

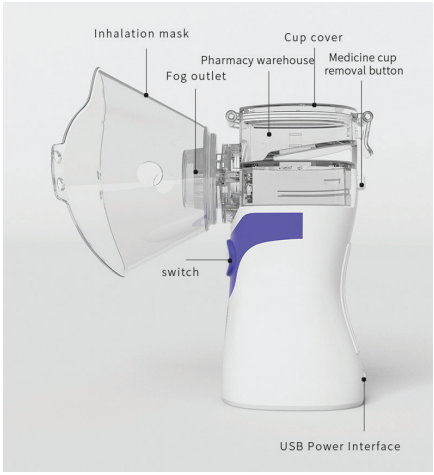
The principle of an ultrasonic nebulizer is based on the vibrations of a piezoelectric crystal driven by an alternating electrical field. These periodic vibrations are characterized by their frequency, their amplitude, and their intensity, which corresponds to the energy transmitted per surface unit. When the vibration in tensity is sufficient, cavitation occurs, and droplets are generated. Ventilation enables airflow to cross the nebulizer and to expel the aerosol droplets. For a given nebulizer, the vibration frequency of the piezoelectric crystal is fixed, often in the range 1-2.5MHz. In most cases, an adjustment in vibration intensity is possible by modifying vibration amplitude.

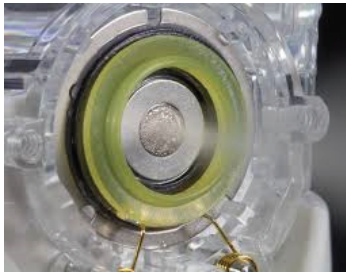




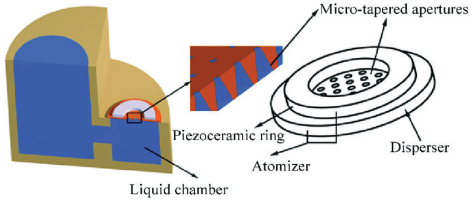
Vibrating Mesh Nebulizer

Vibrating mesh nebulizers use mesh deformation or vibration to push the liquid drug through the mesh. An annular piezo element, which is in contact with the mesh, is used to produce vibration around the mesh, and the liquid drug is in direct contact with the mesh. Holes in the mesh have a conical structure, with the largest cross-section of the cone in contact with the liquid drug. The mesh deforms into the liquid side, thus pumping and loading the holes with liquid. This deformation on the other side of the liquid-drug reservoir ejects droplets through the holes, which can be inhaled by the patient.



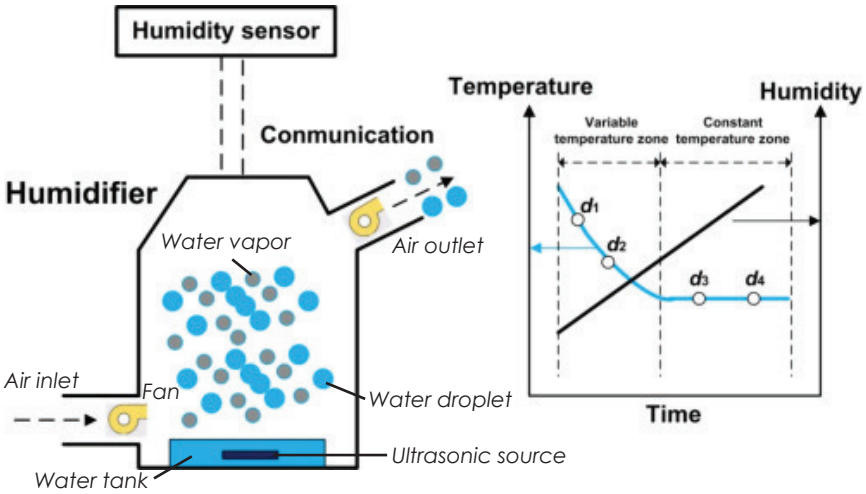


Piezoelectric element for atomizing.



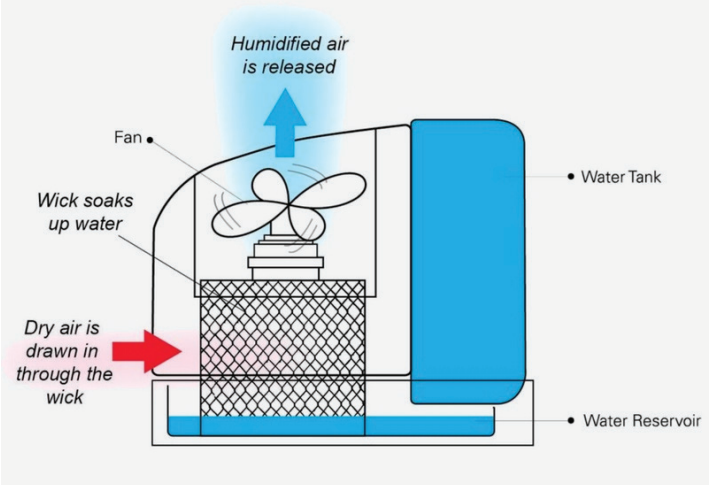
Working principle of atomizer in nebulizer.

Humidifier



Ultrasonic humidifiers

A piezoelectric transducer immersed in a water bed, converts a high frequency, electronic signal into a high frequency mechanical oscillation. As the oscillation speed is increased to a level where the water particles can no longer follow the oscillating surface, a momentary vacuum and strong compression occur, leading to the explosive formation of air bubbles (cavitation). At cavitation, broken capillary waves are generated, and tiny (1 micron diameter) droplets break the surface tension of the water and are quickly dissipated into the air, taking vapor form and absorbed into the air stream.



Evaporative humidifiers

An "evaporative", "cool moisture", or "wick humidifier", consists of just three basic parts: a reservoir, a wick, and a fan.

The wick is made of a porous material that absorbs water from the reservoir and provides a larger surface area for it to evaporate from. The fan is adjacent to the wick and blows air onto the wet wick to aid in the evaporation of the water. Evaporation from the wick is dependent on relative humidity. A room with low humidity will have a higher evaporation rate compared to a room with high humidity. Therefore, this type of humidifier is partially self-regulating; as the humidity of the room increases, the water vapor output naturally decreases.

Further User Research

Scenario 01

- Using towel under the kids to protect from any spillage
- The vaporizer is kept at a very risky position.
- Being the whole system on bed its more risky of toppling over.
- Newspaper is kept under the vaporizer to prevent from water spillage and to made the bed hard enough.
- No proper direction of the vapor.
- Vaporizer is in hands reach of the toddler.
- Using mosquito net and towel to cover them
- Going out of the visibility and reach of the parent in case of emergency.

Scenario 02

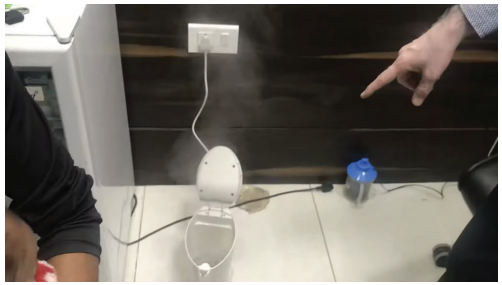
Two methods used here are:

- First the baby is lying upside down and hanging. The steam bowl is placed under the blanket. No proper flow is being provided to the child. Warmth is mainly reaching to the back of the head. Hanging over the hot bowl is risky
- The second method is where the child is placed on the bed and the hot steam is coming from the bottom. The bowl is placed openly and the way the child is placed on the bed is risky and need constant attention.
- Eyes are not protected in both scenarios
- Though the temperature may not be too hot for the child but the flow is not at all consistent.
- Playing with the toy can be risky because if it drops on the bowl water may spill and cause burn.

Scenario 03







- The vaporizer is placed on the floor which is far and the steam will disperse more till it reaches the child
- Sitting with the child on a chair for long is also tiring
- A blanket has to be placed over the child to provide steam effectively which is very big of a process. Total three person is required to complete the process.
- Is case of a electric kettle it's more risky as its open lid. And when electric kettle boils water it spills very much.
- One cannot move the vaporizer while giving steam to the child due to movement limitation.

Home remedies to curb cold and cough in children

1. Steam:

If your little one suffers from cold and has trouble breathing, get him/her to take steam. Make the kid stand in the bathroom with hot water running or simply heat water in a wide bowl and make the kid inhale the hot fumes for at least 10 to 15 minutes. Adding eucalyptus oil can also help soothe your child's system.

2. Honey:

Known for its soothing effect, dip your finger in honey and let your baby lick it two three times in a day. If your child is older than five years, mix a spoonful with cinnamon powder and ask him/her to have it.

3. Carom Seeds:

Boiling water along with carom seeds (ajwain) and tulsi leaves can help to keep the cough in check. It also helps in relieving chest congestion.

4.Kadha:

Kadha is also a traditional home remedy for treating cough, cold and sore throat. It can be prepared by boiling black pepper, ginger and Tulsi leaves in few cups of water for few minutes. Drinking this Kadha can provide relief from the symptoms of cough, cold and sore throat immediately.

5. Keep your kid hydrated:

When your kid is going through a bout of sneezing and coughing, it is very important to keep him/her hydrated. Drinking water at regular intervals will help fight the common cold and reduce the inflammation in the throat along with washing out the infection. Other fluids in form of warm soup or a fresh juice are also beneficial for replenishing the body's lost energy.

6. Salt gargling:

A glass of hot water with a teaspoon of salt can be useful to ease a sore throat. Ask your kid to gargle with salt water twice a day. The saline water helps soothe the pain.

7. Turmeric milk:

Due to its antiseptic properties, turmeric is known to treat viral infections such as cough and cold. Add turmeric powder to a glass of warm milk and make your kid have it every night. It provides instant relief for an aching throat and runny nose. Since it is a rich source of calcium, milk also provides energy to your kid.

8. Massage:

Massages work best for children who are below two years of age. Mix mustard oil with garlic and massage your baby's chest, back and neck area. Also cover the baby's palm and feet with the oil for a quick relief.

Market Study

Basic Steam Vaporizers

PharmEasy All in One Steam Vaporizer machine with Nozzle Inhaler

Brand: PharmEasy

4,313 ratings | 48

-42% ₹349.00 (₹349.00 / count)

M.R.P.: ~~₹599.00~~

- This is a very basic vaporizer with two metal inserts.
- Very cheap plastic material.
- Very uncomfortable to use.

Healthgenie Imported Steam Sauna Vaporizer Machine, And Steam Inhaler

Visit the Healthgenie Store

2,278 ratings

-73% ₹899.00

M.R.P.: ~~₹3,299.00~~

- The materials are bit better and well built.
- Knob for heat adjustment.
- Better quality attachment.
- Metal water container.

ARLICORPING™ Nano Facial Steamer & Medical Steam Inhaler Vaporizer

Brand: ARLICORPING

77 ratings

-25% ₹749.00 (₹749.00 / count)

M.R.P.: ~~₹999.00~~

- Flat narrow opening to direct steam and spread evenly.
- Water level indicator.
- Handy power button.
- Easy water pouring.

HealthSense Vaporizer & Steamer for, Steam Inhaler & Vaporizer Machine.

Visit the HealthSense Store

11,695 ratings |

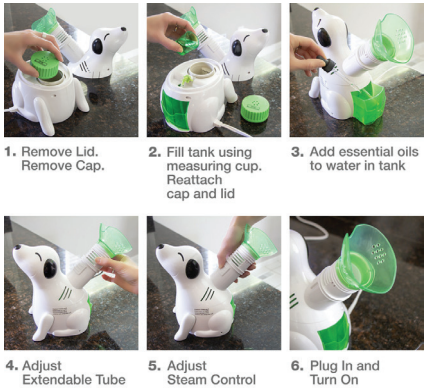
M.R.P.: ~~₹2,400.00~~

Deal Price: ₹1,799.00

You Save: ₹601.00 (25%)

- Very good plastic built.
- Handy holder for carrying.
- Handy power button.
- Even vapor producing.
- Premium finish.
- Safe water compartment.

Existing Kids Products



HealthSmart Personal Steam Inhaler for Kids

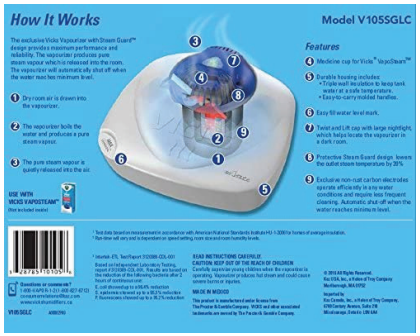
- Price Rs. 4000
- These products are more appealing to kids for their form and appearance.
- The extended nozzle is very helpful for adjustment.
- Steam is controlled.
- Separate water container and essential oil.
- Cute form for appealing kids.
- Modular in construction.

Vicks Products

Vicks Nursery 1 Gallon Vaporizer with Night-Light Warm Steam Vaporizer for Baby Room

Visit the Vicks Store

4.5 out of 5 stars 12,545 ratings | 164 answered questions



- Price: 5300
- Item weight 862 gram
- Has bigger water container.
- 1 gallon volume
- Create steam for big rooms.
- Brand reliability.
- Better plastic material.

Vicks Advanced Soothing Vapors Waterless Vaporizer

Brand: Vicks

3.5 out of 5 stars 21 ratings

- Price: 2000
- It has card instead of liquid
- Very light weight
- This device is wireless
- Plugs directly into wall socket
- Extremely portable

MyPurMist Products

Mypurmist 2 Ultrapure Handheld Personal Steam Inhaler (Plug-in), Vaporizer and Humidifier with HEPA Air Purifier

Brand: mypurmist

★★★½☆ 40 ratings

₹9,999.00

- It uses sterilized water
- In built UV to kill germ
- Extremely portable
- Patented instant steam technology
- HEPA air purifying filter
- It has self cleaning capability
- It features wireless usability

MyPurMist Handheld Personal Steam Inhaler Vaporizer

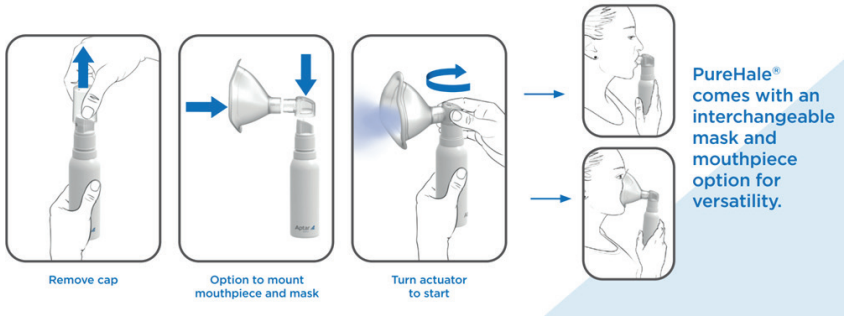
Brand: mypurmist

★★★★☆ 642 ratings

₹31,554.00 (₹31,554.00 / Count)

- Accurate temperature of 100* to 115* F
- Handheld device
- Latex face mask
- Plug-in, fill with water, press ON
- Germ free instant steam technology

PureHale Products



- Prefilled, portable and ready-to-use system
- Non-electronic, purely mechanical system
- By turning the actuator, the valve opens and the pressure between can and bag presses the formulation out of the bag, providing a continuous fine mist.
- PureHale®'s technology is based on Aptar Pharma's proven Bag-on-Valve System.
- Mouthpiece and mask both can be attachable.

InnoSpire Go Products

- Efficient aerosol therapy with audible and visible indicators that signal therapy completion.
- A small, portable and discreet therapy device
- Rechargeable, long life, built-in battery that provides up to 30 treatments.
- The easily detachable mouthpiece`

1. Fill
Lift the green lid, pour in the medication and the InnoSpire Go is ready to use.

2. Treat
Press the on button and the InnoSpire Go will begin to nebulize.

3. Clean
Remove the mouthpiece and quickly rinse it in warm water.

Kids Nebulizer Products

Philips REF-1093268 Sami the Seal Nebulizer

Brand: PHILIPS

★★★★½ 181 ratings | 31 answered questions

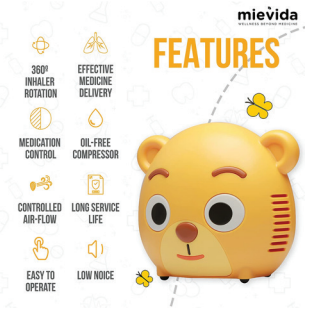
Mievida Mi-KIDZ C04 Compressor Nebulizer for Child & Adult with Medi Control Technology and 360° Inhaler Rotation for Effective Delivery of Medication

Visit the MIEVIDA Store

★★★★☆ 126 ratings

M.R.P.: ~~₹2,560.00~~

Deal of the Day: ₹1,569.00



- Mostly jet nebulizer.
- Heavy and has complex work flow
- Mostly the form is kids friendly
- But form does not adding any value
- Kids may be more friendly with the process.

Reviews From Existing Products

★☆☆☆☆ **too hot, cord too short, isn't safe to use with extension cord**

Reviewed in the United States us on February 28, 2018

Verified Purchase

Steam is so hot that my kids (5.5 & 3) won't use it. It's fine for me, but makes the kids cry. Its also on a SUPER SHORT cord, and instructions say not to use with an extension cord. Only way my kids can use it is facing the wall, and because of the angle on the tube they have to awkwardly bend over it or kneel up to a table, again facing the wall. If they try to hold it instead so they can sit, the unit tips, as it is meant to be on a stable flat surface. the "extendable adjustable tube" is adjustable by maybe 1" or 1 1/2". If tube was longer, or more adjustable perhaps steam could cool enough to not turn my kids' face bright red and make them stop crying that it's burning their faces.
Id rather put them i the bath or spend on the fancy handheld thing the doctor suggested. So much for trying to save money!

★★★★☆ **Tough to use with a toddler, though I like it well enough for myself.**

Reviewed in the United States us on December 3, 2012

Verified Purchase

Got this to keep on hand for those stopped up evenings. The mask is rather big, so the steam ends up going in my kiddo's eyes. Plus, the only way I can get him to use it is to turn on cartoons to distract him. Trying to balance him and the inhaler is no small feat. I've given up using it on him though I do use it myself at times (with essential oils for nasal relief).

★★★☆☆ **As advertised**

Reviewed in the United States us on June 3, 2018

Verified Purchase

my son is afraid of this, i have to sneak attack him while he sleeping. 3 stars is because the water change too much the treatment should be alil longer, in order for that you will have to refill the lil green cup in the back, i have been recycling that water at least 2x because i add the vaporizing liquid to it. I will keep it for a rainy day but plan to buy a bigger 1

★★★☆☆ **Not quiet at all.**

Reviewed in the United States us on February 28, 2018

Verified Purchase

Noisy. The sound of the water heating scared my 9 year old.

★☆☆☆☆ **Upset with product..waste of money**

By Exploring_mykidscreativity on February 25, 2019

It's very bad..we used only one time for 4 years old son..I locked and using it..suddenly it's opened,hot water poured on my son leg..he got hurt with it..am very upset about this

Atul Narain Singh

★☆☆☆☆ **Stay Away, Never Buy**

Reviewed in India on 16 October 2018

Verified Purchase

I would have bought at least 10 steamers before this as I take steam everyday without fail. This is by far the Worst steamer I have used ever. I can see sparks in the water. The water itself turns brown within a min - imagine what quality of steam we will inhale ?!! Water capacity too little and you have to refill within 5 mins. It's single layered plastic body that's get very hot to hold unlike several others which have two layers of plastic for you to hold safely (like thermos). Really disappointed

Tilak

★★★☆☆ **Ok but not great.**

Reviewed in India on 10 September 2018

Verified Purchase

Just got the product. Tested also. My 1st impression and observation:
1. The plastic quality is very average. In fact not good. Cannot be a Dr. Morepen product.
2. Works fine. Water gets heated fast. And steam is also ok. So it does the job.
3. Cord lenght is less. And it does not have thermostat. And no on/off switch also. So water keeps on getting hot. Need to take the plug out after a while.
4. Don't know how durable it is will post if it conks off fast.
5. But at this low price what else can u expect

Materials for Children Safe Products

BPA free Silicone

BPA- and phthalate-free plastic

Polypropylene

Synthetic rubber

100% PVC-free labeled materials

Technological comparison

Vaporizer Vs Humidifier Vs Nebulizer

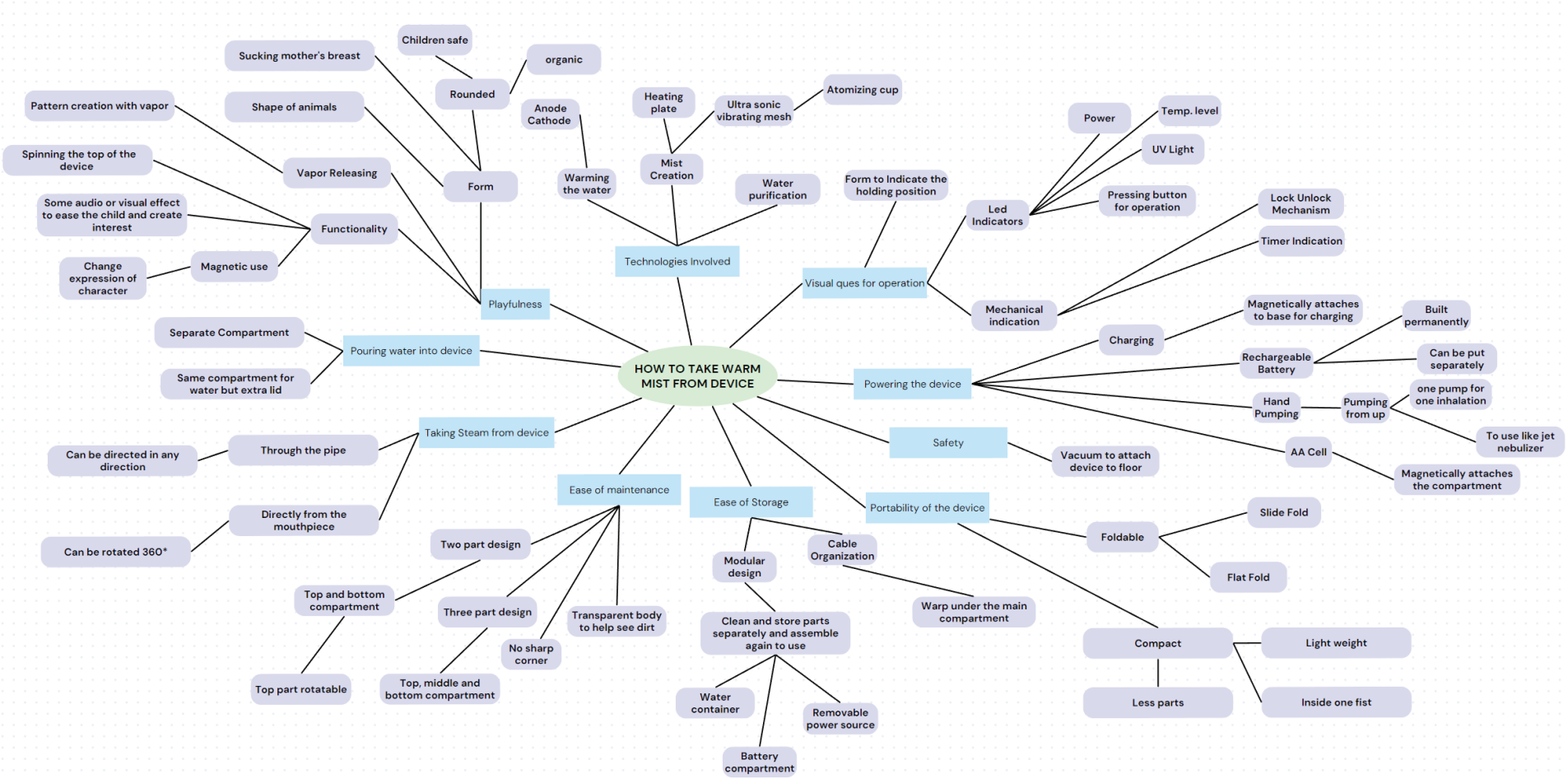
Vaporizer	Humidifier	Nebulizer
• Produces water vapor • Using a vaporizer is recommended in the treatment of throat and nose related infections. • Relieve from general nasal discomfort and no medication needed unless doctor recommends • Heats water to create mist • Extremely caution needed	• Produces fine mist of water • Uses to create humidity inside rooms • No medication needed • Mostly ultrasonic mechanism • Relatively safe with such device	• Produces cold mist • Used to deliver prescribed medication to respiratory systems • Only prescribed medication should be given • Several different mechanisms • Parental observation needed

Final Design Brief

Design a hydrothermic device for the age group of 6 months to 5 years, to help them relieve from symptoms of common cold and nasal patency.

Must Have	Should Have	Good To Have
Controlled Temperature of steam	*Automated Timer for operation*	*Wireless device*
Controlled Flow of steam	*Easy to Clean*	*Can also be used without battery*
Easy to carry and operate	*Modular attachments*	*Can be used to humidify locally*
Can be used with medication	*Be playful and inviting for a infant*	*Surface temp detection of baby*
Extremely leak proof and safe	*Workable with normal water*	*Rechargeable battery operated*

Mind Map


HOW TO TAKE WARM MIST FROM DEVICE
Playfulness
Form
Children safe
Sucking mother's breast
organic
Rounded
Pattern creation with vapor
Shape of animals
Vapor Releasing
Spinning the top of the device
Some audio or visual effect to ease the child and create interest
Functionality
Change expression of character
Magnetic use
Technologies Involved
Anode Cathode
Warming the water
Heating plate
Ultra sonic vibrating mesh
Atomizing cup
Mist Creation
Water purification
Visual ques for operation
Form to Indicate the holding position
Led Indicators
Power
Temp. level
UV Light
Pressing button for operation
Mechanical indication
Lock Unlock Mechanism
Timer Indication
Powering the device
Charging
Magnetically attaches to base for charging
Rechargeable Battery
Built permanently
Can be put separately
Hand Pumping
Pumping from up
one pump for one inhalation
To use like jet nebulizer
AA Cell
Magnetically attaches the compartment
Pouring water into device
Separate Compartment
Same compartment for water but extra lid
Taking Steam from device
Through the pipe
Can be directed in any direction
Directly from the mouthpiece
Can be rotated 360*
Safety
Vacuum to attach device to floor
Ease of maintenance
Two part design
Top and bottom compartment
Top part rotatable
Three part design
Top, middle and bottom compartment
No sharp corner
Transparent body to help see dirt
Ease of Storage
Modular design
Clean and store parts separately and assemble again to use
Water container
Removable power source
Battery compartment
Cable Organization
Warp under the main compartment
Portability of the device
Foldable
Slide Fold
Flat Fold
Compact
Light weight
Inside one fist
Less parts

Design Directions

a steam vaporizer for regional humidity in a room

offering steam through mask and pipe

animal inspired hand held device to provide steam

unidirectional steam generating device that are to be used kept on the floor

form as cute and appealing for parents considerable for the children

Without the use of power

Pressure as source of power

portable so that parents can provide steam on the go

Rotation 360* for easy direction

The piece may be displayed as a show object when not in use

What makes toddlers excited at this age and how I can make the device playful by improvising those elements

Can help reduce dry mouth

should keep the nasal passage away from drying

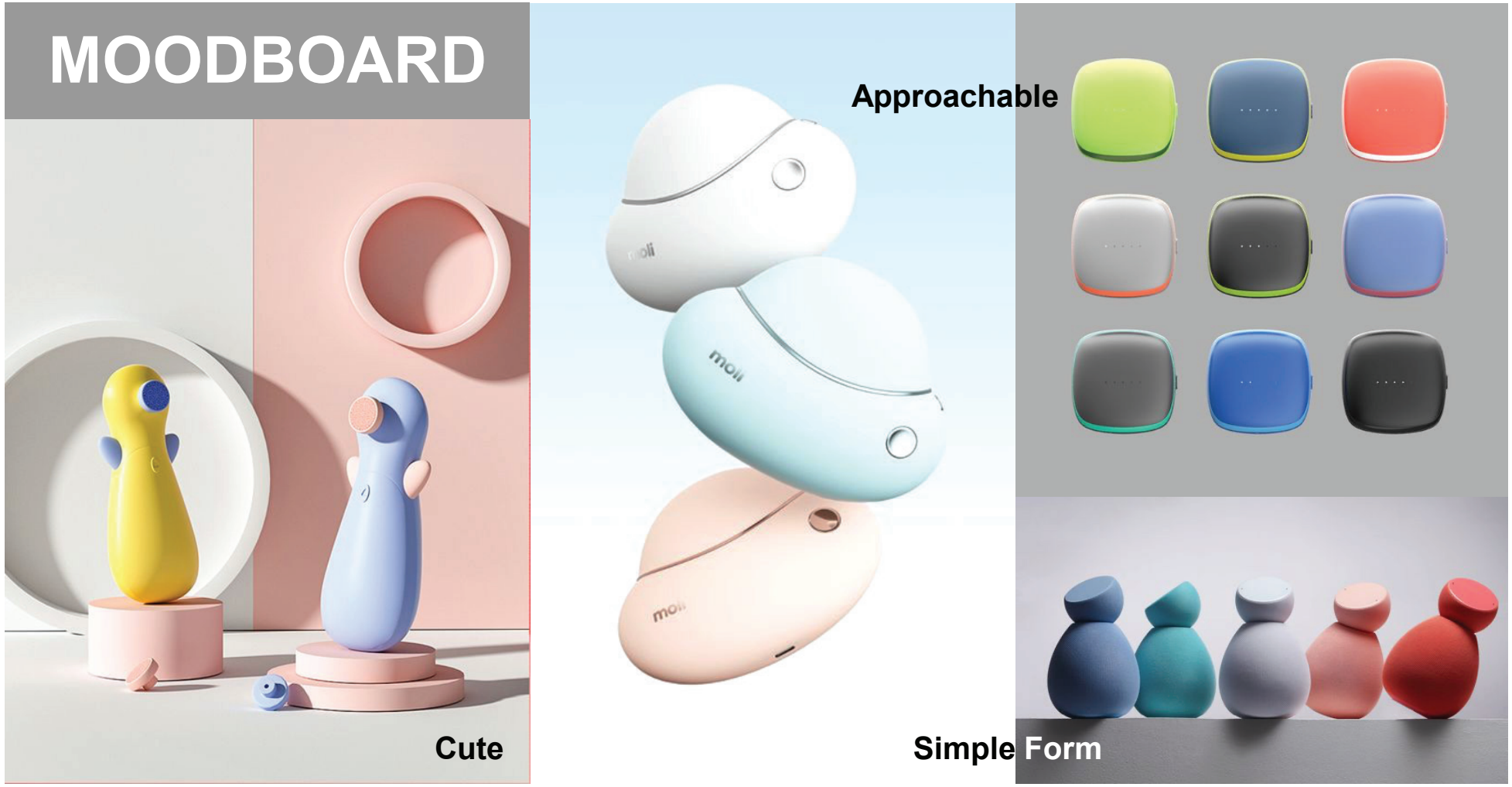
how if I can use normal water and can produce mist for nasal relief

lighting to sooth the anxity of children

Design Opportunity

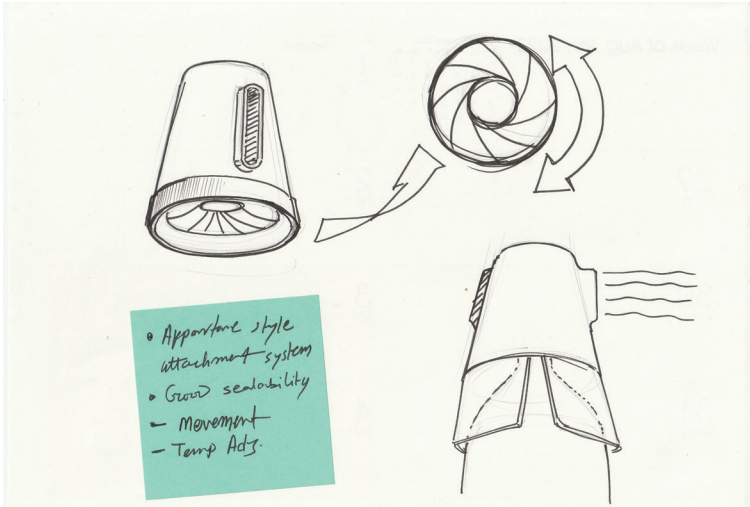
- A design to control or regulate the amount of steam flow.
- Redesign for a better holding grip or handle to enhance safety.
- Redesign the locking mechanism for the top and bottom compartments for better safety when containing heated water.
- Different power source options.
- Improved attachment design for better steam intake facility.
- Easy operation and maintenance.
- Optimize usability, manufacturing and cost in creative way to launch in an affordable price segment.

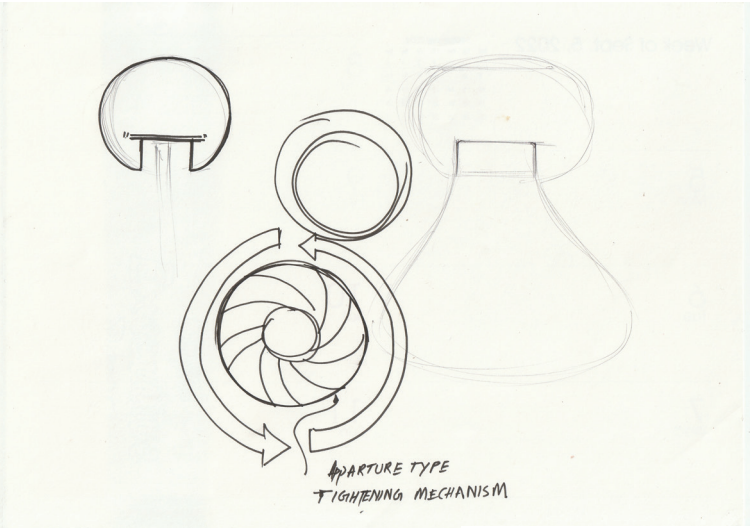
Mood board

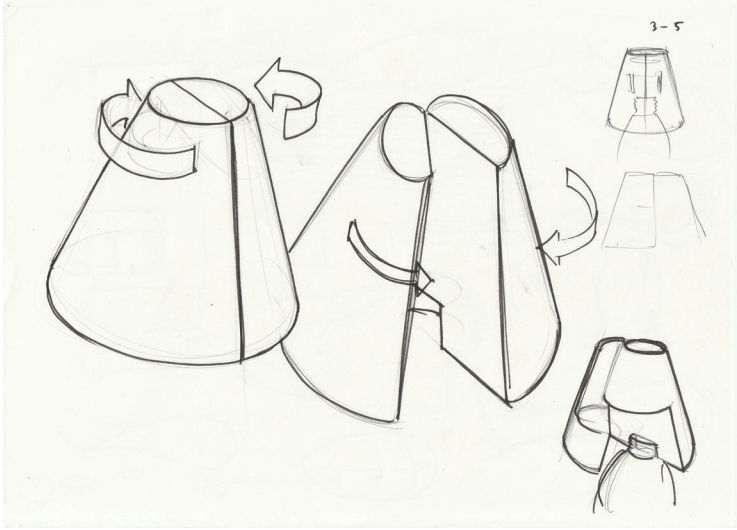


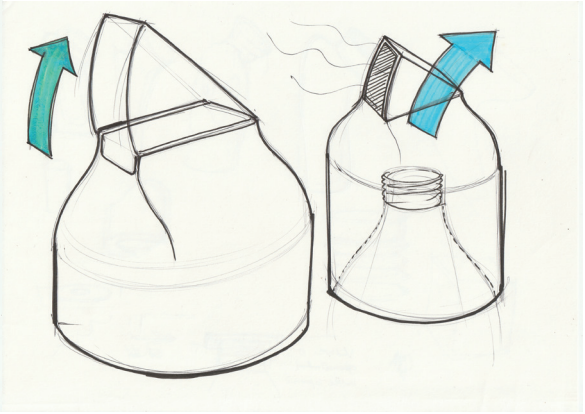
Ideation

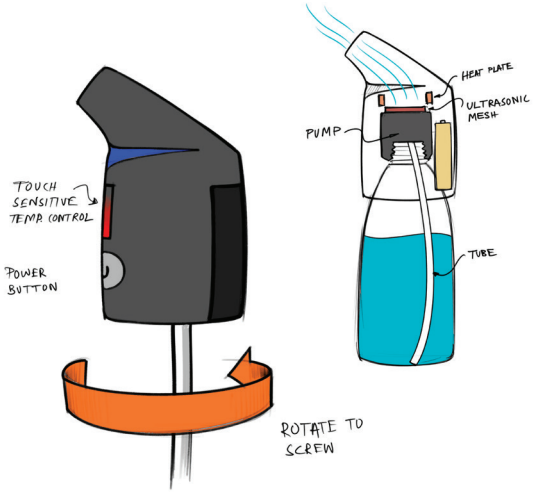
Bottle Attachment







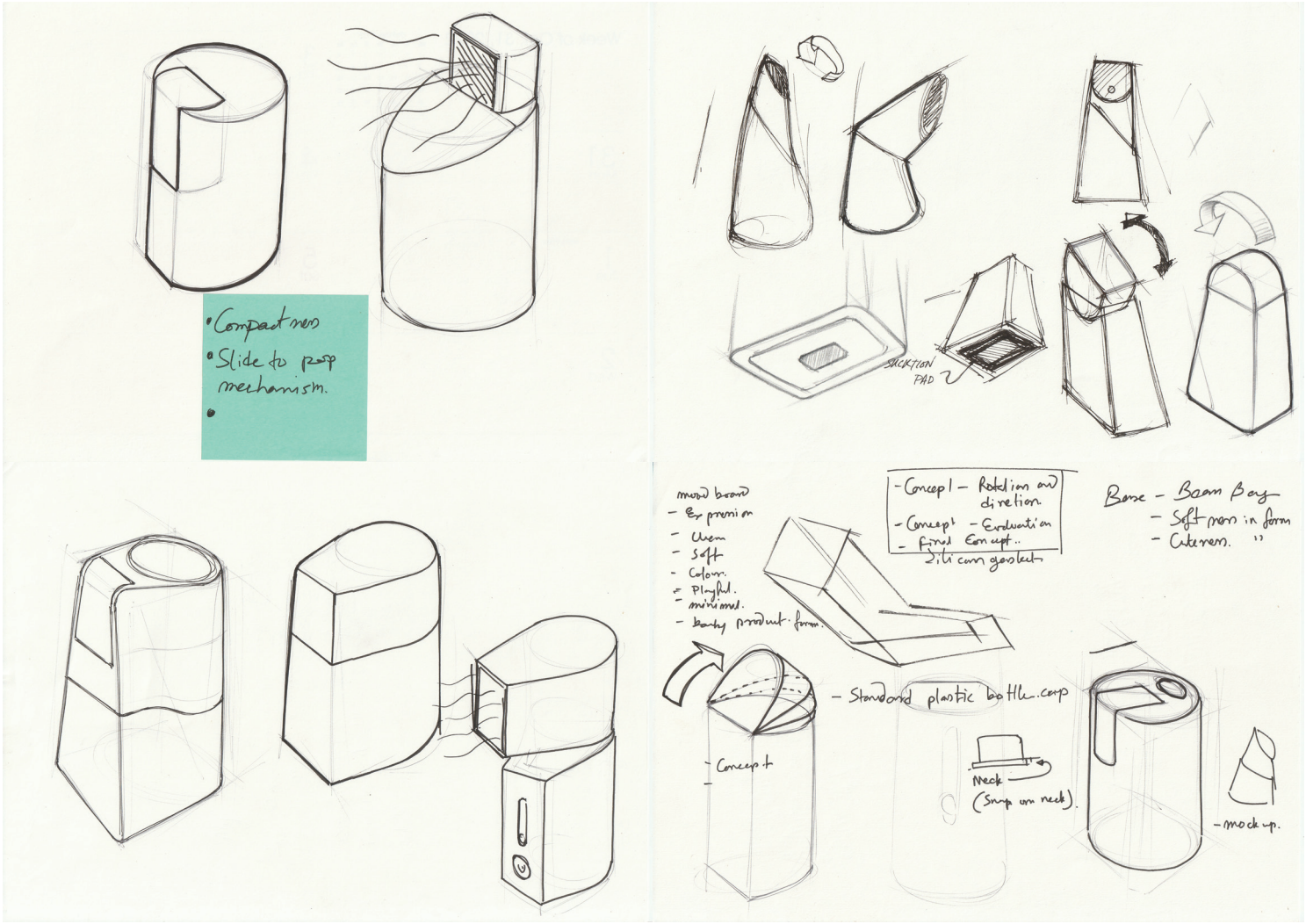




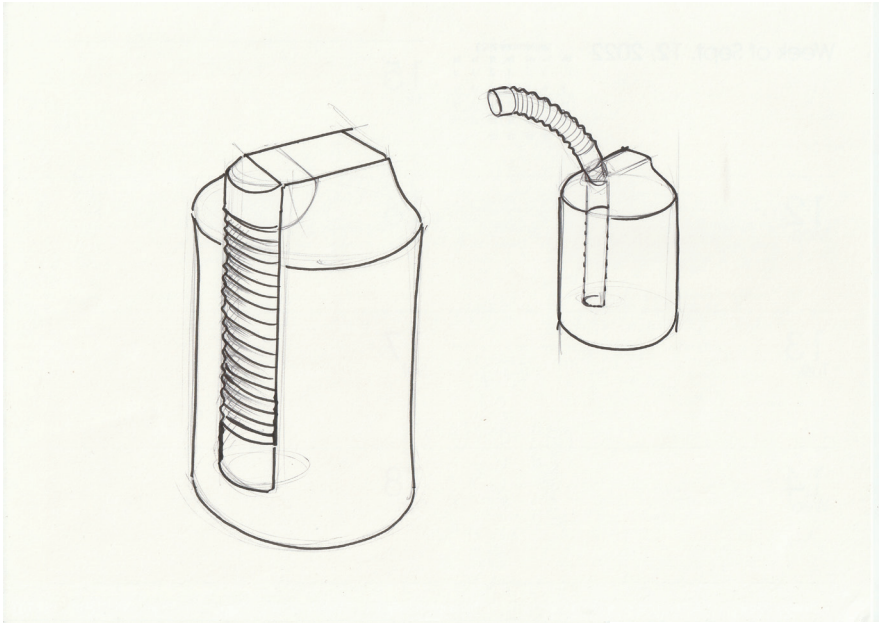
Rotate 360*

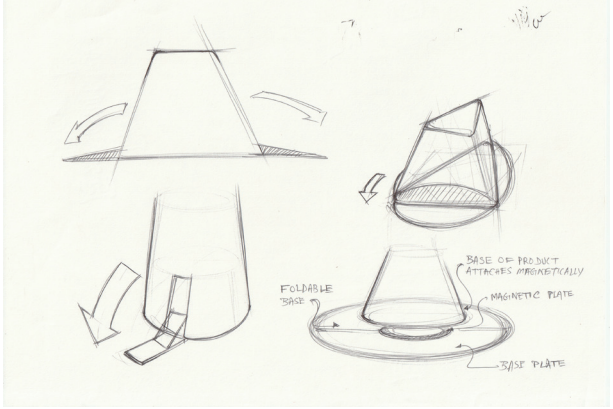

SILICONE BASE TO ATTACH ANY BOTTLE
360° ROTATION
SUCKTION PAD
firm break.

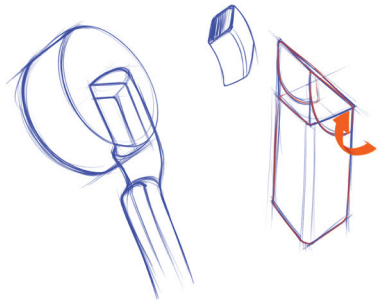
Compact Design

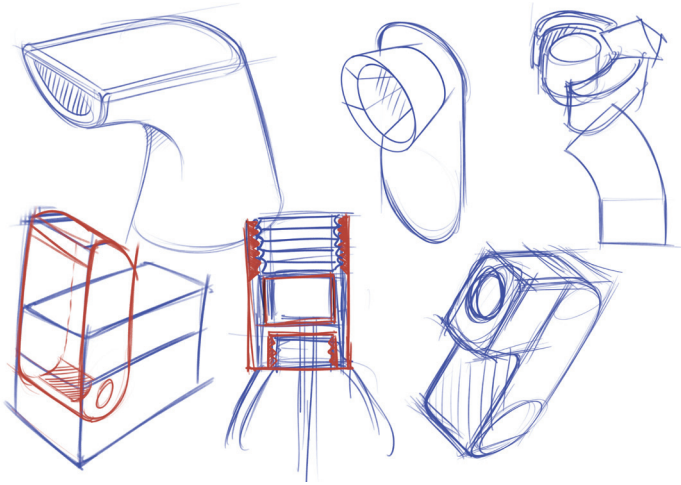


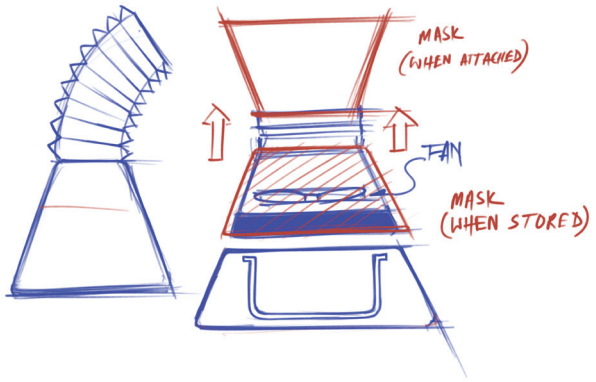
Direct Flow of Steam



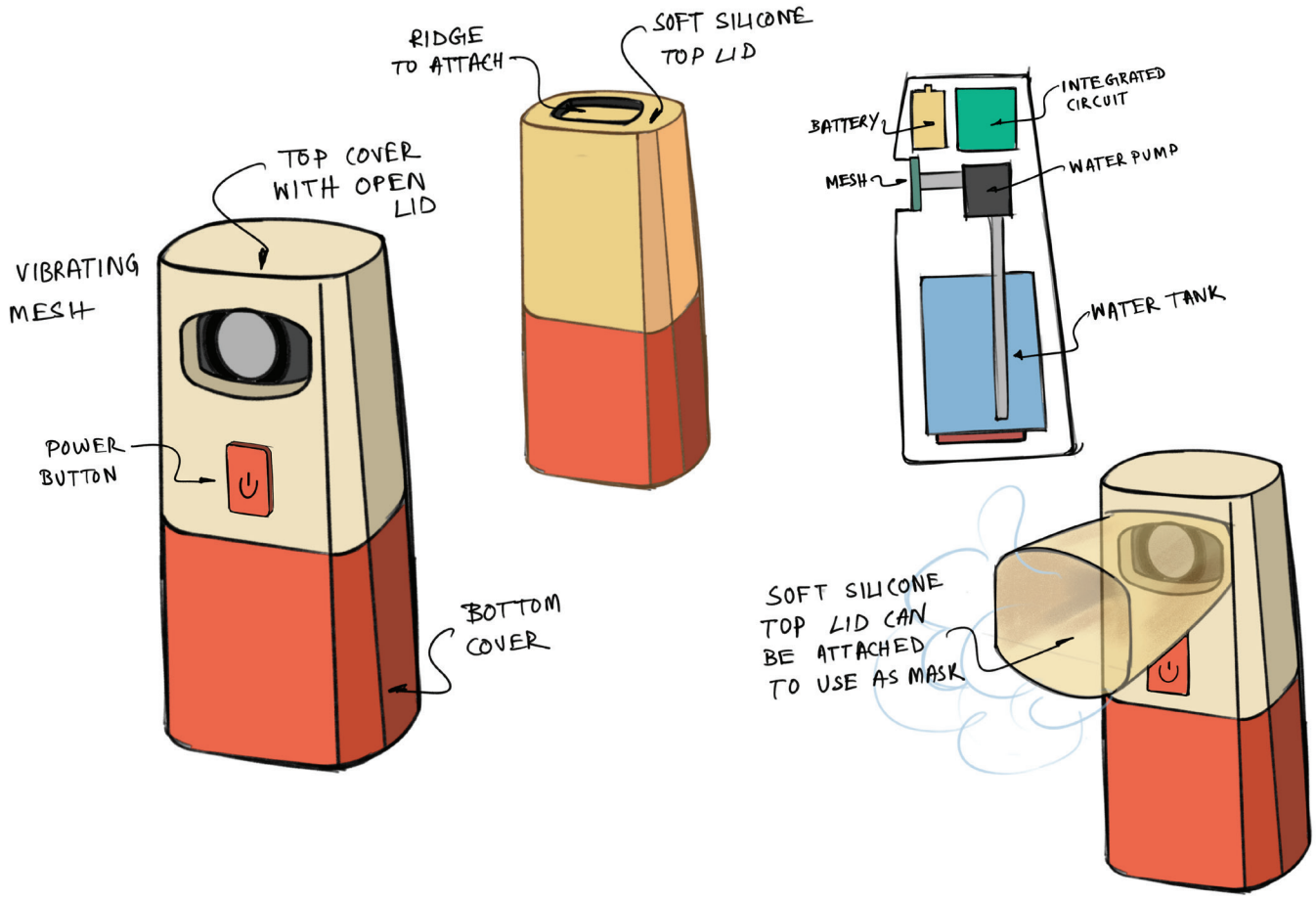




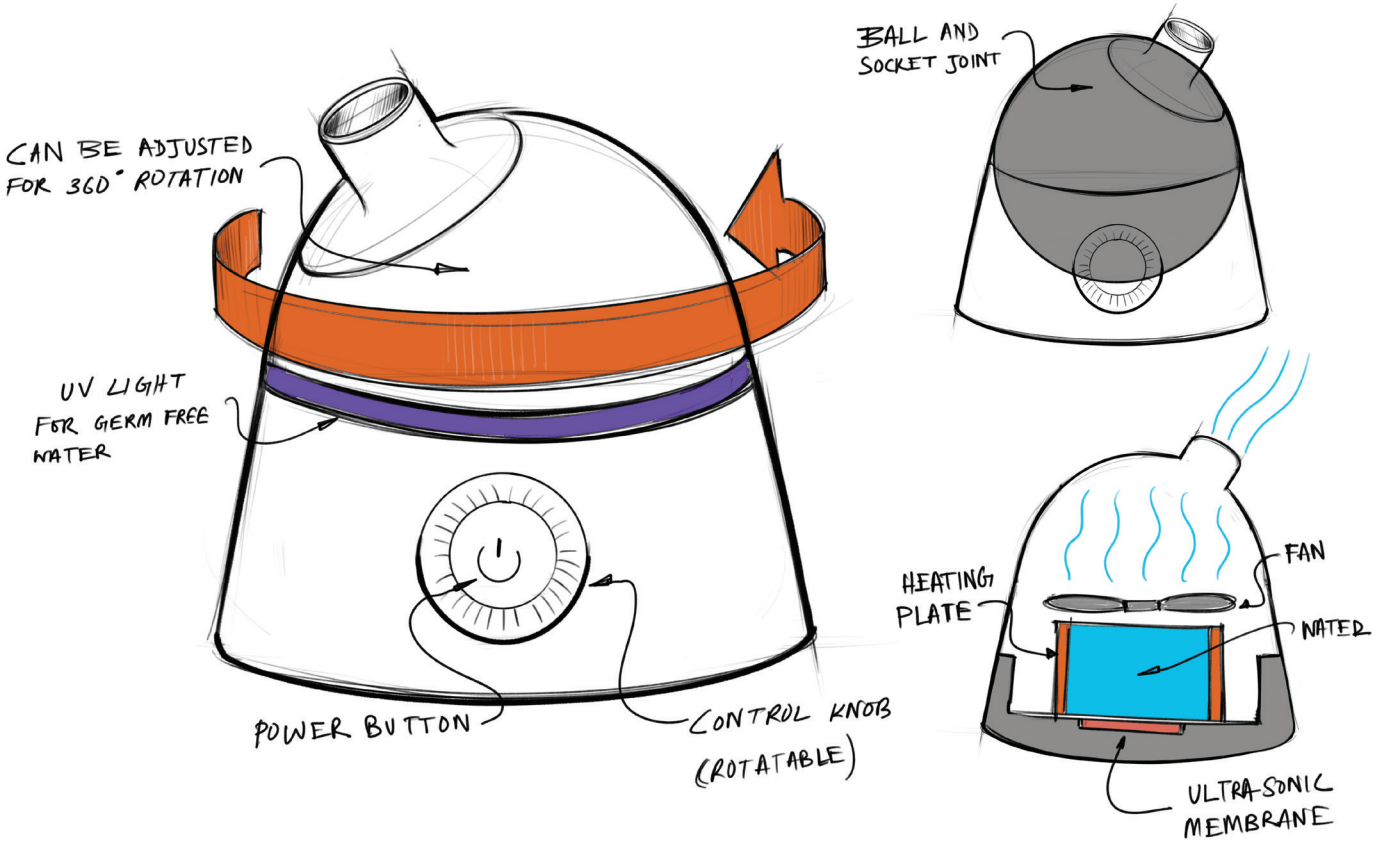




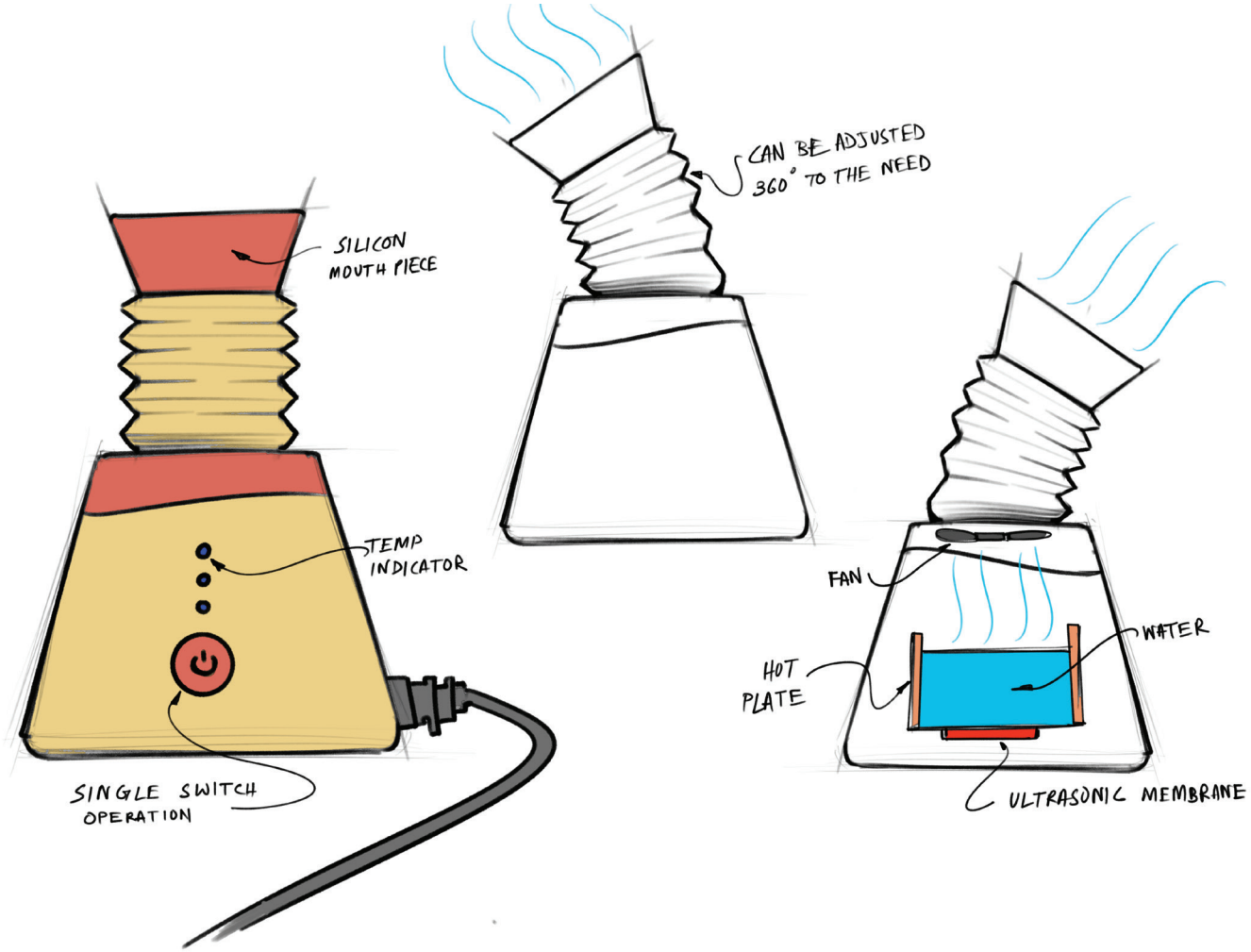
Portability



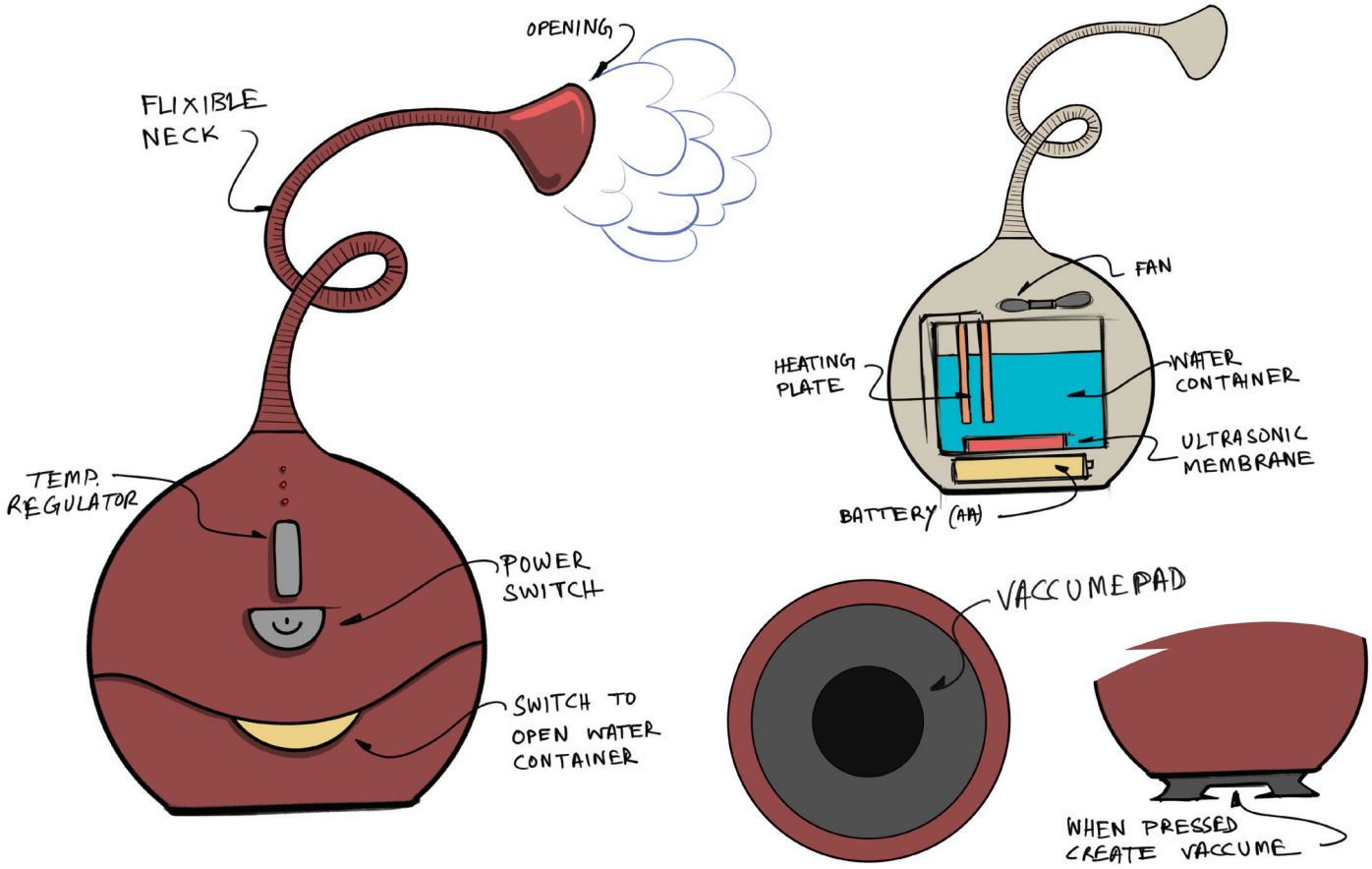
Rotate 360*


CAN BE ADJUSTED FOR 360° ROTATION
UV LIGHT FOR GERM FREE WATER
POWER BUTTON
CONTROL KNOB (ROTATABLE)
BALL AND SOCKET JOINT
HEATING PLATE
FAN
WATER
ULTRA-SONIC MEMBRANE

Directionality

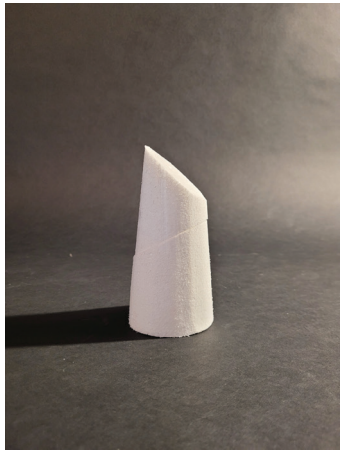


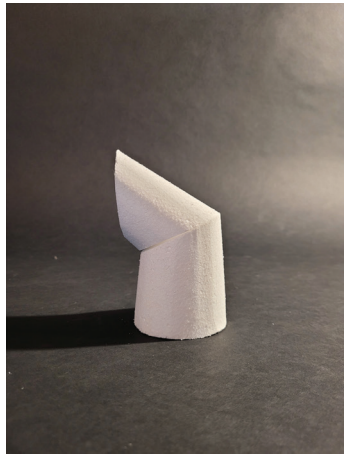
Directionality



Mock Upssss

Exploration of a creative rotational mechanism that can initially throw mist in forward upward motion. But when twisted it throws mist very sharply in forward motion. The joining is bit difficult and hard to achieve. And also being it a cone the cross section it has is elliptical. So in any intermediate angle the joinery does not match. These are the problems that need to be thought but the simple and elegant mechanism gives a user satisfaction.





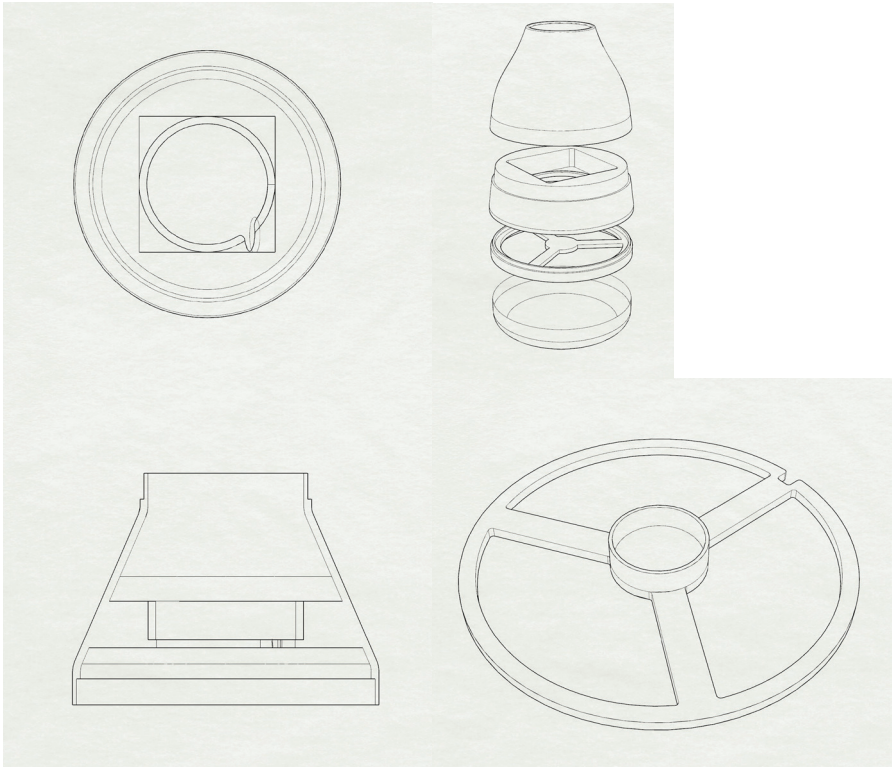
This is another experiment where a 360* rotatable head is throwing the mist in all direction. User can hold the nozzle and rotate according to the direction user wants the mist to come. This is a two part design where the top part holds most water and the bottom part has the mechanisms.

The concept in this mock up is that the nozzle is attached with the help of a collapsible structure that can be directed into any direction. So when in store the form can be reduced and when in use can be extended. The mask here is also attachable to the base and flexible. The mask can be taken off of the base and can twisted to form the shape.

This unique concept translates into the portability of the device. This device has no water container and it is very light. This has simple function that it attaches to the regular cold drinks bottle and with one button it works. This is easy to attach and operate. For people on the go in a regular basis, they can attach quickly with the bottle they have and get a immediate relief. Its does not require cleaning regularly as there is not water stagnancy.

Working Rig Development

The Rig is made on top of a pre existing top of regular steam vaporizer. The main purpose is to mist maker to create mist instead of steam technology and use a fan to direct the flow. This rig is 3d printed in three parts to fit properly in the system and also to access the parts appropriately. The narrow inversed form further condenses the flow.



Working Rig Testing

After making this rig I have tested with the mechanism and the technical limitations of it.

There is a comparison I did between a narrow opening and a wide opening. In case of the narrow opening the mist has more force when coming but traveling greater distance but in case of wide opening the flow is more smooth but reaches less distance.

With out the top the fan can barely throw mist and also the speed of the fan being fast can not hold on to the mist making speed

But adding the funnel shaped top the mist immediately get condensed and flow out properly. And the reach of the mist is also quite usable

After attaching the bellow pipe to the top i can even more accurately direct the flow. The mist is more dense now because of the length of the pipe.

Use Case Study

Using On Table Top

This is a scenario where parent is holding the baby in lap near table and the device is on the table. The distance has to be considered also and the flow.

When the parent take her child on lap and sit on the bed the base of the device has to be stable and the nozzle are directed downward

The nozzle is kept at a 10 inch minimum distance

Using On Floor or Bed

When the child is on the bed and the device is kept at minimum 12 inch distance from the baby

In a case where parent is keeping the baby on chair but the baby is alone more distance are to be considered

Sometimes parents keep their children on their shoulder and make them sleep this time directing the nozzle up helps mist to reach the baby

It is observed that parents keep the baby and the device inside bathroom and give steam to clear up nose.

Inferences From Rig Testing

Fan speed is to be controlled

Length of the pipe is to be approx. 10cm in length when collapsed and can be 1ft

The bottom has to be heavy enough to support the length of the pipe

The opening mask diameter of the device can ideally be 6cm.

The length of the pipe must be out of reach of children hand when extended.

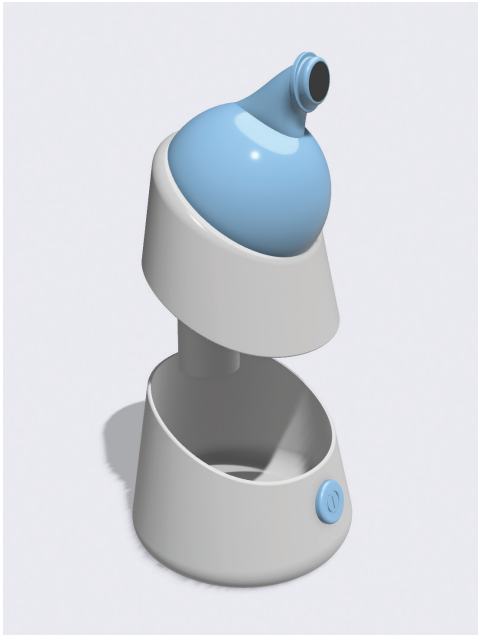
People find it difficult to move the nozzle while holding their baby

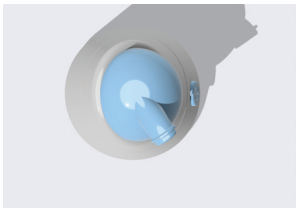
They are happy about that the direction can be altered

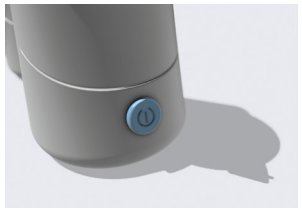
pull and push is a bit tough for some

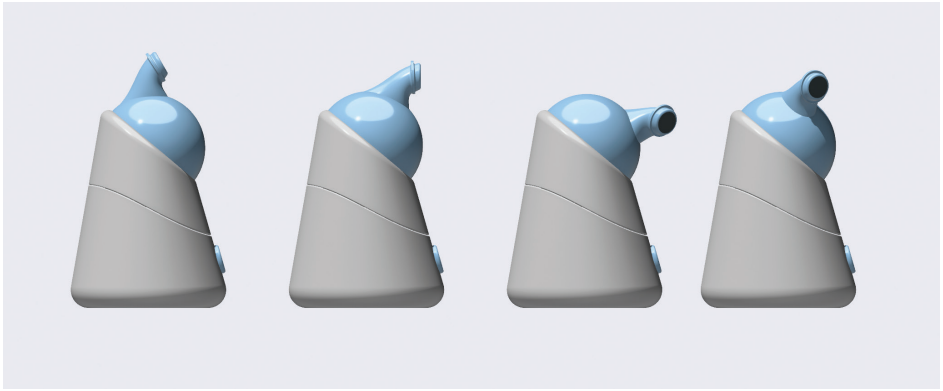
Concept 1


CAN BE ADJUSTED FOR 360° ROTATION
UV LIGHT FOR GERM FREE WATER
POWER BUTTON
CONTROL KNOB (ROTATABLE)
BALL AND SOCKET JOINT
HEATING PLATE
FAN
WATER
ULTRASONIC MEMBRANE
360° ROTATION
SUCTION PAD

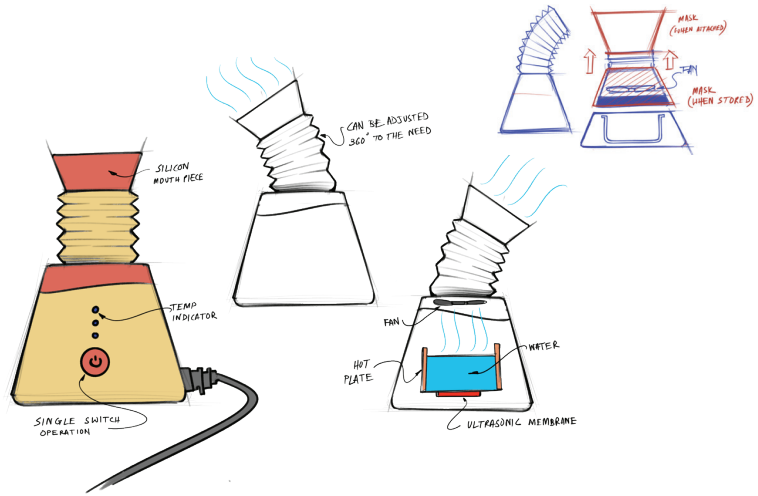


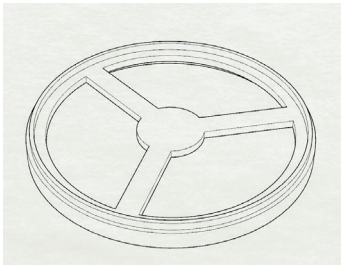


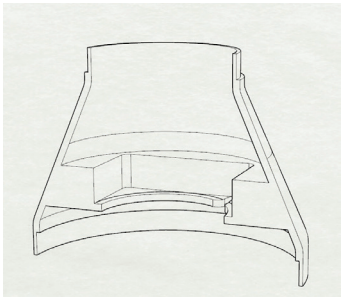


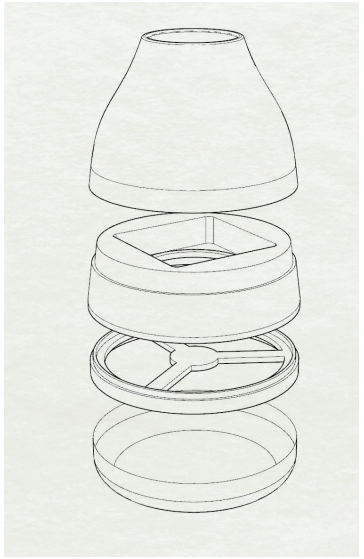


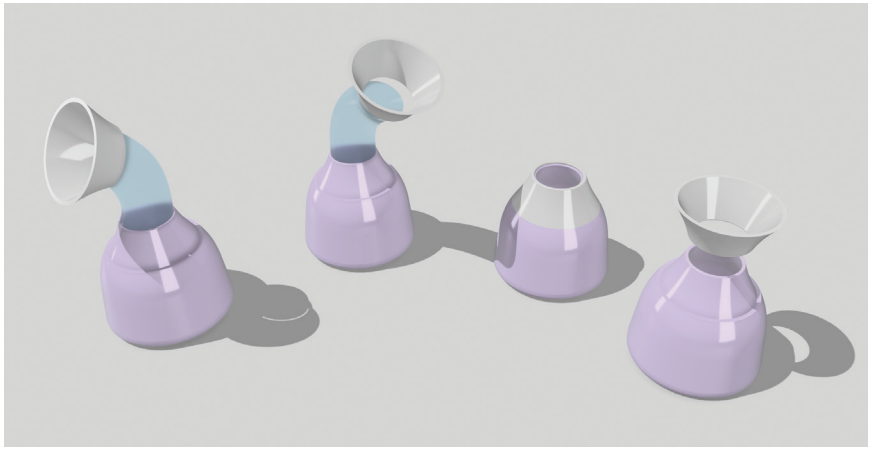
Concept 2

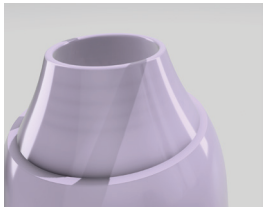

SILICON MOUTH PIECE
TEMP INDICATOR
SINGLE SWITCH OPERATION
CAN BE ADJUSTED 360° TO THE NEED
FAN
HOT PLATE
WATER
ULTRASONIC MEMBRANE
MASK (WHEN ATTACHED)
FAN
MASK (WHEN STORED)

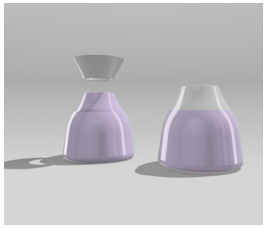




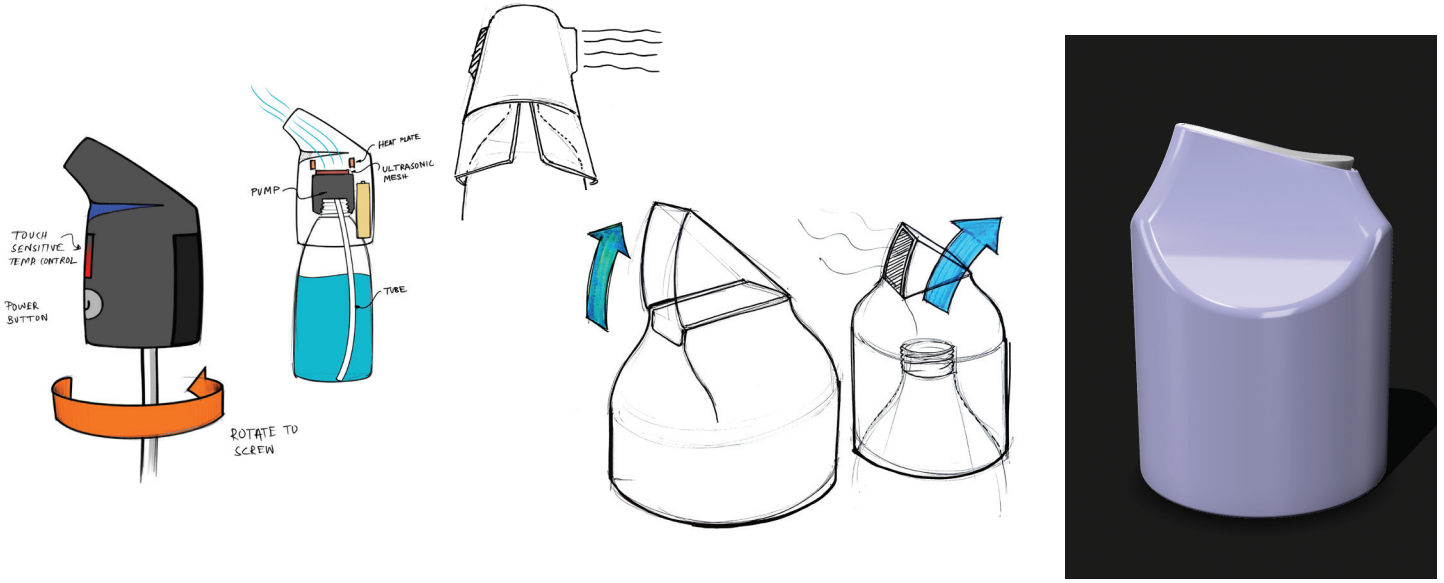


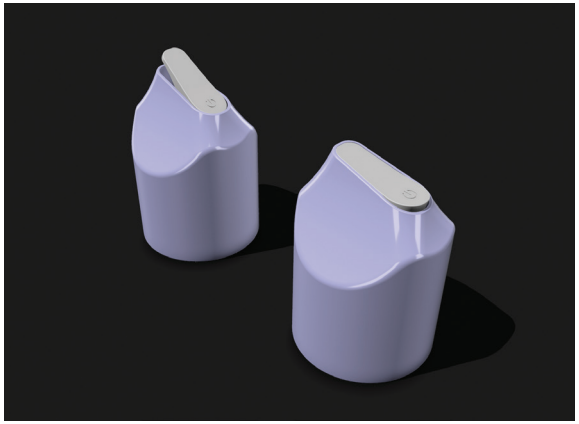


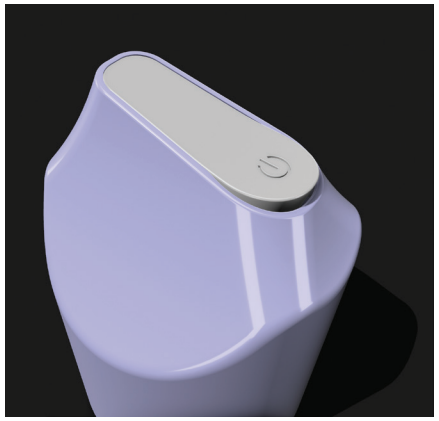


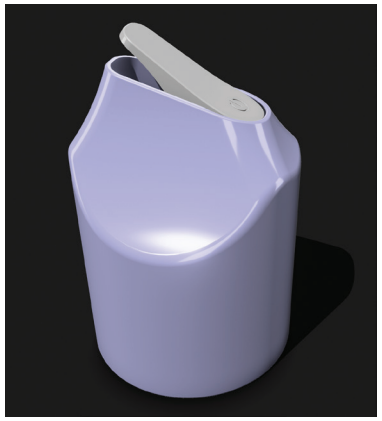


Concept 3


TOUCH SENSITIVE TEMP CONTROL
POWER BUTTON
ROTATE TO SCREW
PUMP
HEAT PLATE
ULTRASONIC MESH
TUBE





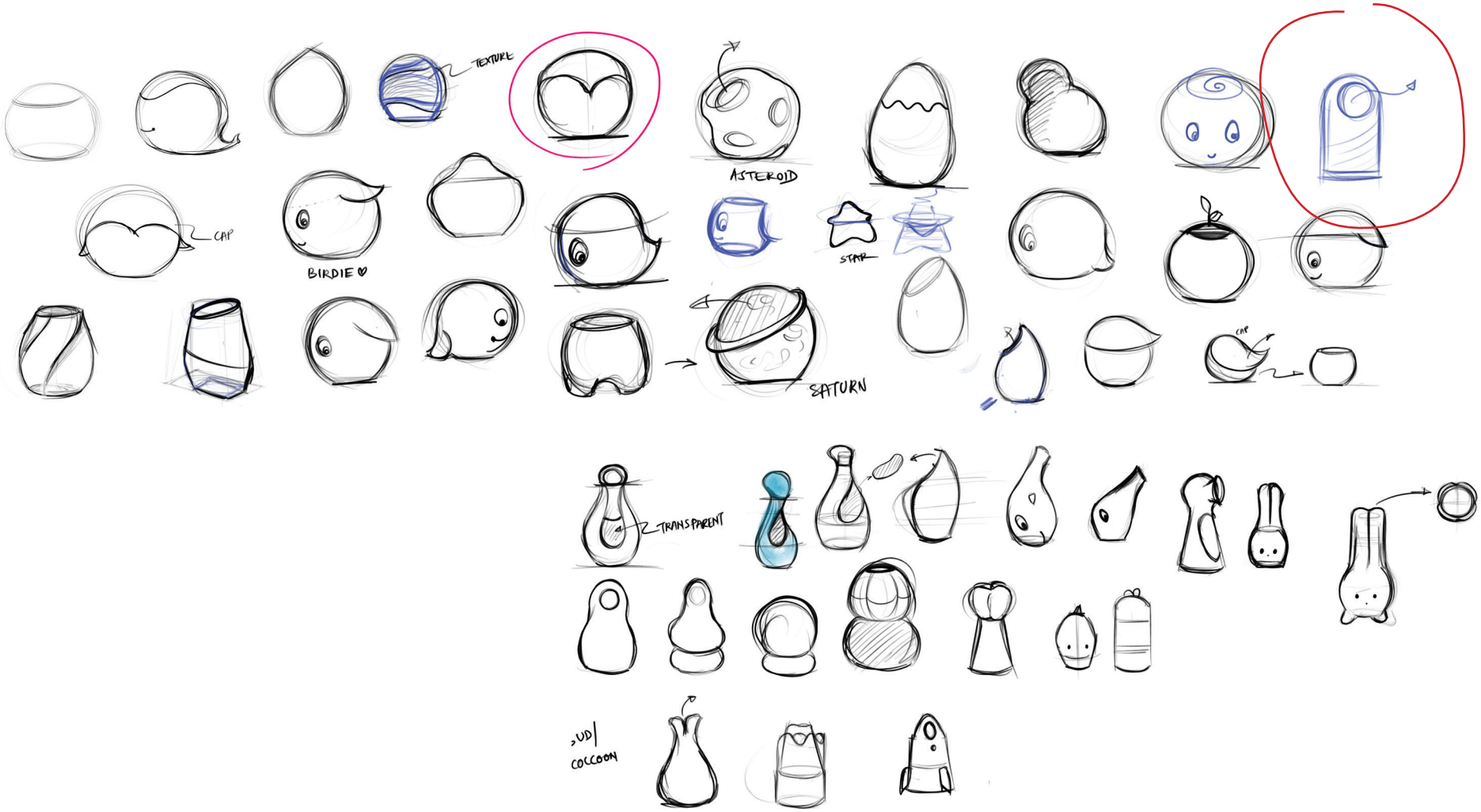


Concept Evaluation

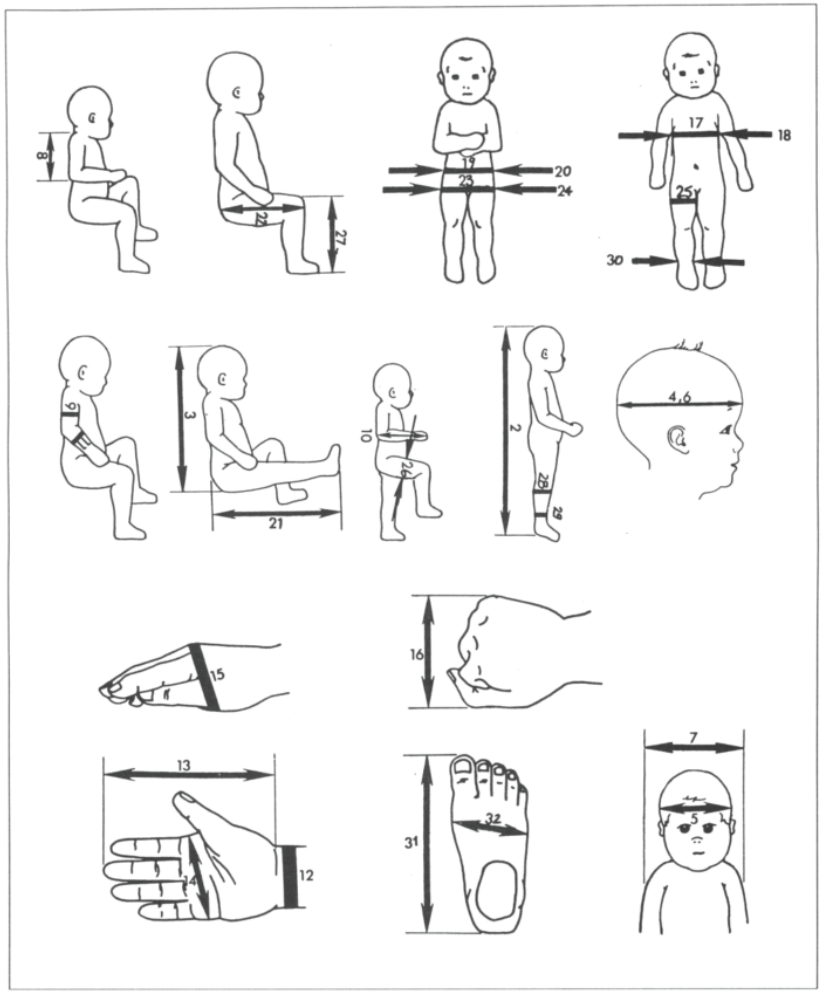
On a scale of 1 to 5	Concept 1	Concept 2	Concept 3
Direction of flow	4	4	2
Compact	3	4	4
Usability	4	3	3
Ease of use	3	3	4
Portability	4	4	4
Storage	3	3	4
Attachment capability	2	4	1
Maintenance	3	4	2
total	26	29	24

Further Concept Development

Formal Exploration



Children Ergonomics



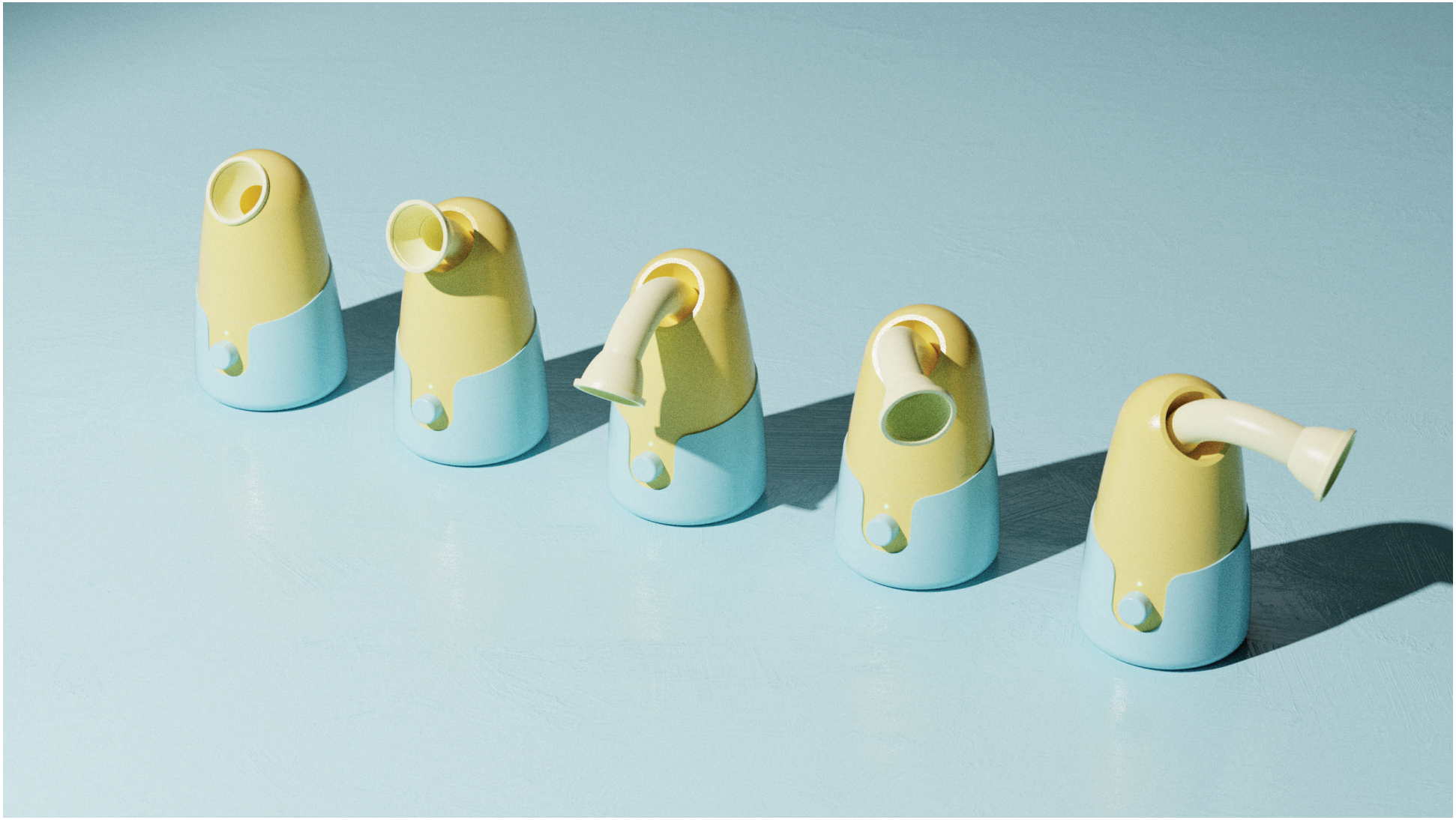
Anthropometric data
Male and female infants to age two

	Age-in months	0-2	3-5	6-8	9-11	12-15	16-19	20-23
1.	Weight (lbs.)	11.2	15.2	17.8	20.2	22.2	23.3	25.3
2.	Crown-sole Length	22.5	25.2	27.4	29.2	30.6	31.7	33.0
3.	Crown-rump Length	15.6	16.9	18.3	19.0	19.6	19.9	20.6
4.	Head Circumference	15.4	16.7	17.6	18.2	18.6	18.7	19.1
5.	Head Breadth	4.2	4.6	4.7	4.9	5.1	5.1	5.2
6.	Head Length	5.4	5.8	6.2	6.4	6.7	6.7	6.8
7.	Shoulder Breadth	6.7	7.5	8.1	8.4	8.5	8.7	9.0
8.	Shoulder-Elbow Length	4.4	4.9	5.2	p. 6	6.0	6.2	6.5
9.	Upper Arm Circumference	4.7	5.2	5.6	5.9	5.8	5.9	6.0
10.	Elbow-Hand Length	6.0	6.6	7.2	7.8	8.0	8.3	8.6
11.	Forearm Circumference	4.7	5.2	5.6	5.7	5.8	5.8	5.9
12.	Wrist Circumference	3.6	4.1	4.2	4.3	4.4	4.3	4.4
13.	Hand Length	2.7	3.0	3.2	3.6	3.7	3.7	3.8
14.	Hand Breadth	1.5	1.6	1.7	1.8	1.8	1.8	1.9
15.	Minimum Hand Clearance	13.6	14.4	15.2	16.1	16.2	16.0	16.5
16.	Maximum Fist Breadth	1.7	1.8	2.0	2.0	2.1	2.2	2.2
17.	Chest Circumference	14.8	16.2	17.4	18.0	18.5	18.7	19.1
18.	Chest Breadth	4.9	5.5	5.9	6.4	6.3	6.3	6.5
19.	Waist Circumference	13.8	15.2	16.1	16.2	16.6	17.2	17.6
20.	Waist Breadth	4.6	5.0	5.4	5.6	5.7	5.8	6.0
21.	Rump-Sole Length	9.2	10.2	12.0	13.5	14.2	15.0	16.2
22.	Rump-Knee Length	5.6	6.4	6.9	7.7	8.0	8.5	9.0
23.	Hip Circumference	14.7	16.2	18.3	17.9	18.6	19.1	19.0
24.	Hip Breadth	5.3	5.7	6.4	6.6	6.7	6.8	6.8
25.	Mid-Thigh Circumference	6.7	8.3	8.5	9.3	9.4	9.8	9.9
26.	Mid-Thigh Depth	2.1	2.4	2.5	2.8	2.8	2.8	2.9
27.	Knee-Sole Length	6.0	6.6	7.2	7.9	8.3	8.6	9.2
28.	Calf Circumference	5.5	6.2	6.8	7.2	7.2	7.4	7.6
29.	Ankle Circumference	4.1	4.6	4.9	5.2	5.3	5.3	5.4
30.	Ankle Breadth	1.2	1.4	1.4	1.5	1.6	1.6	1.6
31.	Foot Length	3.3	3.6	4.0	4.4	4.9	4.8	5.0
32.	Foot Breadth	1.4	1.6	1.7	1.9	2.0	2.0	2.1

Final Form Mock Up

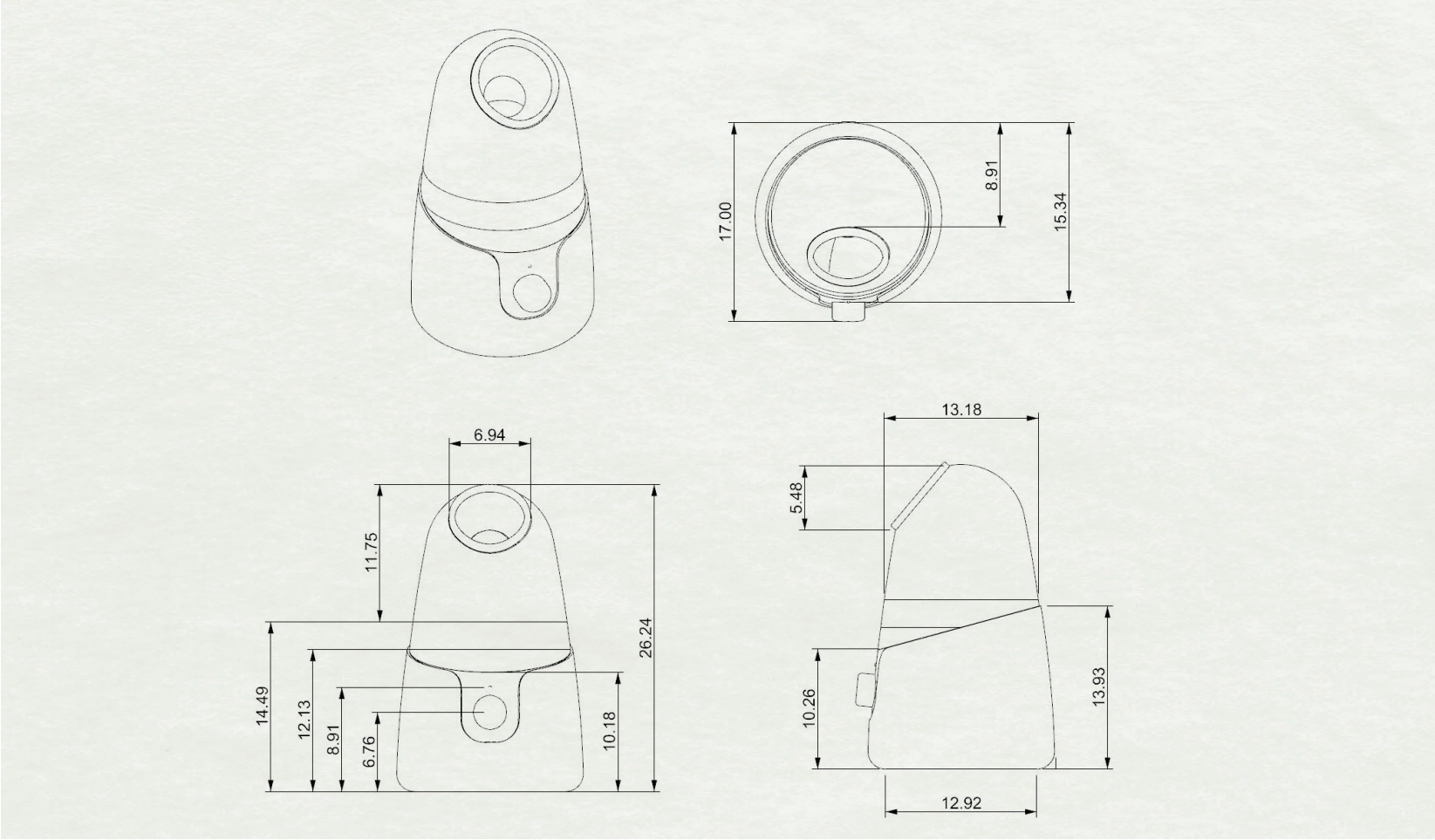
In this final mock up the main focus was to get the proportion correct and how the surfaces are interacting.

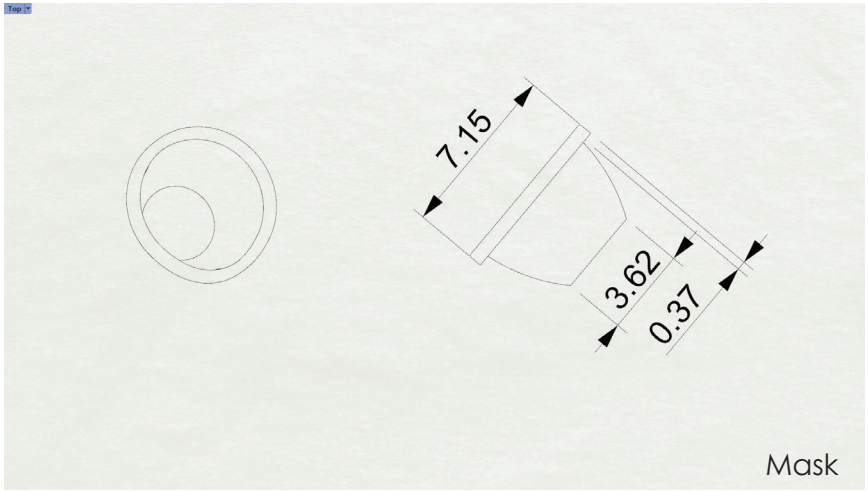
Final Concept



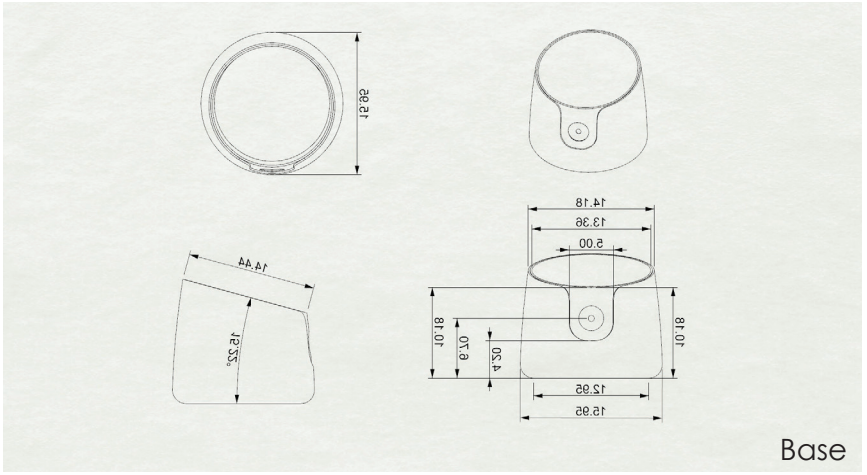
Exploded View

Detail Drawing

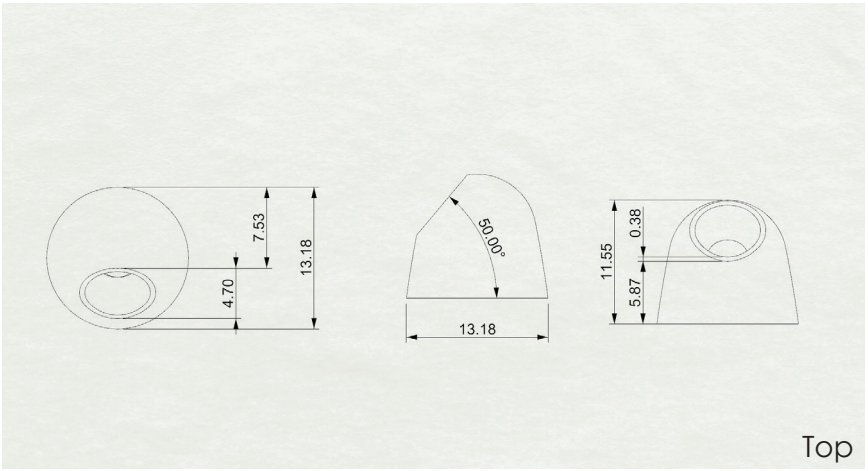




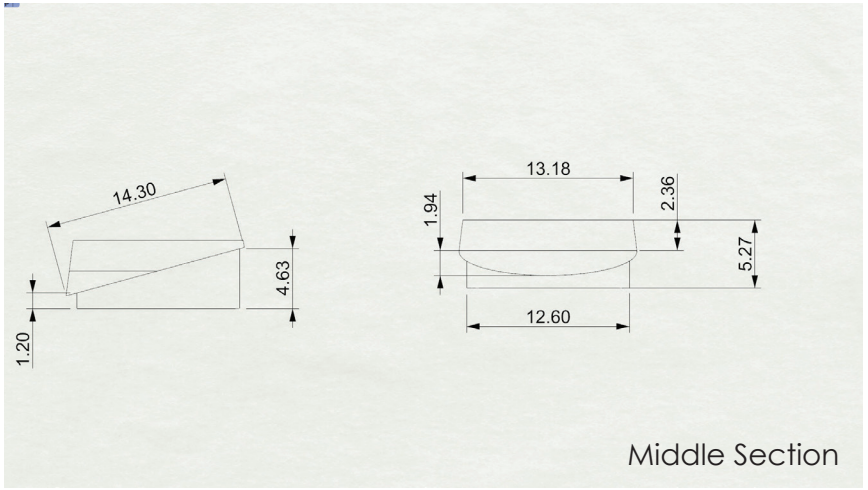
Mask



Base



Top



Middle Section

Product In Making

These are all the part that are included in the making of the final working prototype. This whole making process involves spare parts from an humidifier, 3d printed parts.

- Top part
- Middle part
- Circuit
- Fan
- Ultrasonic mesh
- Mask
- Bellow pipe
- Cable.

Final Model

Reference

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- https://www.amazon.com/Inhaler-Personal-Vaporizer-Aromatherapy-Children/dp/B0083F7LQA/ref=sr_1_2?keywords=steam+vaporizers+for+kids&qid=1662234017&sr=8-2