


Redesign of **Insect Killer**




Industrial Design Project-2
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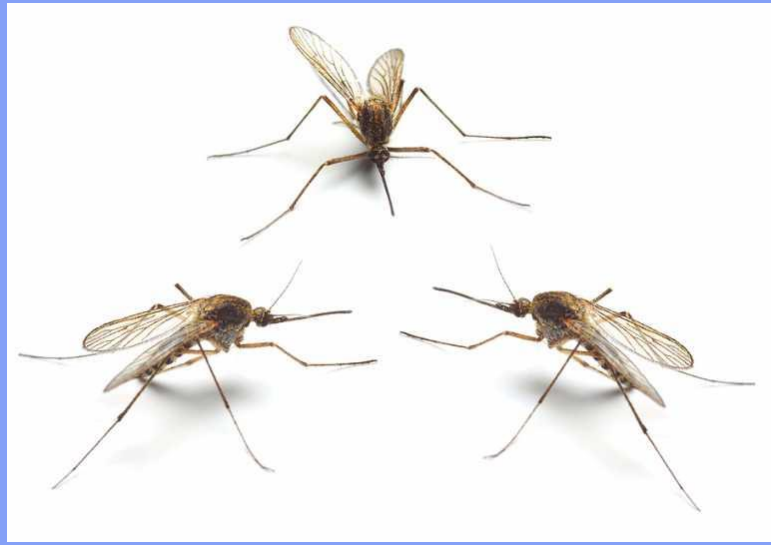
156130005-Product Design

Introduction

Pests are all around us. Insects like **house fly, mosquito, moths** etc. are often attracted to food, human/animal presence and light. If their numbers remain unchecked they rapidly **spread diseases** and cause considerable **damage to environment.**

Methods of pest control

Biological
Pesticides
Poisoned baits
Eliminating Breeding Grounds
Traps
Repellent

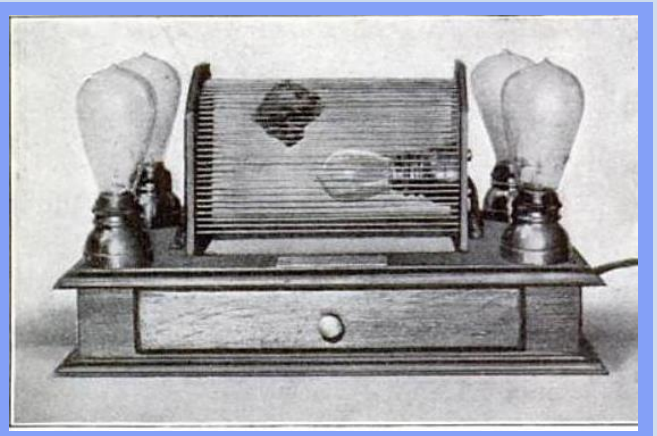


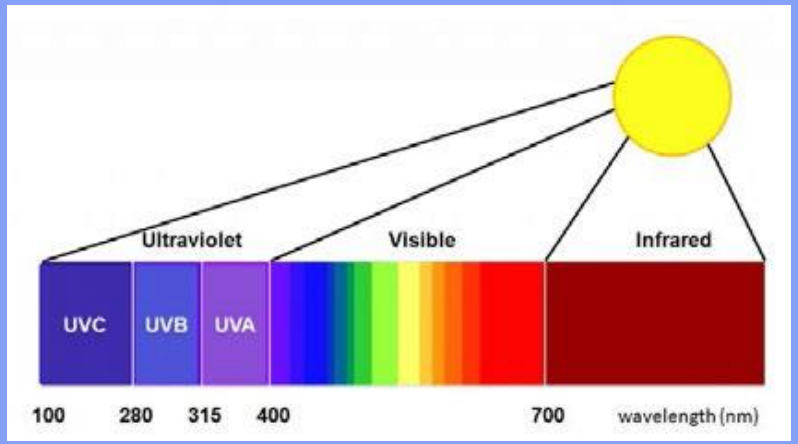
Background

Pest control equipment's and insect traps are getting increasingly popular these days. They also play an important role in keeping food and surroundings healthy

History

Invented in **1911**, patented in 1932.





Insects and UV

Insects are attracted to **UV-A** which has a range of **315-400**nm

Typical construction details

Housing made of plastic or metal parts

A light source, which is usually fluorescent-type, such as mercury, neon or ultraviolet light

Wire grid(electrified)

Transformer –step up 250v-2000v or more

Market Research

Flowtron Programmable Insect Killer

Pros:

-The self-regulating unit is controlled by photocell timer

-Additional Octenol replacement

-1-acre area reach

Cons:

-Metal Frame Can Cause a Minor Shock

-Not so Clog resistant

Product dimensions: 10.2 x 10.2 x 16.5 inch

Aspectek Indoor Insect Killer

Pros:

-Best indoor zapper

-Easy to Use

-Chemical Free

-Simple Design

-6,000 square feet reach

Cons:

-Frame Can Cause a Shock

Product Dimensions: 38.1 x 8.1 x 27.9 cm

Flowtron FC-8800 Diplomat

Pros:

-Covers a Large (2 acres)

-Powerful(**5,600 volts)**

-Up to 2 acres coverage

Cons:

-Extremely Bright Light

-Large Size

Product dimension :12 x 12 x 27 inches

Stinger Cordless Rechargeable

Pros:

-Cordless

-Easy to Clean Tray

-Additional backlight

Cons:

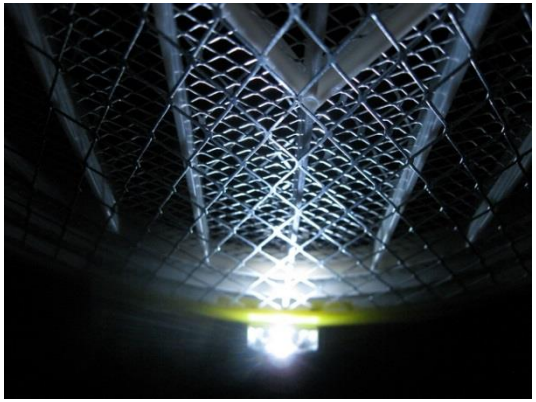
-Small Coverage Area

-The lithium ion battery drains fast

Product dimension :7.4 x 7.4 x 15.4 inch

User -Bug Zapper issues

Noise:
Electrocution of bugs lead to spark and creates noise every-time while device is performing.



Burning Smell and Hygiene issues:
Electrocuted insects are blasted into a fine mist that contains miniscule insect parts. This mist can be spread up to 7 Feet from the device

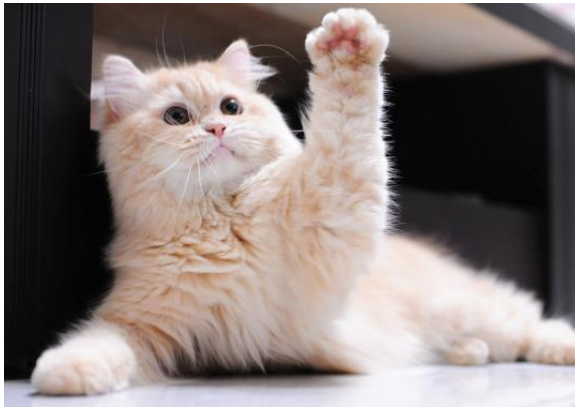
User -Bug Zapper issues

Cleaning and maintenance:
Clogged up insects will also reduce performance of product as well.

Fails to trap mosquitos but attracts harmless insects as well:
The most troublesome insect we all target, the mosquito, is not attracted to ultraviolet light.

User -Bug Zapper issues

Children and safety :
Children and pets are always curious to explore. If kept in reach they may attempt to insert hands/paws into the zapper grill and may receive a nasty shock.



Objectives

To adopt **superior technology** and facilitates **easy maintenance**

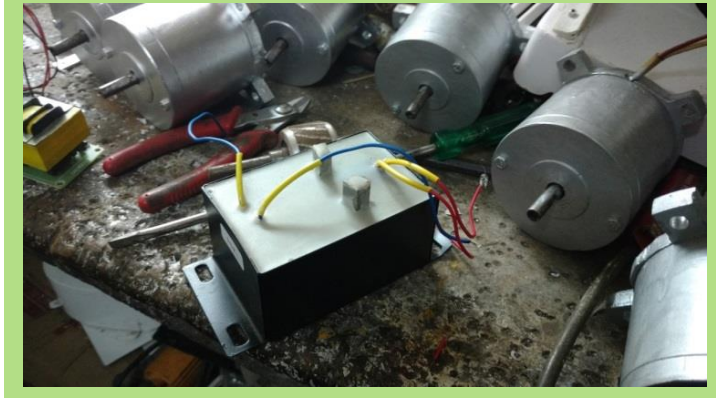
To explore possibility of **easy bulb replacement** without compromising safety

To **increase safety of the device** and **utility**(attracting mosquitoes)

Improve **aesthetics** and **experience**

Industry visit

Thomson & Thomson Manufacturer located at Marol, Anderi East



Observations

Transformer used-240v to 1800v step up

Teflon strips are resistant to high current/spark

Helps in keeping conducting rods equidistant

A gap of 6-5mm has to be maintained between the mild steel rods to create a spark.

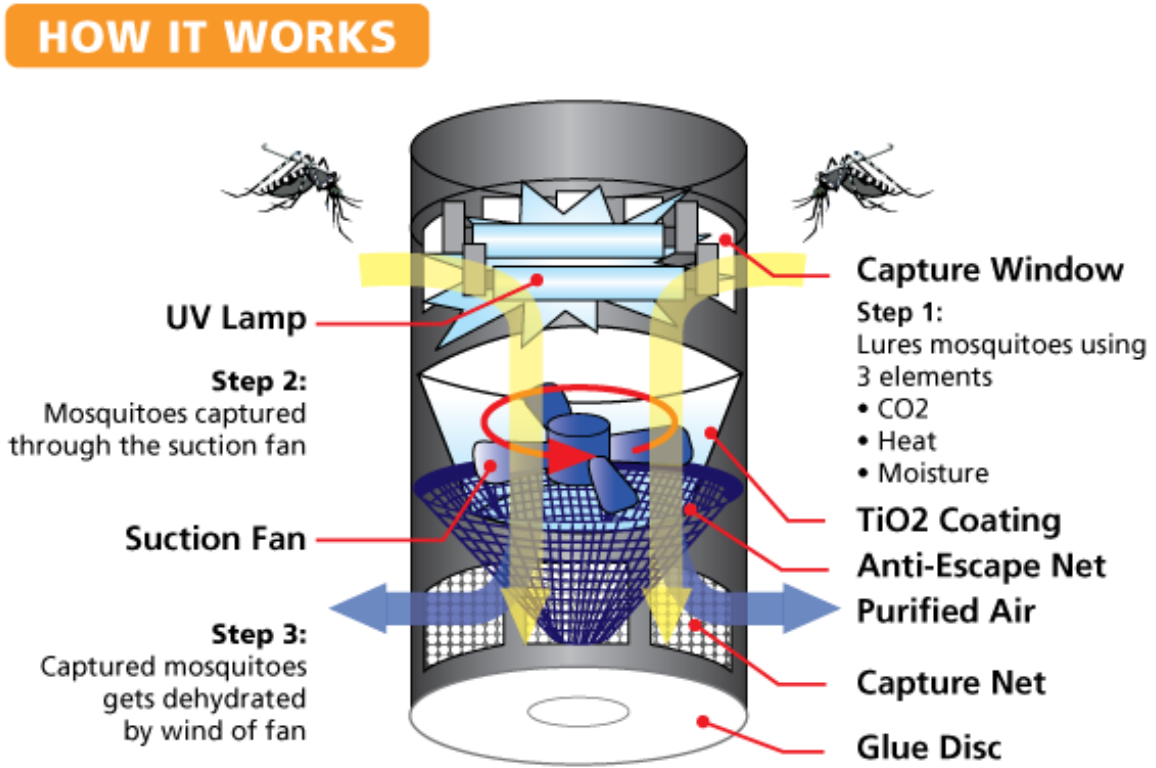
Industry visit

Repositioning Bug Zapper

Factors that are responsible for repositioning of bug zapper :

Adopting latest technology
Aesthetics and feel
Multi-utility
Added value

Latest technology-Without Zapping!



What is Photocatalysis of TiO2?

TiO2 acts as a catalyst where a Titanium Dioxide (TiO2) coating inside the unit combines with UV light to produce Carbon Dioxide (CO2). This process is aided by any carbon matter left behind on the inner surfaces from bugs as they have been drawn into the unit by the fan.
This process also results in the production of hydrogen radicals that offers a level of air purification.

-International patent: PCT/kr/01-00427 (2000)
-Korea domestic patent: No.43847 (2001)

SPC

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Research Paper

Added value

CCTV camera inbuilt /mount while placed on a height

Integrated smoke alarm unit

Enhanced mosquito lure (Tio2 & Octenol)

LED display that **counts Kill** ,shows **Time** and reminds of **cleaning**

Adding game, music

Design brief

To design a smart insect killer by critically incorporating value addition and promotes more user interaction with the product. To adopt new technologies that prevents zapping related health hazards and increase safety standards that allows easy handling, maintenance and cleaning.

Study model

Mosquito trap unit

Octenol lure

Validation

The study model was kept at various mosquito is infested places in campus. Validation of proposed technology was crucial to make sure that the technology is reliable.

Validation

Amul outlet H14

Brewberries cafe

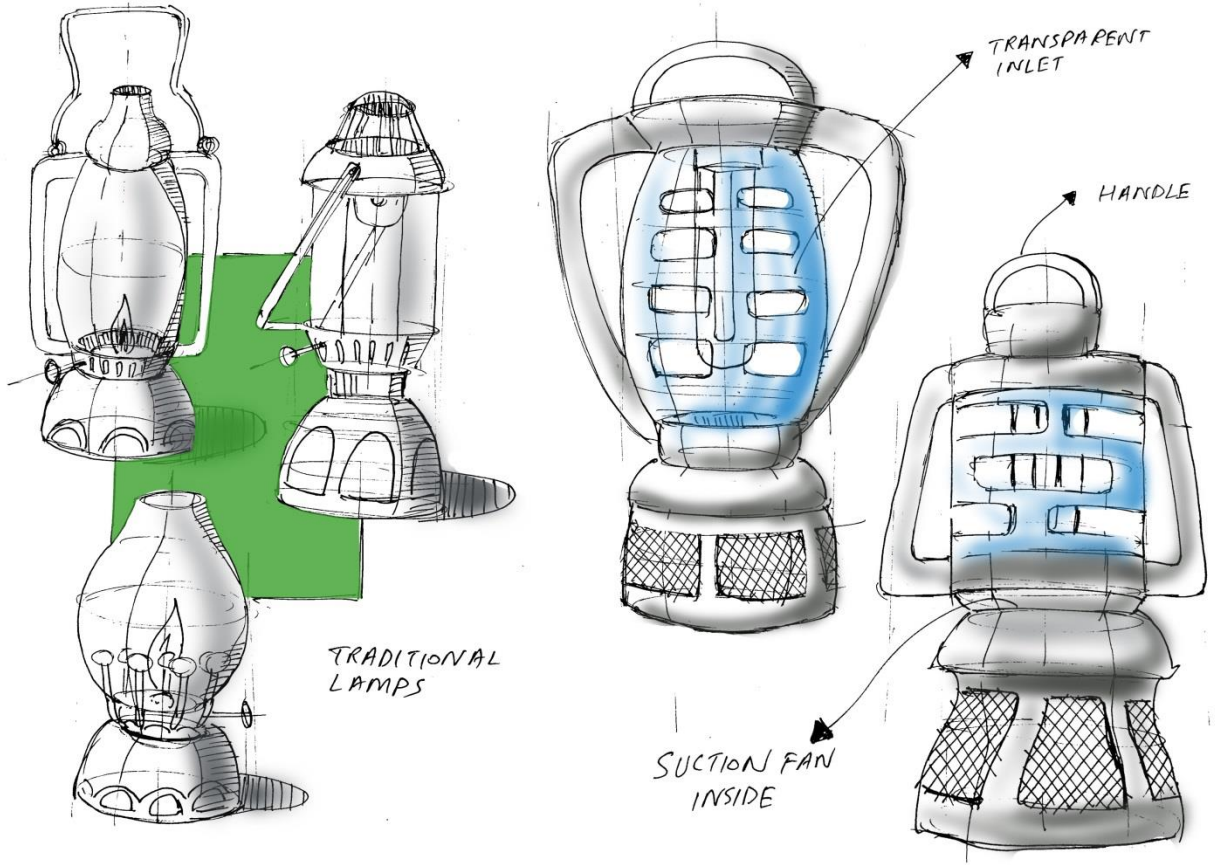
Validation

The overall catch rate of the equipment is observed not up to the mark as promised by the manufacturer. Catch rate was found to be little high while trap is set with octenol

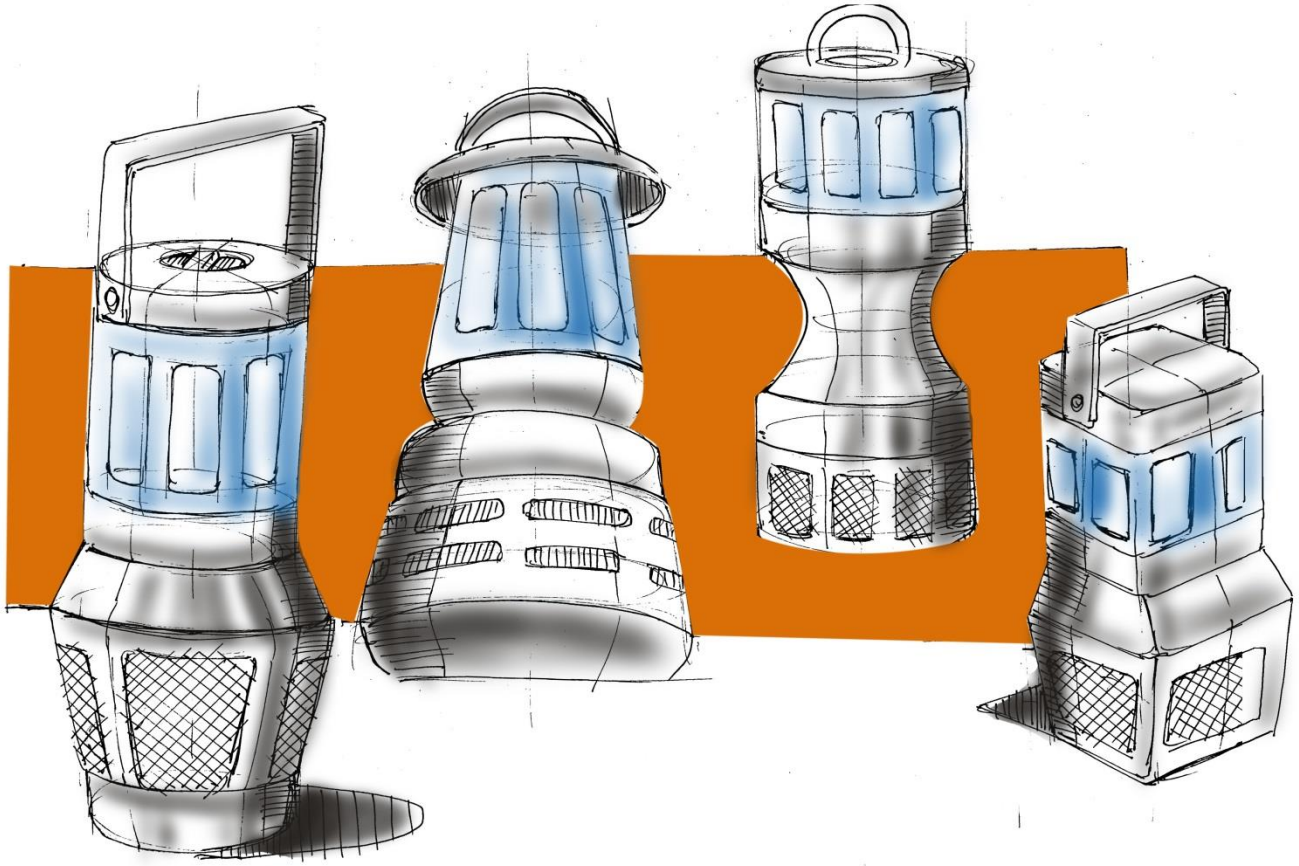
Place of trial	Hours	Volume of catch	Type of insects
Amul milk shop (H-14)	7pm-9pm	2	1 mosquito, 1 fly
Brew Berries	12am-3am	3	2 mosquito, 1 fly
Brew Berries (with octenol patch)	6pm-12am	5	3 mosquito, 2 fly

Ideation sketches-refined designs for domestic domain

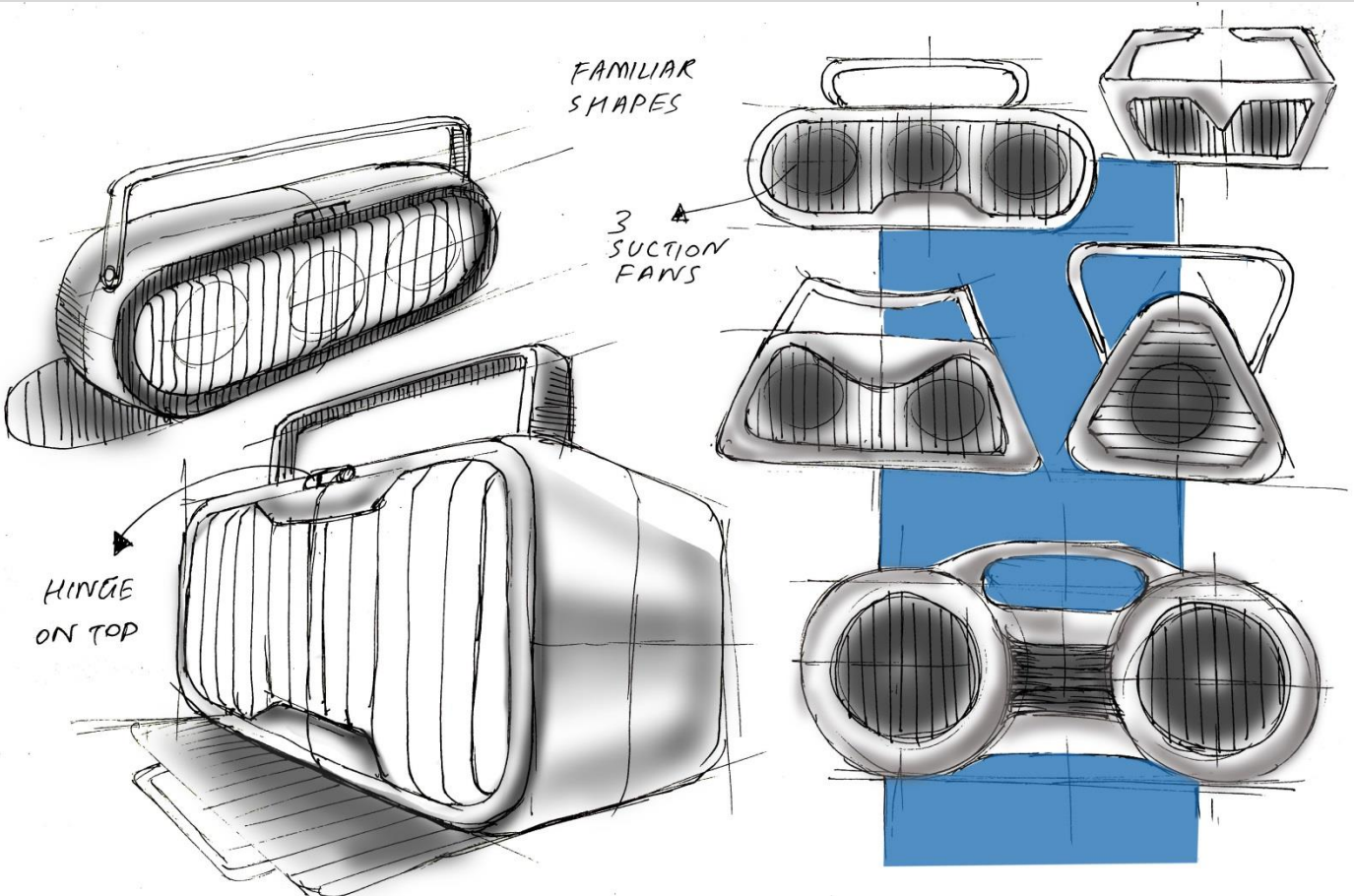
To give the product a familiar face, form inspirations were taken from various day- today products.



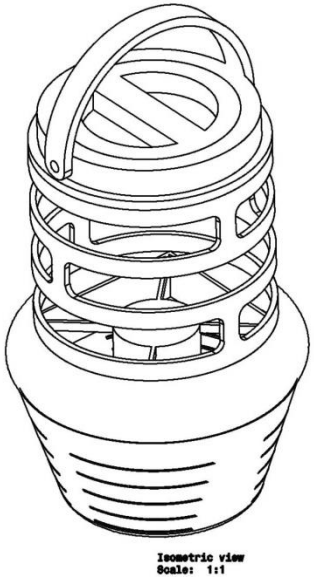
Ideation sketches-refined designs for domestic domain

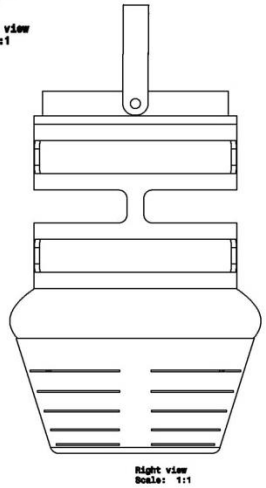


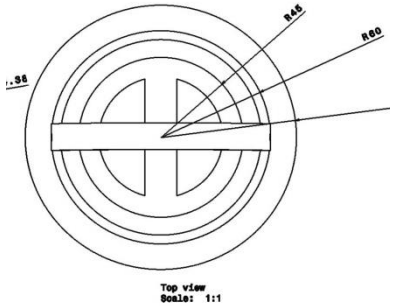
Ideation sketches-refined designs for domestic domain

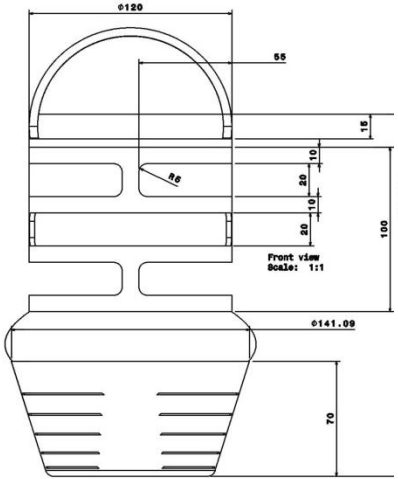


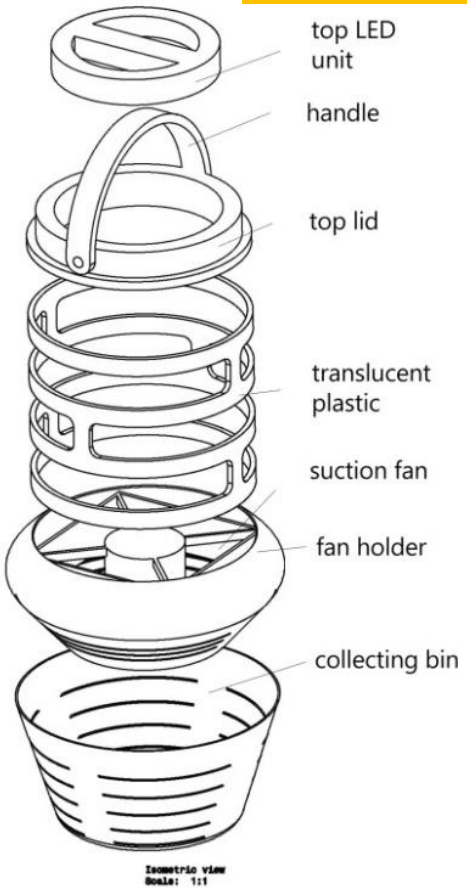
Dimensional drawings











Proposal-1

Materials used

Casing and outer cover-ABS

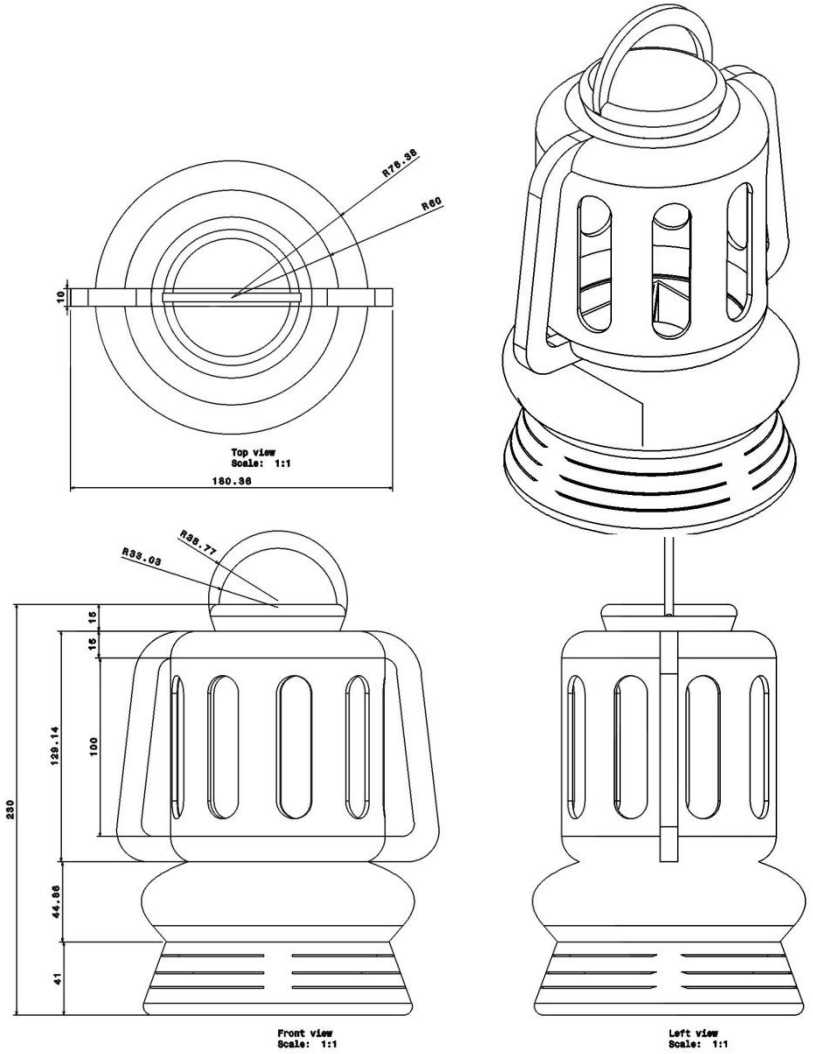
Inlet- translucent acrylic

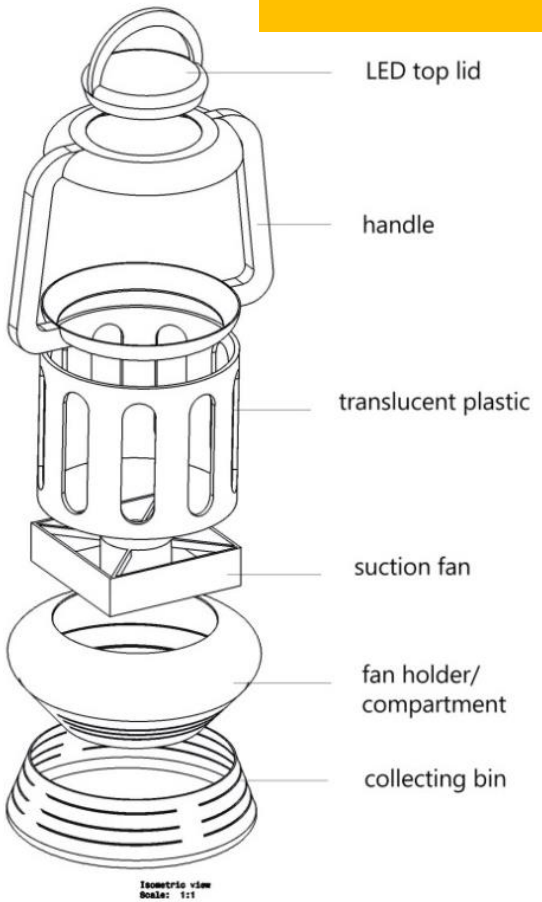
Process

injection molded snap fit joineries

The design consists of a foldable handle .A suction fan is kept at the middle and the collecting tray is connected to the main body by a twist lock. The top LED unit may also be accessed by twist opening the cap at the top.

Dimensional drawings





Proposal-2

Materials used

Casing and outer cover-ABS

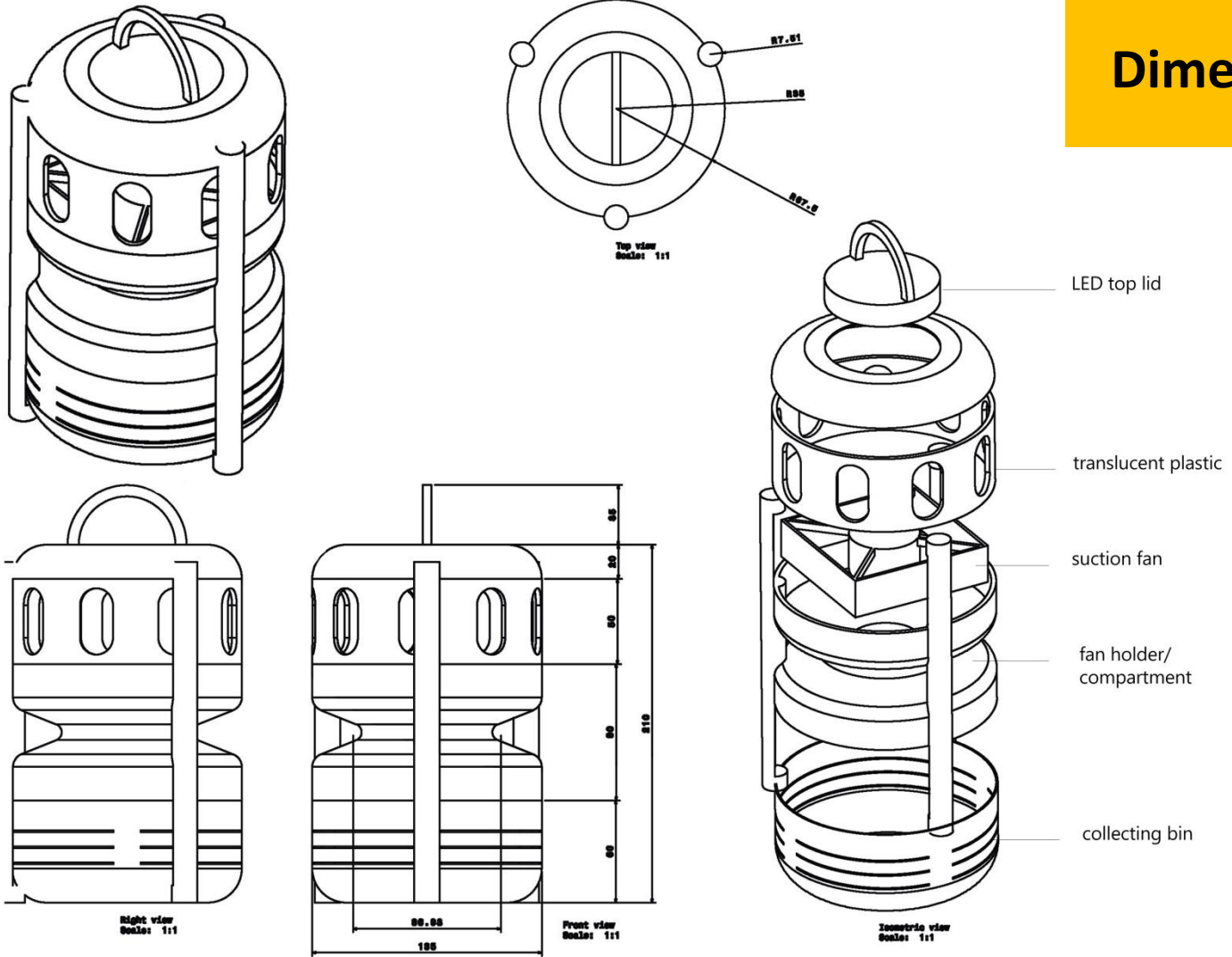
Inlet- translucent acrylic

Process

injection molded snap fit joineries

This design directly connects user to traditional kerosene lamps.
A suction fan is kept at the middle and the collecting tray is connected to the main body by a twist lock.

Dimensional drawings



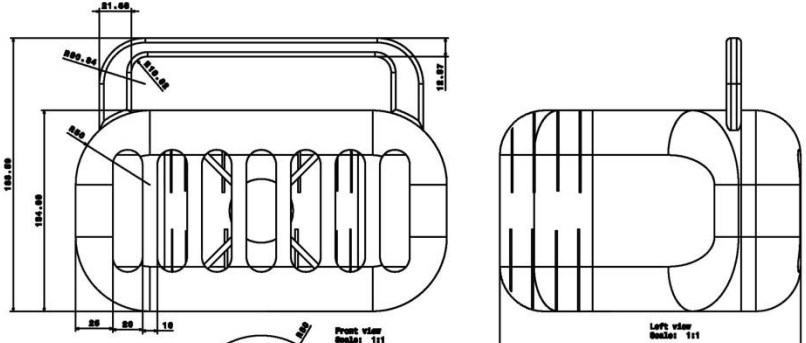
Proposal-3

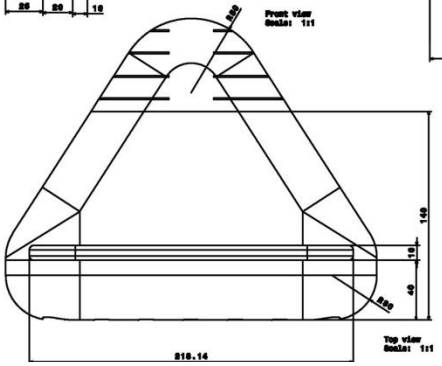
Materials used
Casing and outer cover-ABS
Inlet- translucent acrylic

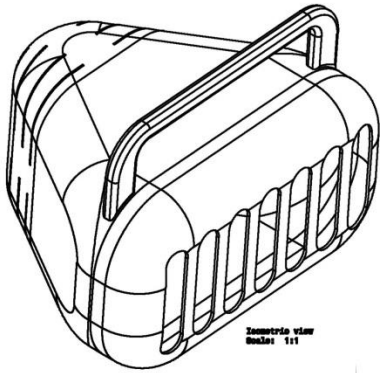
Process
injection molded
snap fit joineries

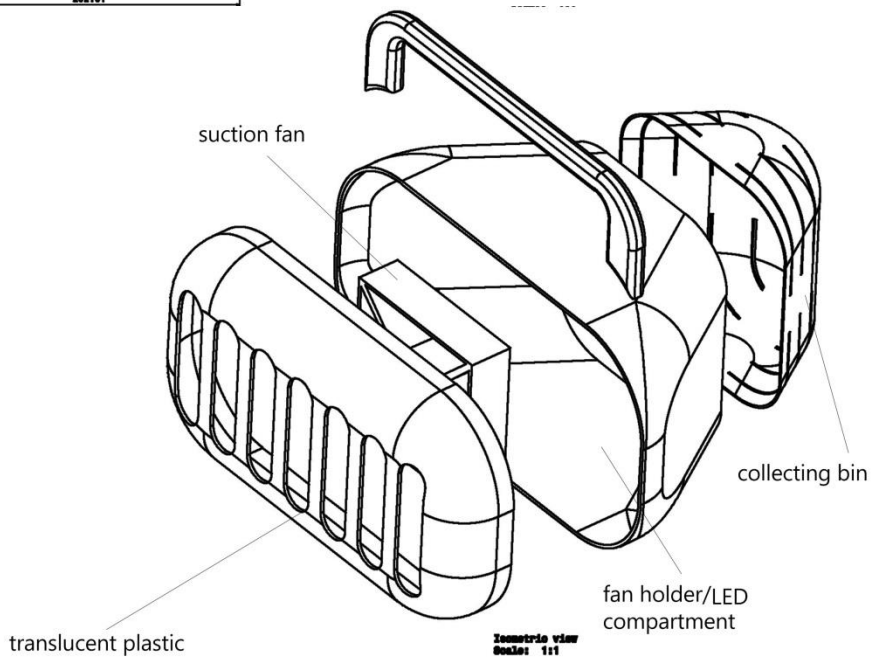
This design was inspired from a sand clock. A suction fan is kept at the middle and the curved central portion directs airflow faster with less chances of insect escaping. Collecting tray is connected to the main body by a twistlock.

Dimensional drawings









Proposal-4

Materials used

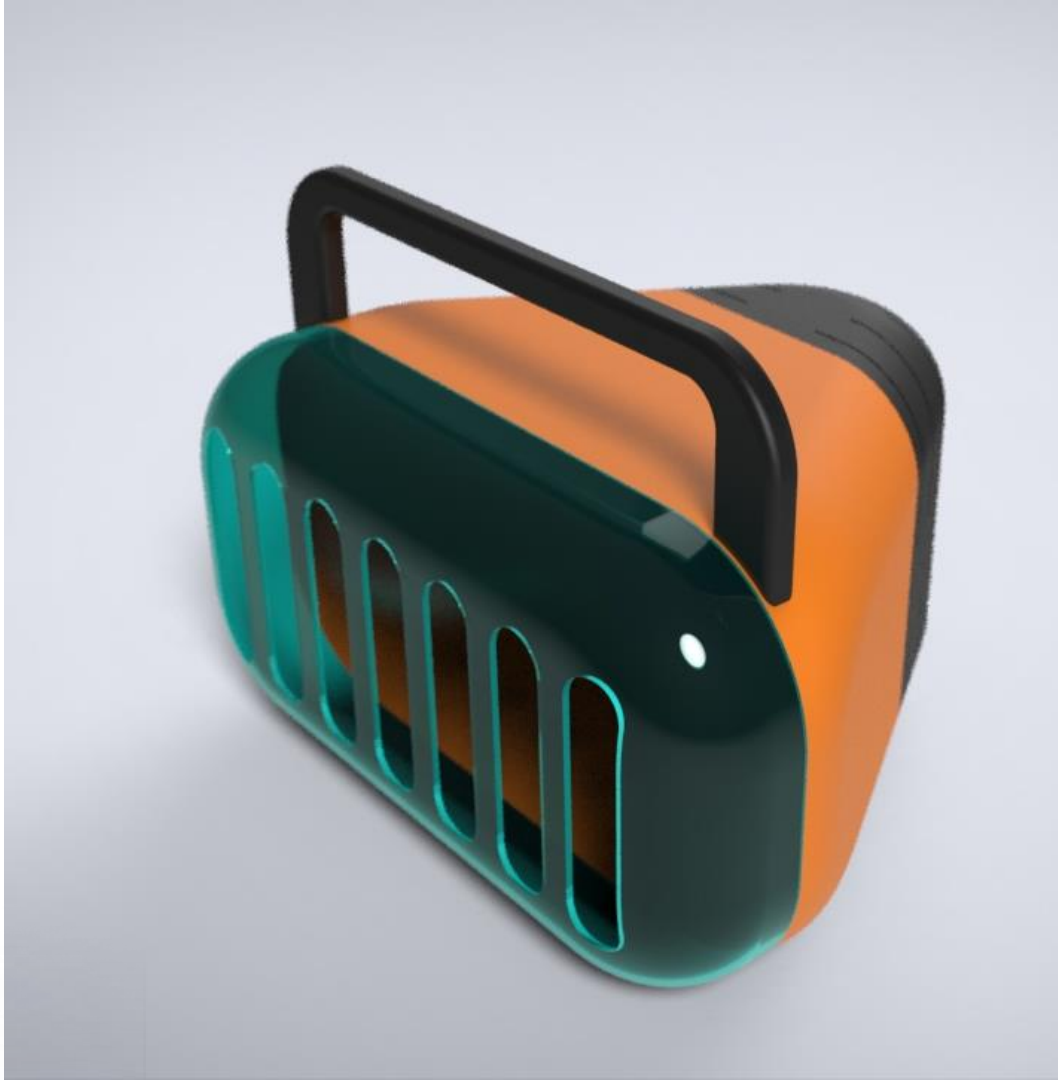
Casing and outer cover-ABS

Inlet- translucent acrylic

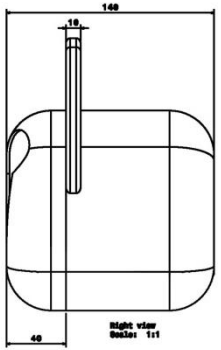
Process

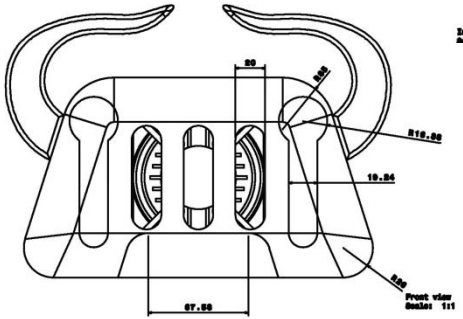
injection molded snap fit joineries

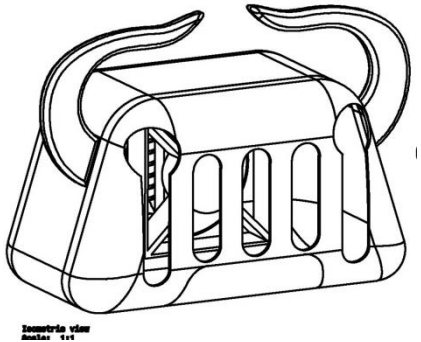
Inspired from a radio, the suction fan is kept at a horizontal axis which makes the product more grounded.

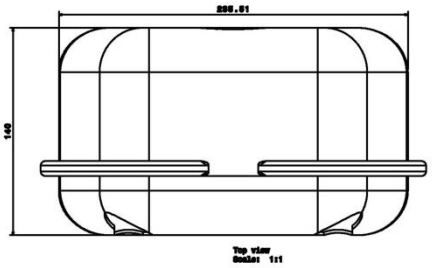


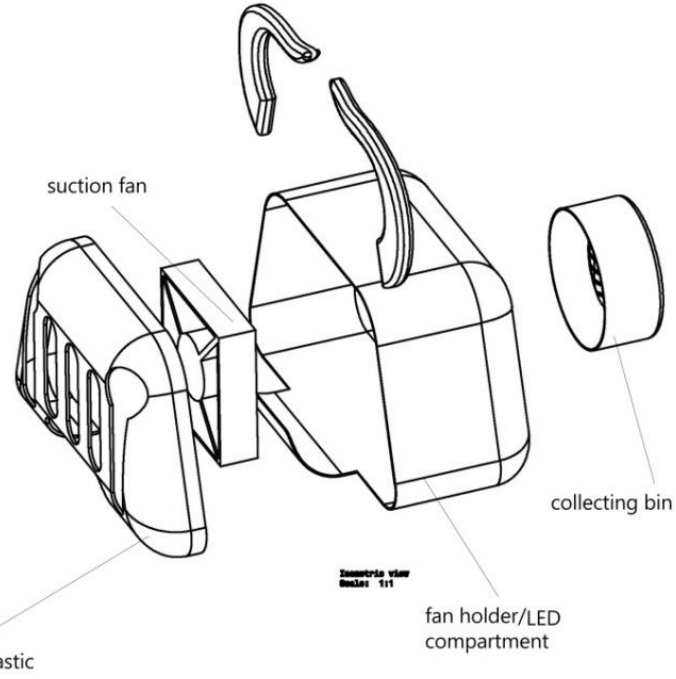
Dimensional drawings











Proposal-5

Materials used

Casing and outer cover-ABS

Inlet- translucent acrylic

Process

injection molded snap fit joineries

Kid friendly design with a unique touch to the handle. The suction fan is kept at a horizontal axis which makes the product more grounded.

Comparison- domestic domain

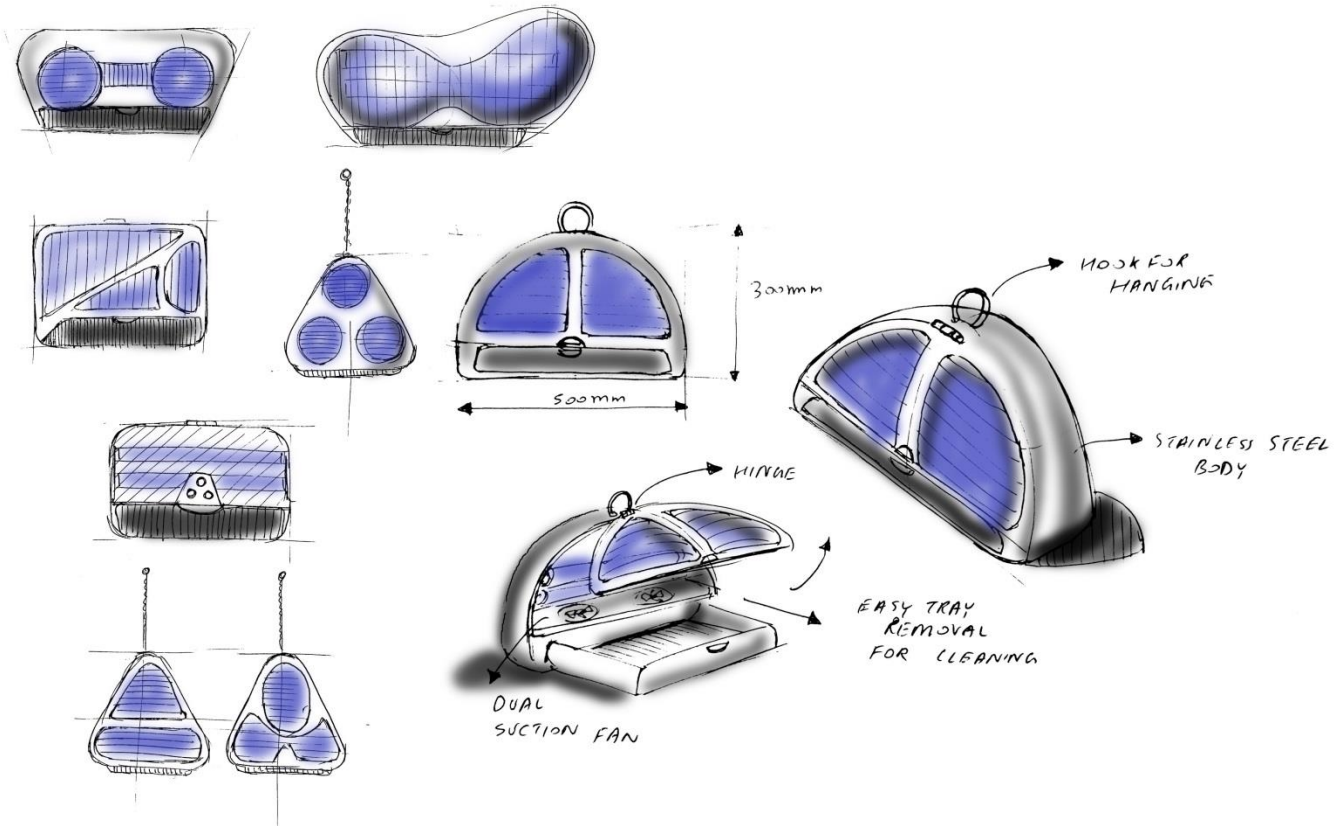
Design Proposal	location of use	dimension(mm)	Range	Power supply	technology	Octenol tray
	Hung/Indoor Table top	H-220 Dia-150	360 degree	240v AC	UV+Suction fan +TiO2	yes
	Hung/Indoor Table top	H-230 Dia-150	360 degree	240v AC	UV+Suction fan +TiO2	yes
	Hung/Indoor Table top	H-210 Dia-135	360 degree	240v AC	UV+Suction fan +TiO2	yes
	Indoor/ Table top	H-185 L-250	180 degree	240v AC	UV+Suction fan +TiO2	no
	Indoor/ Table top	H-185 L-250 B-150	180 degree	240v AC	UV+Suction fan +TiO2	no

Critical Thinking

As the initial ideations were not explored with any specific constraints or context, it was suggested to look at certain refinement of concepts with in the context.

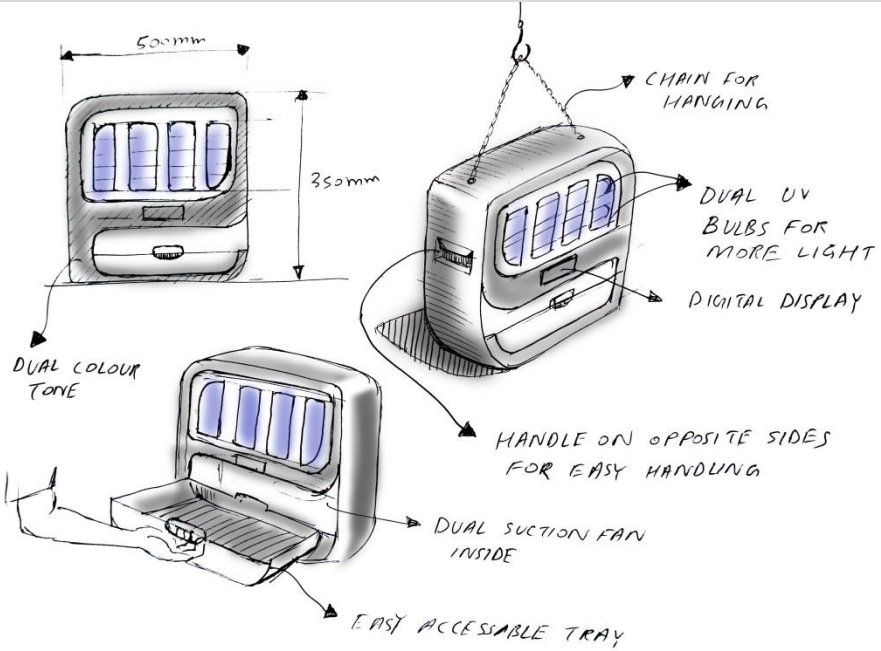
This lead to further exploration into the project for a **public domain** product that addressed segments needs like **wall mounted, grounded, hanging** etc. by giving a **family nature** to the products.

Ideation sketches-public domain

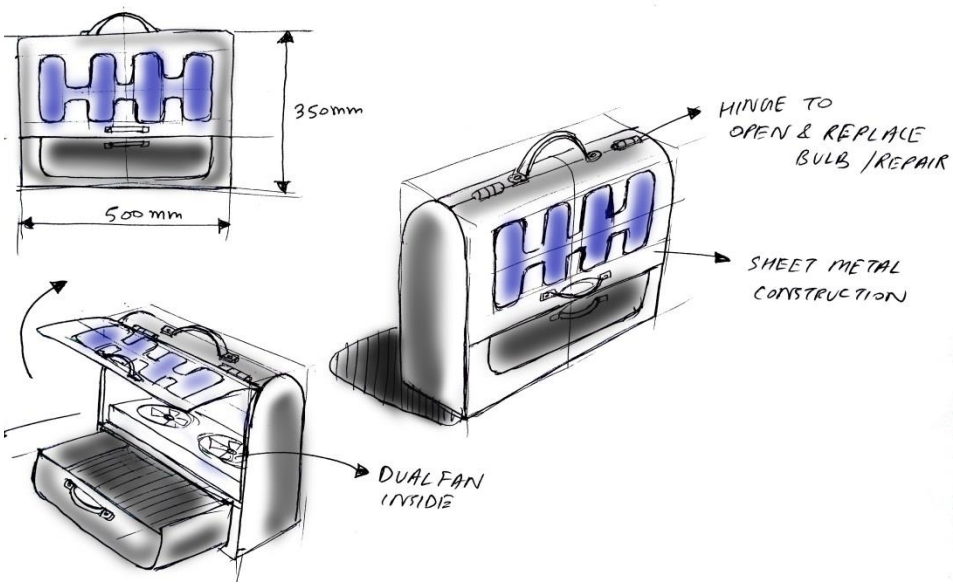


Products placed in public domain will be bigger in scale with dual or more suction fans that trap and dehydrate the insects caught.

Ideation sketches- public domain



Hanging and Grounded

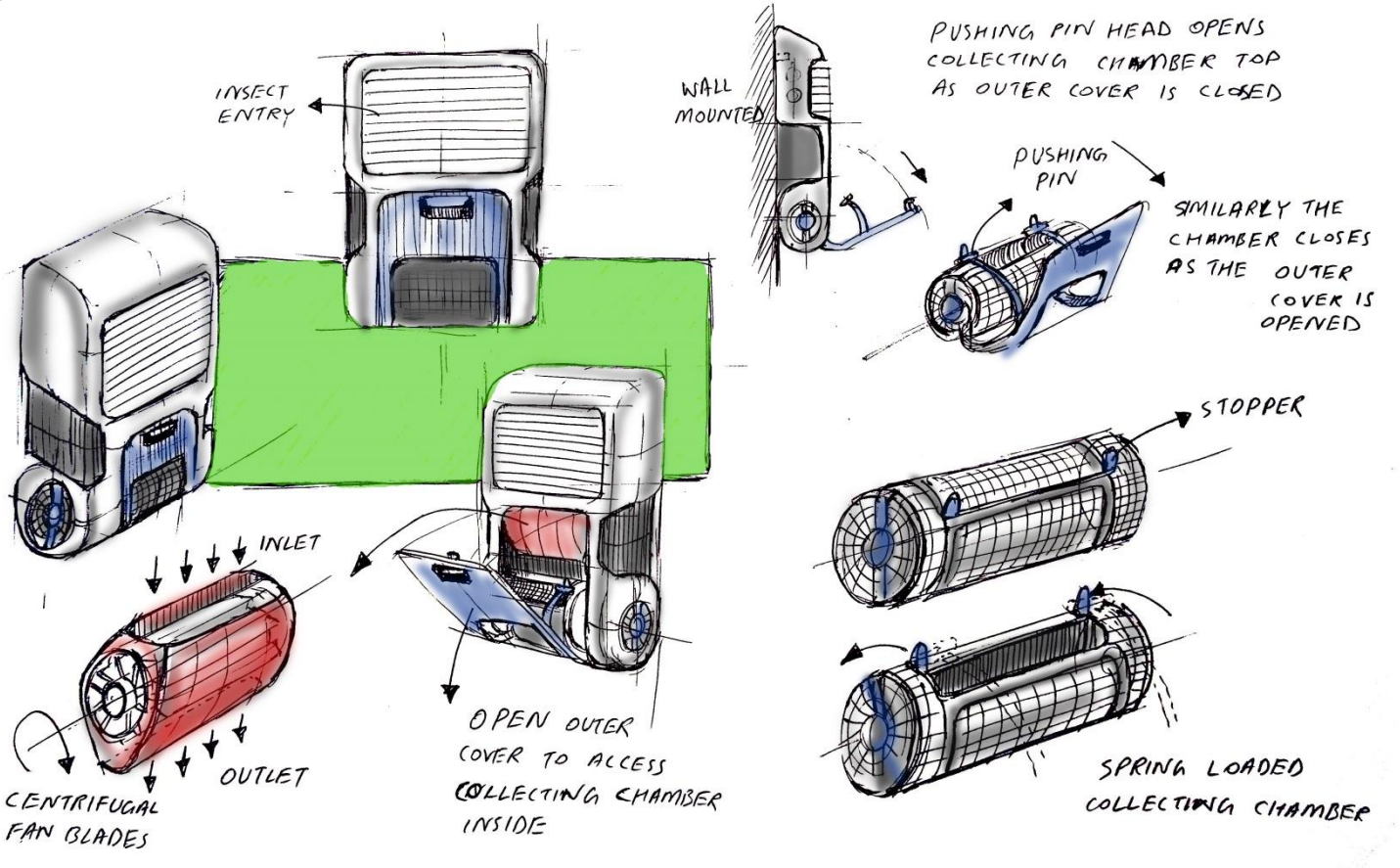


Grounded

Form study

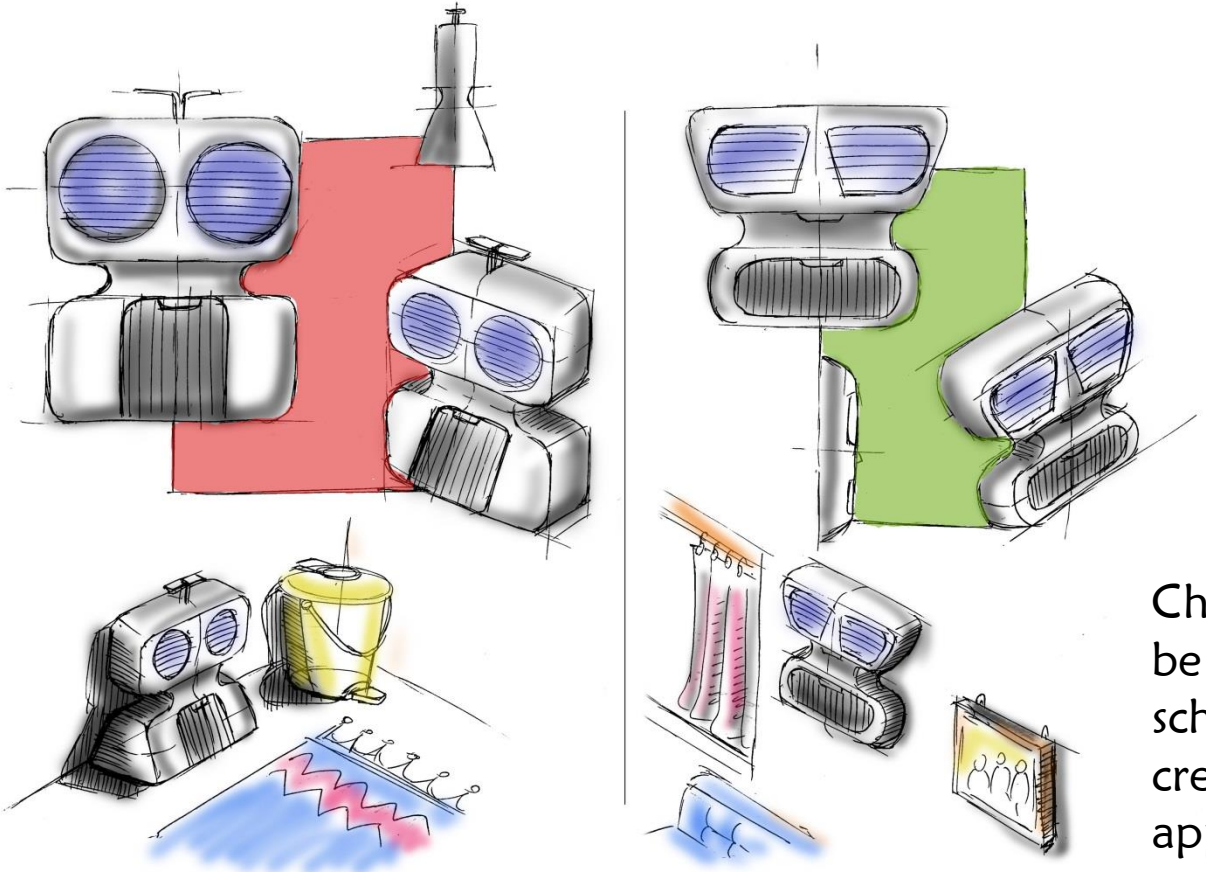

INNOVATIVE
TRADITIONAL
ESTABLISHED
ACTUAL
DISTINCT
EXTREME
RADICAL
INNOVTIVE
CURRENT
KNOWN
OLD FASHIONED
TRADITIONAL
EXTREME
LIFESTYLE
OLD FASHION

Ideation sketches- public domain



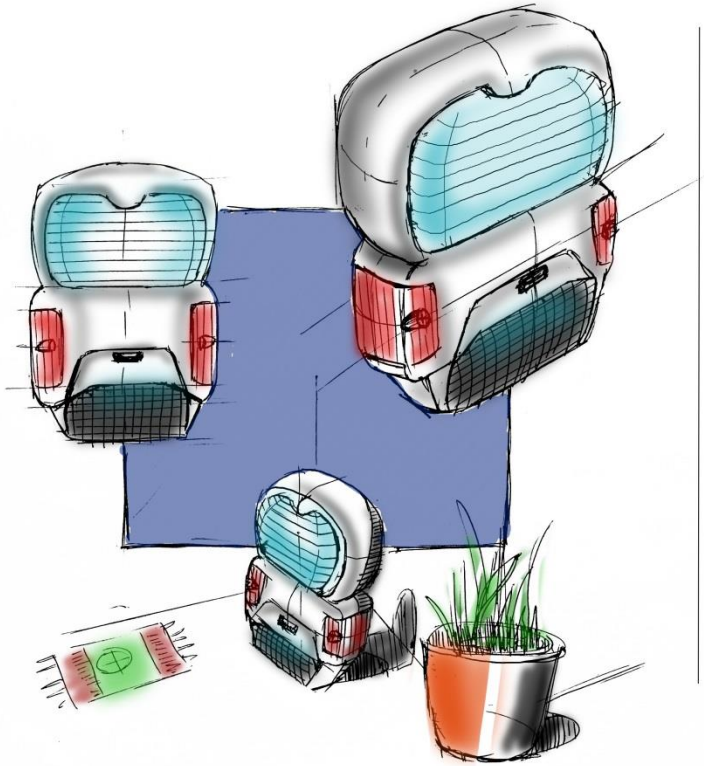
Spring loaded collecting bin that automatically close once outer cover is opened prevents escape of live fly if present

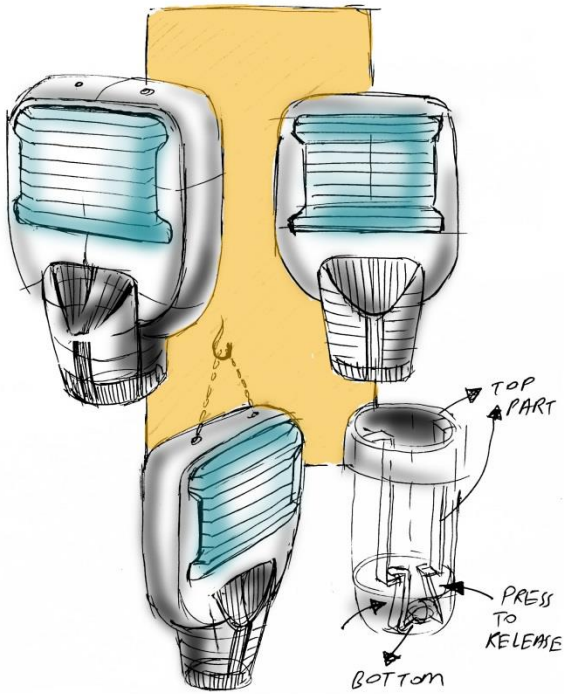
Ideation sketches- public domain



Child friendly designs may be deployed in nursery schools and day cares that creates a positive appearance to the product

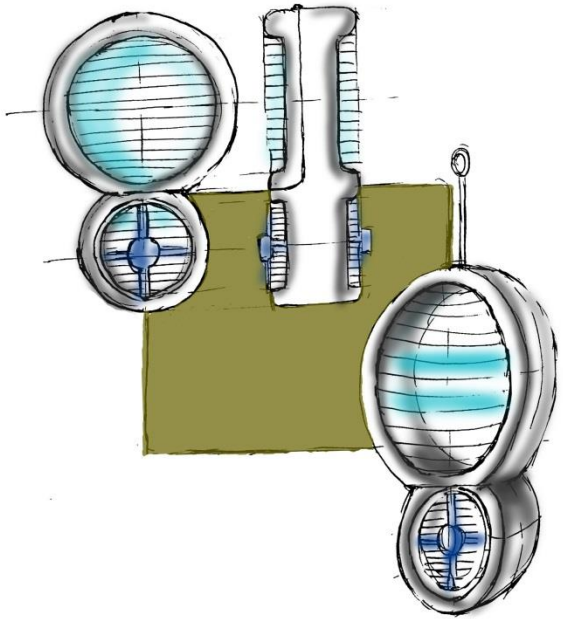
Ideation sketches- public domain

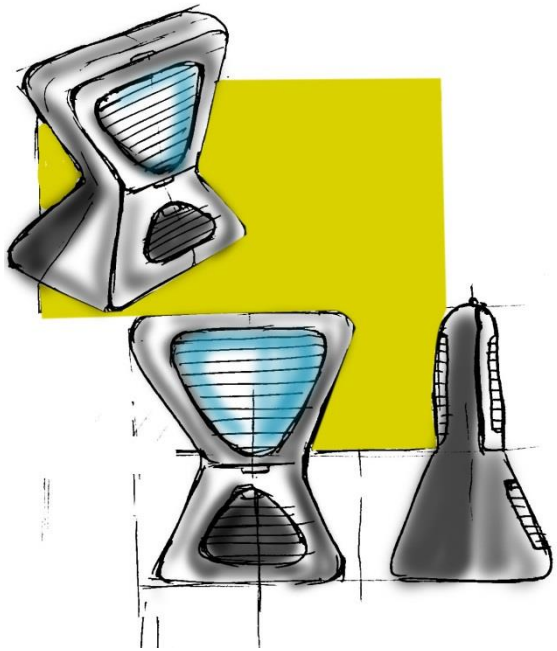


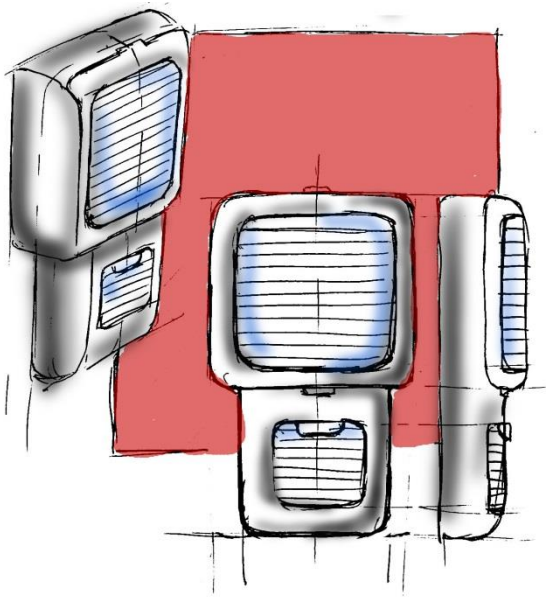


Semantics of public domain products were studied to arrive at a certain design language

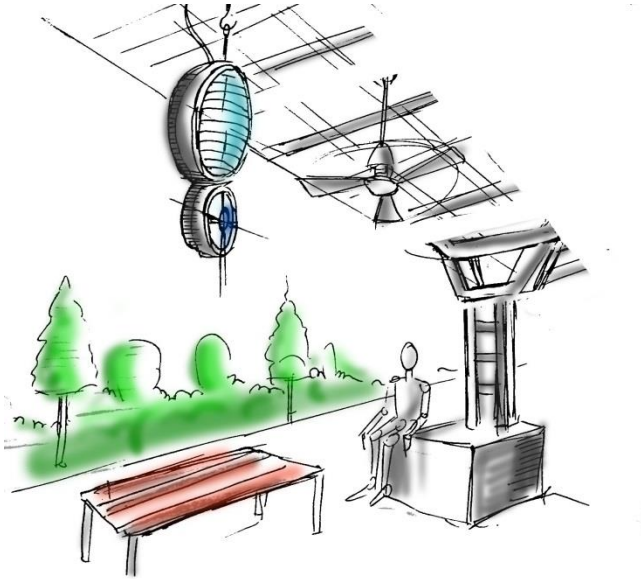
Ideation sketches- public domain

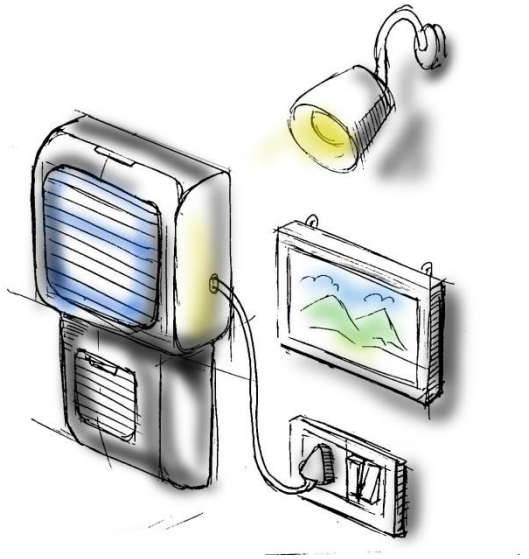






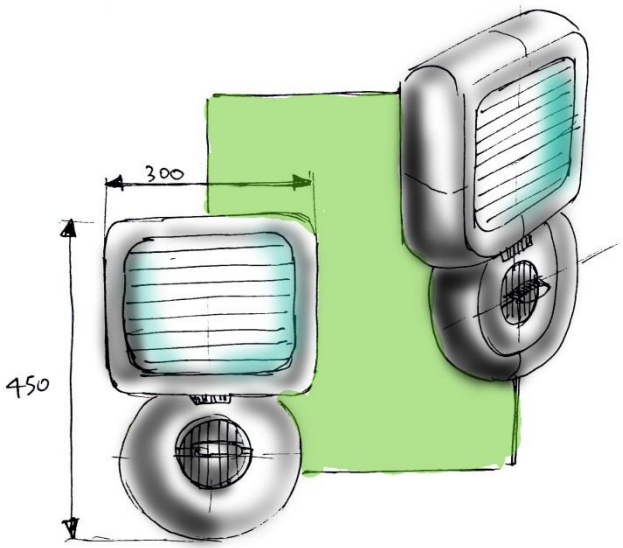
Ideation sketches- designs for public domain

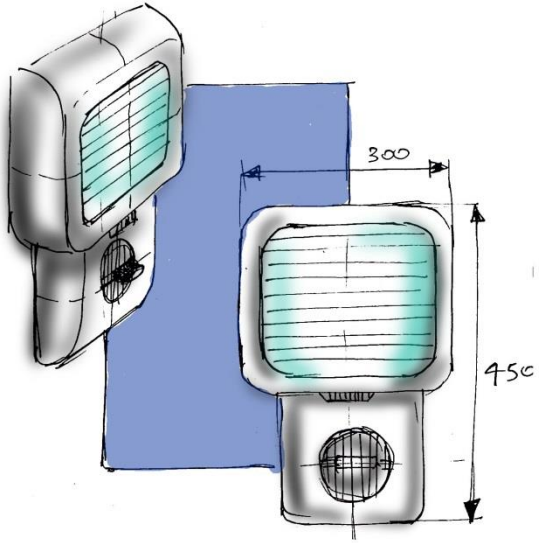


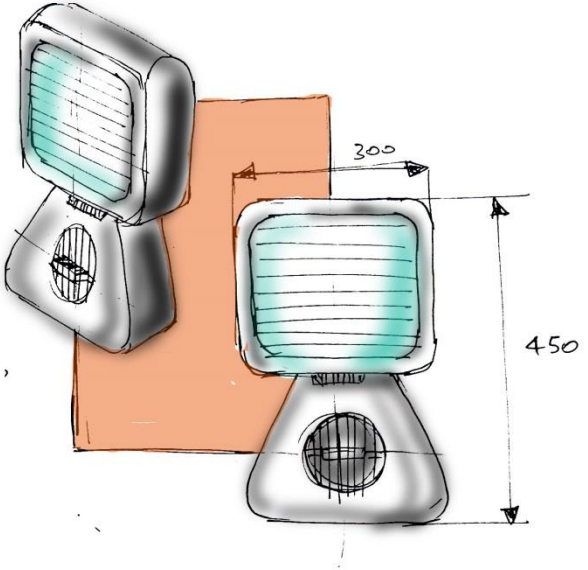


Ideation sketches-refined designs for public domain

Concept 1

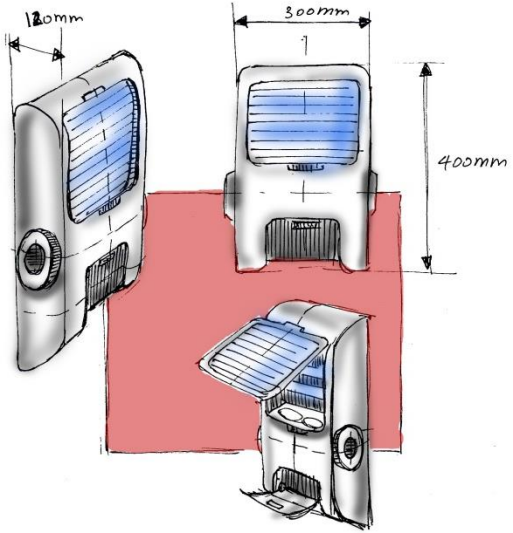


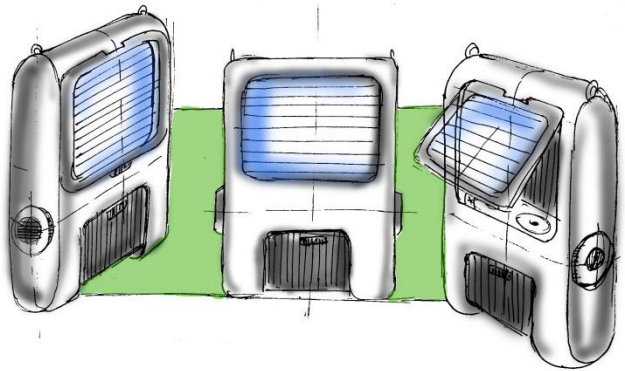


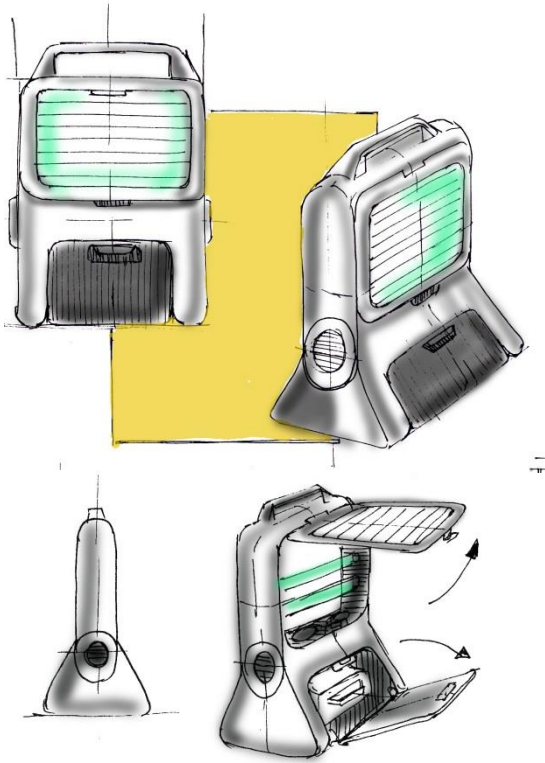


Ideation sketches-refined designs for public domain

Concept 2







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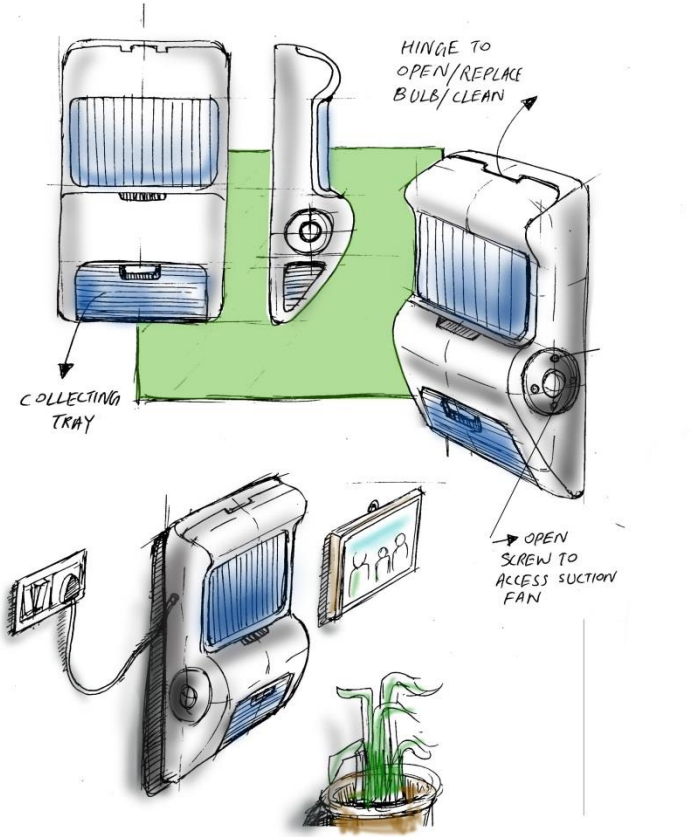
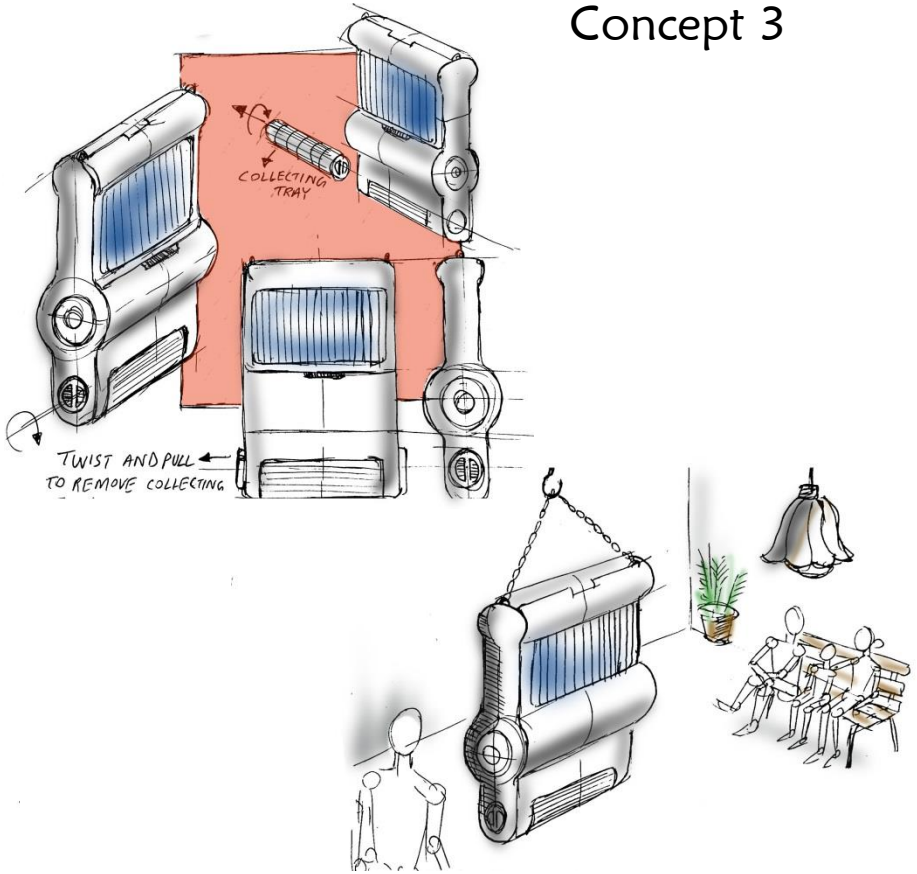
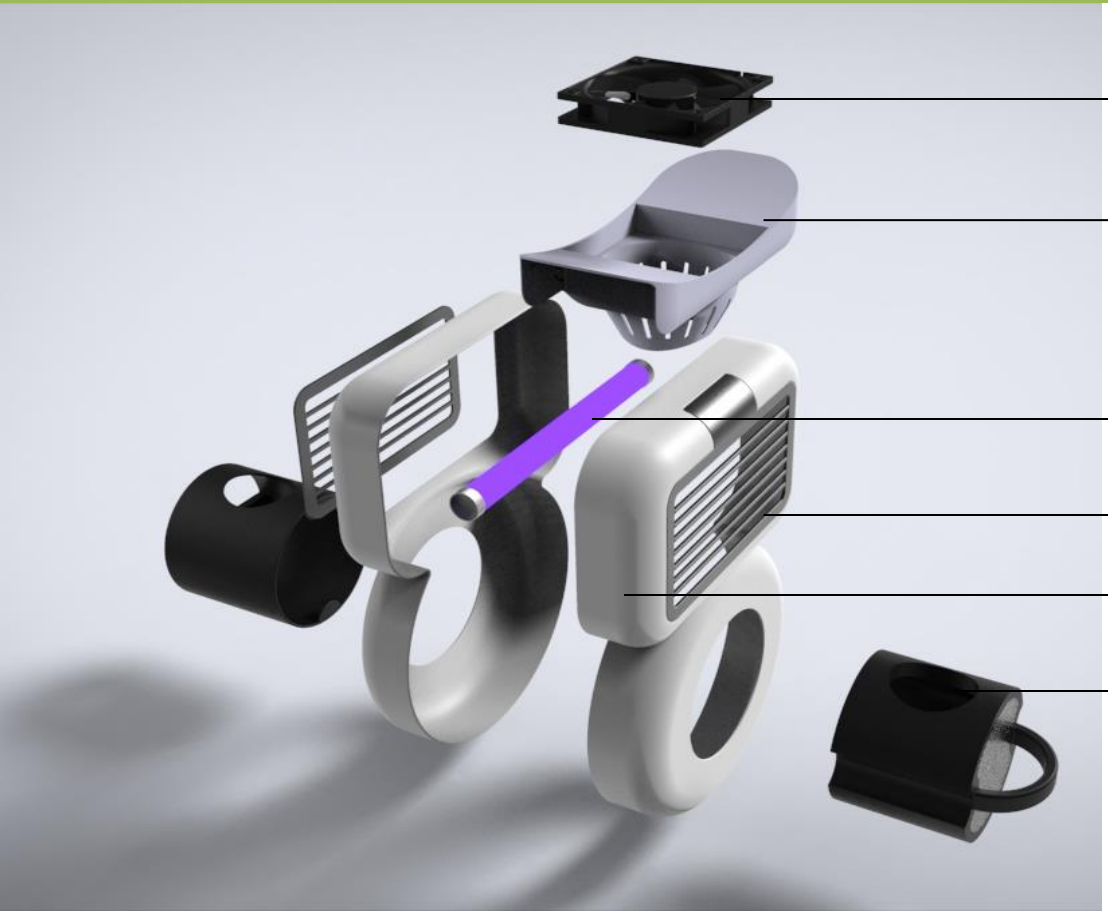


Concept 3



3D Model- set 1 part list



Suction fan

Flow directing unit

UV tube light

Front grill

Outer casing

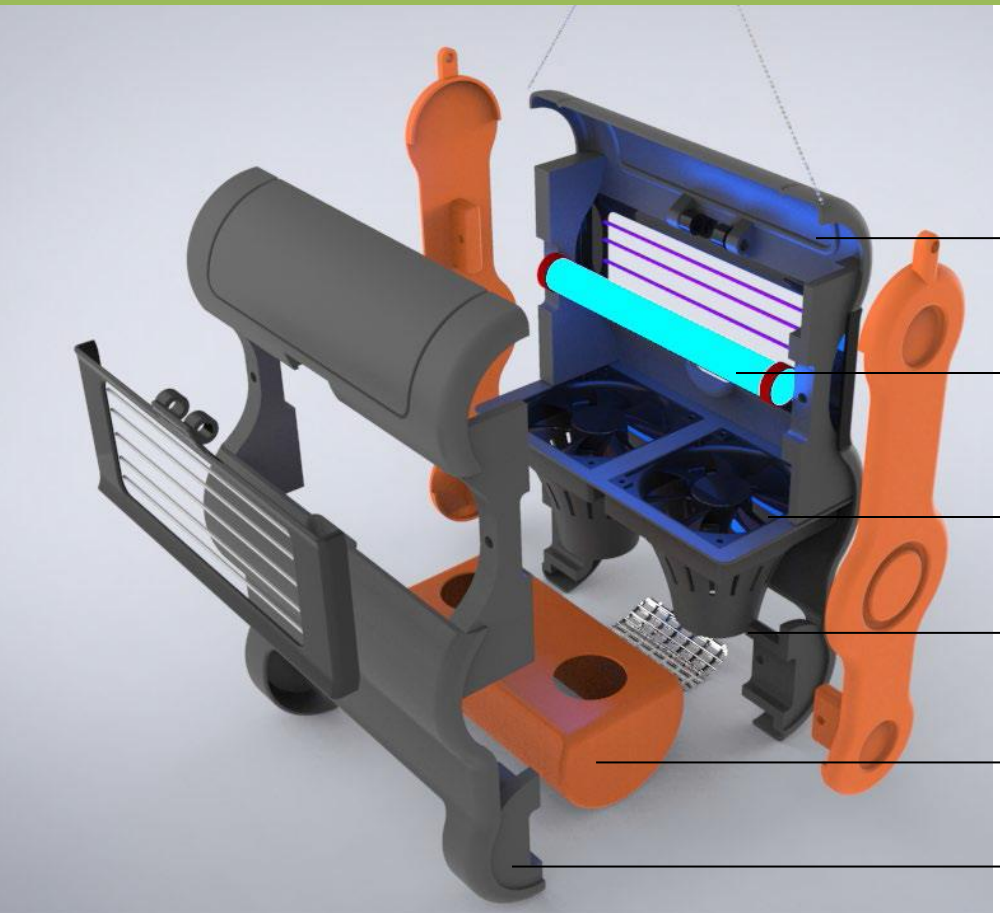
Collecting tray

Hanging

Wall mount

Grounded

3D Model- set 2 part list



Front grill

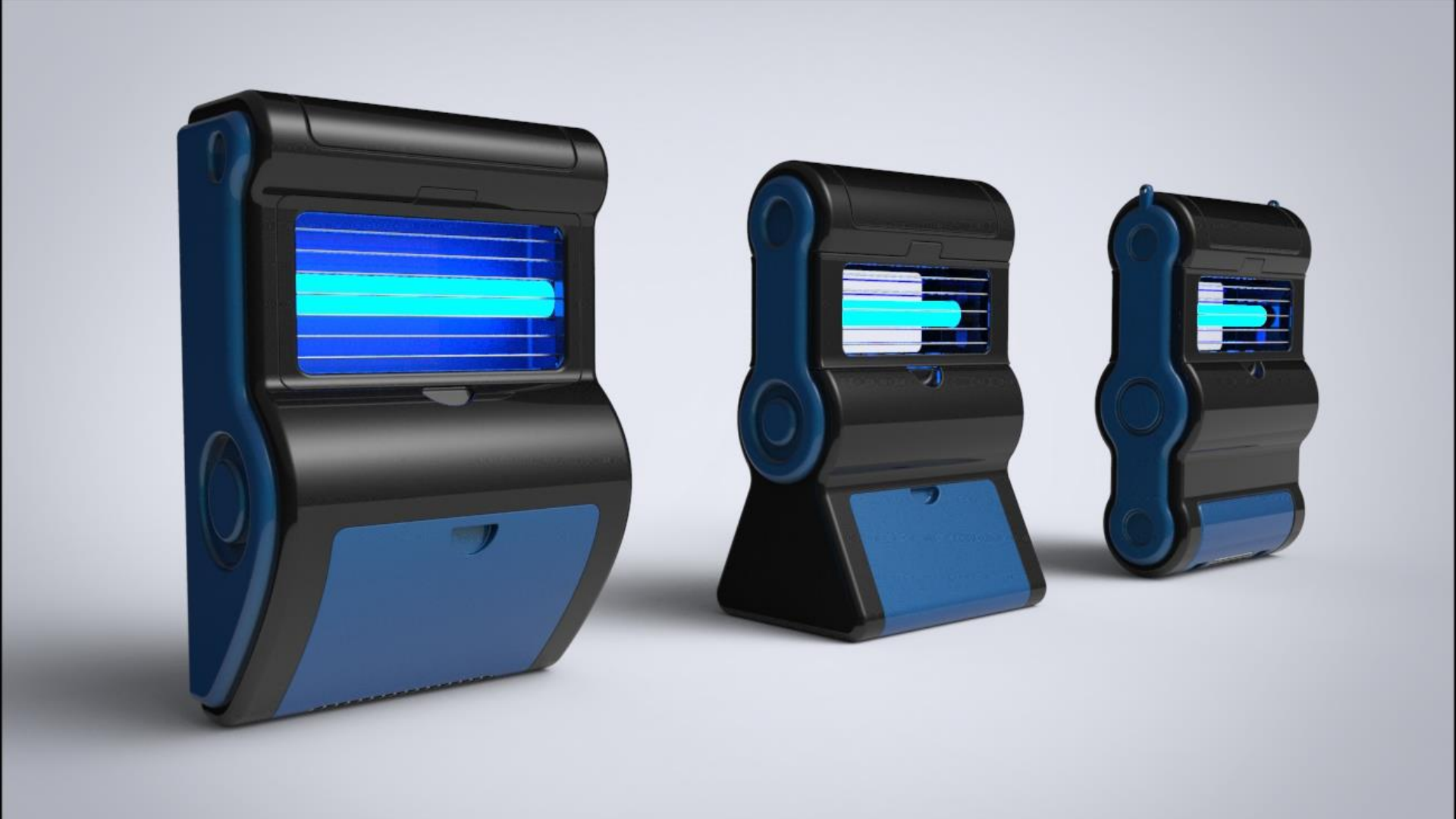
UV tube light

Suction fan

Flow director

Collecting tray

Outer casing



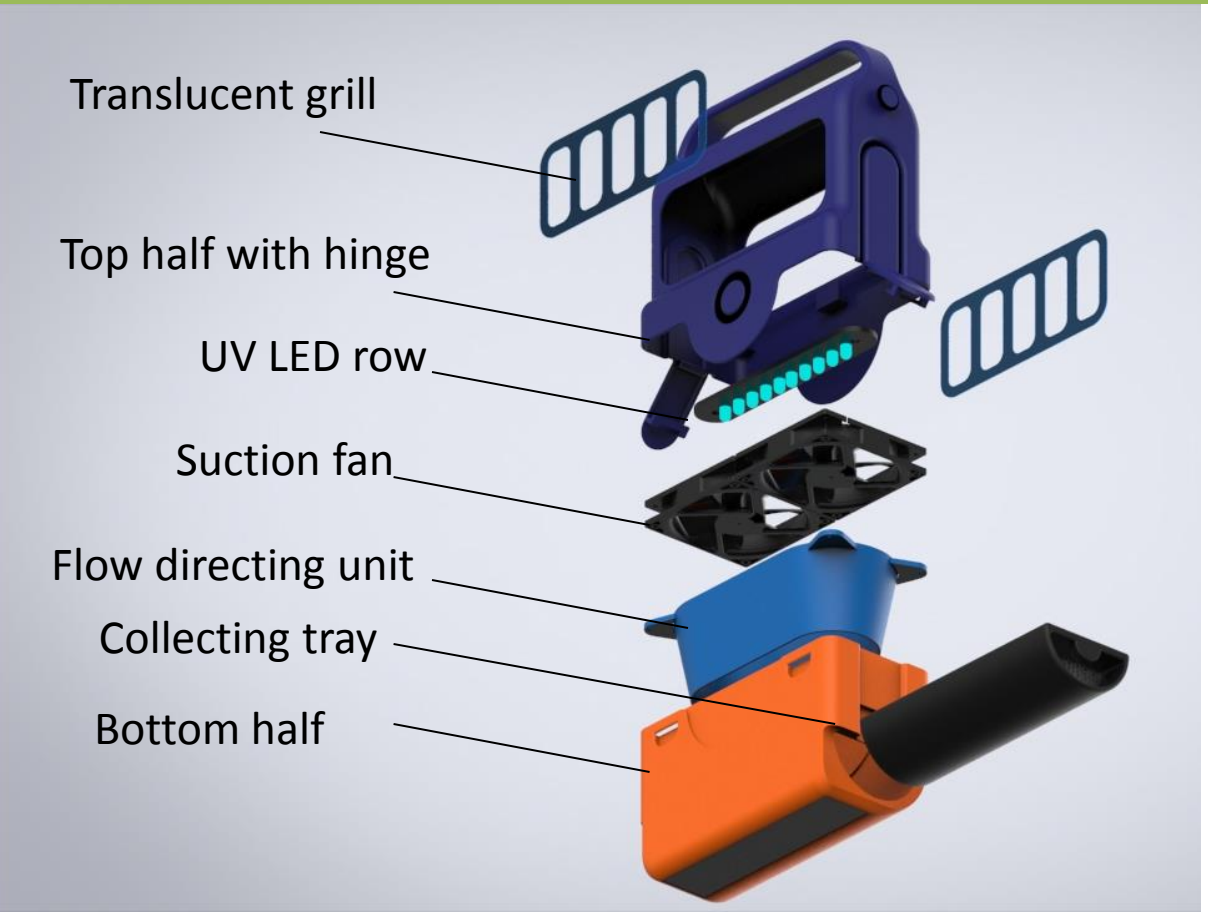
Designs were made distinct to speak for itself.

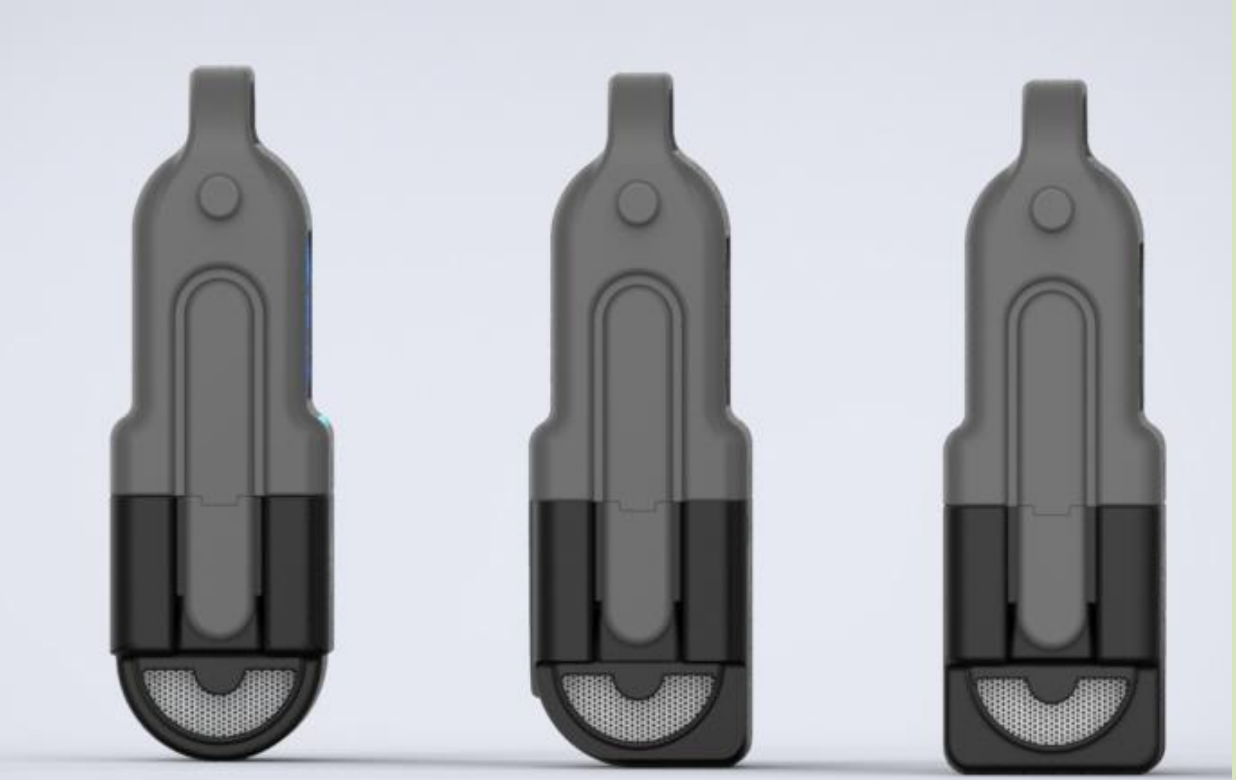
Hidden collecting tray

Emphasis
On certain elements


320mm
450mm

3D model- set 3 part list





Hanging Wall hung Grounded

Snap fit side hinge make it easy to remove base module.

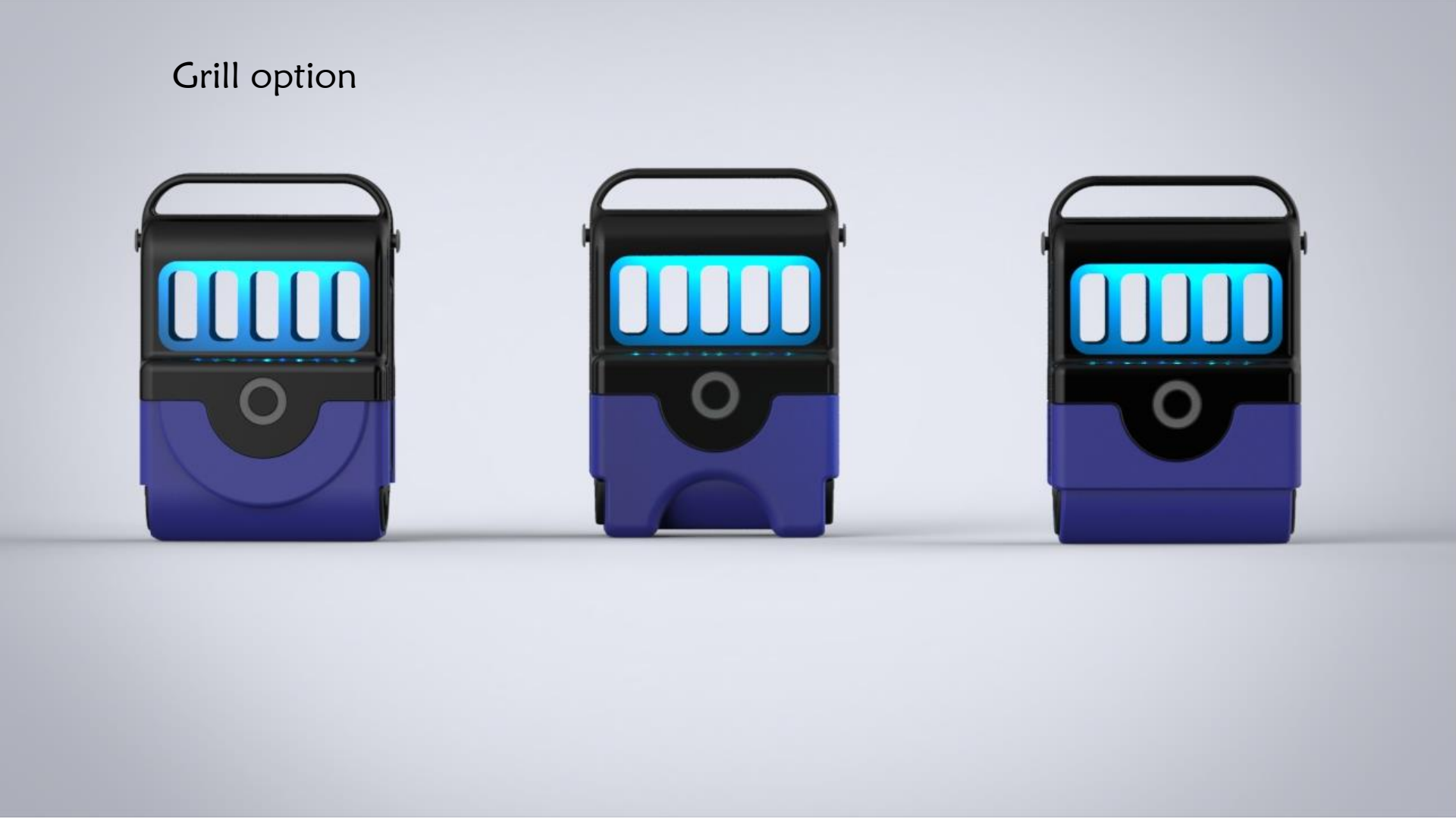
Grills are made of translucent acrylic which effectively disperse light.

The top module has electronic components that can be switched to base module catering the scenario of use

Colour schemes

Integrated hook in handle

Grill option



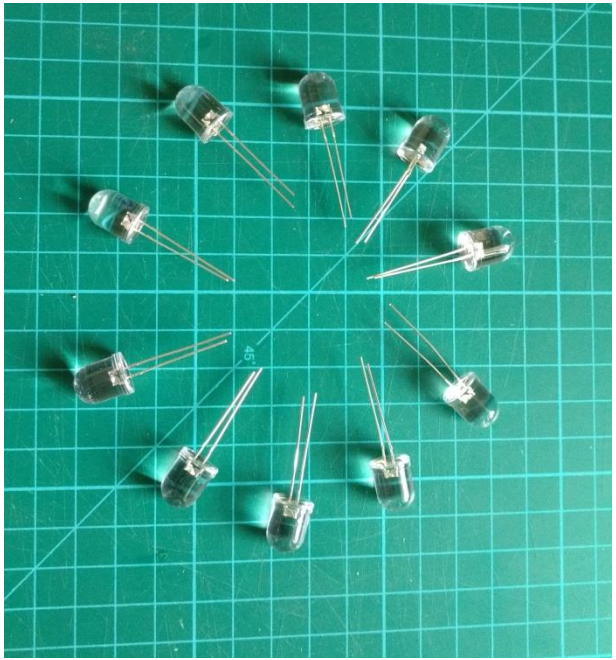
Mockups

Mock-ups were made to have better understanding of size and user interaction with the product

Components

Suction fan
120mm*120mm
Power:12V

UV LED
Size:10mm
Dominant Wavelength: 400-405nm
Luminous Intensity: 80-120MCD
DC Forward Current: 20mA
DC Forward Voltage: 3.2-3.4V



Task Analysis

Task analysis was conducted with the help
of mock-ups developed. The following are
the steps involved

Task Analysis-Mock up2

Cleaning

-Step 1
Slide collection tray to release
-Step 2
dumping dead insects and cleaning/ washing of tray
-Step 3
fitting tray back into product

Task Analysis-Mock up2

Maintenance

-Step 1
Release the hinge (both sides)
-Step 2
Lift the top half to separate
-Step 3
clean suction fans using a blower.
Replace if necessary

Feedbacks

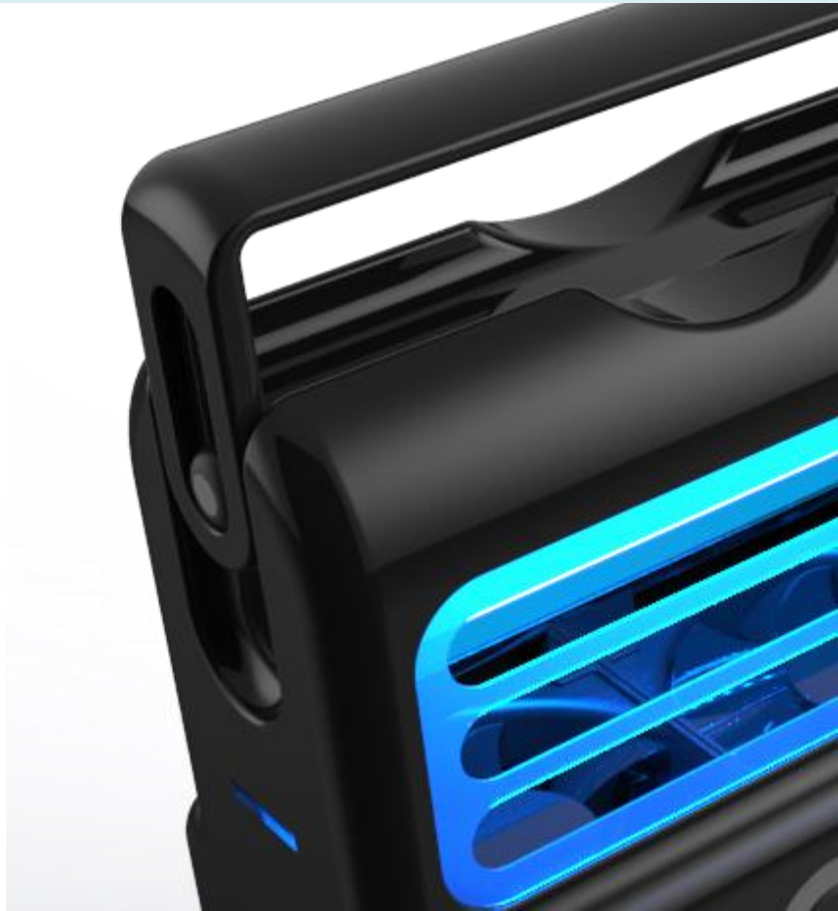
- Instead of having separate base modules for different scenarios, it is better to have add on parts that transform functionality.
- Handle may also be foldable/detachable.
- Colours may be more subtle/less loud to merge with surroundings.
- Difficulty in identifying front and back

Final design

Final design is optimized with less lesser components.

Handle is slides inside a slotted grove so that it merges with the outer profile.

Instead of snap fit and hinge, screws are added considering the frequency of maintenance.



Part list Final design

Removable handle

Translucent plastic

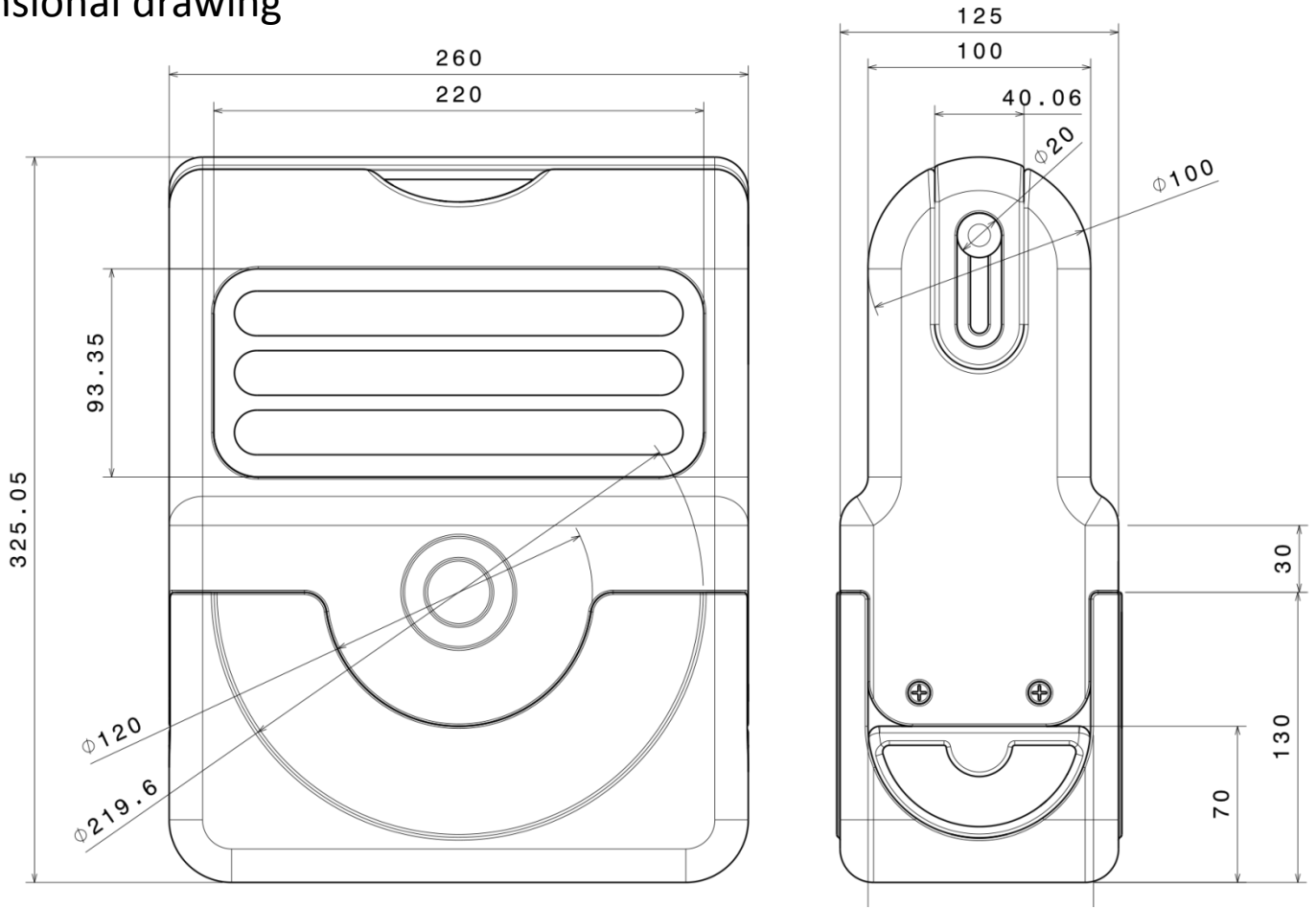
Suction fan

Collecting tray

Hanging

On the wall

Dimensional drawing



Translucent top module may be injection molded to obtain a wider coverage of UV light. UV light on fan

Power and cost

LED
current- 20mA (total 9 LED)
Voltage-3.2-3.4v
connection- 3 in series of 3 parallel circuit

Fan
Current- .2A
Voltage-12v

Total power=11.98W

Estimated cost of the model will be of 3000 to 4000rs range.
Translucent top will be for 5000

DAY OR NIGHT

YOU GOT NOTHING TO WORRY AS LONG AS THEY ARE BELOW THIS LINE

FLYin

The Ecofriendly Insect Killer

Attrap

Making

A working prototype was made by vacuum forming of styrene sheet. The asembly was then painted and connections were given

THANK YOU