




Photon
Disc golf target beacon

The Challenge

Playing disc golf from dusk til dawn can be both fun and difficult.

There are few solutions to lighting the target (basket) properly.

Players want to have fun. The lightsource must be...

Easy to carry, charge, mount and use.

Water proof.

Emmit even light 360°.

Reliable use min. 2h.

Be affordable.

None of the existing solutions provide all this.

Morten Deurell

s206073



Photon - Design Brief

Design

Morten Deurell

Production Company

Løft Discs ApS

Product Description

Photon is a portable light source designed specifically for disc golf players. The lamp is designed to be mounted on disc golf baskets, allowing players to continue playing the sport between sunset and sunrise. The lamp is equipped with LED lights, and will help to light up the basket and make it visible to players in low-light conditions. The lamp is designed to be easy to charge, easy to mount, easy to carry, and easy to use, making it a valuable addition to any disc golfer's equipment. Photon should serve as a beacon for those players.

Target Audience:

The primary target audience for Photon is both males and females between the ages of 16-50, with a focus on those between the ages of 18-45. The target group consists of individuals for whom disc golf is a lifestyle. They are "hooked". This is their primary social playground and thus they are very willing when it comes to investing in equipment that can expand the possibilities of playing. As a supplement to buying discs and clothing, gear for playing disc golf in the dark could very likely become an object of their desire.

Goals and Objectives:

- To create a portable light source that can be easily mounted on disc golf baskets, allowing players to continue playing the sport between sunset and sunrise.
- To bring more value to the sport of disc golf by providing a necessary tool to play in low light conditions.
- To create a product that has a low production cost and a medium to high profit margin.
- To design a product that aligns with the Løft Discs brand aesthetic and values.

Design Considerations:

- **Portability:** The lamp should be lightweight and easy to carry, so that players can bring it to the course.
- **Mounting:** The lamp should be easy to mount on disc golf baskets and must be designed to avoid being damaged by impact of discs.
- **Charging:** The lamp should be easy to charge using USB-C, and should have a minimum of 2h hours of use when fully charged.
- **Durability:** The lamp should be durable enough to last for at least 2 years, if well protected for a minimum of 5 years.
- **Waterproof:** The lamp must be waterproof to protect it from any weather or disc golf course conditions.
- **LED-lights:** The lamp must be equipped with LED lights, which will help to light up the basket and make it visible to players in low-light conditions. This will also reduce the power consumption.
- **RGB light:** RGB light should be considered as a want for the product, if possible.
- **Branding:** The design of the lamp should reflect the Løft Discs brand and its aesthetic, but could also draw inspiration from the minimalistic Scandinavian design, as a means to create desire in the end user. Ex B & O or Philips (Hue)
- **Cost-efficient:** The lamp should be as cost-efficient as possible.
- **Sustainable:** The lamp should be designed to be as sustainable as possible.

Schedule:

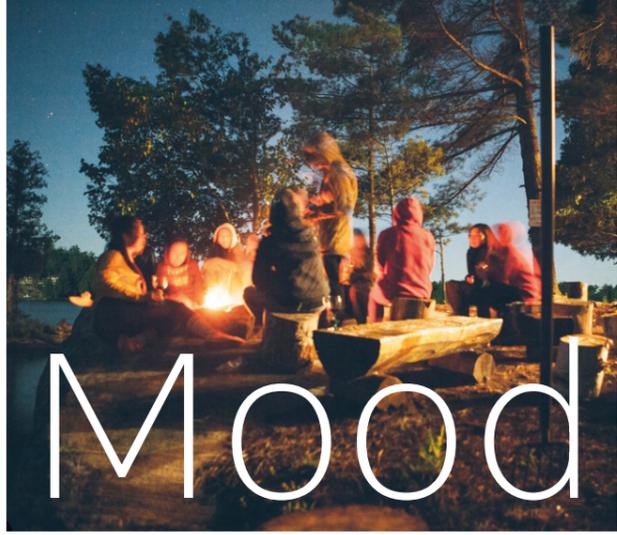
Design and development will take place between 2 January 2023 and (Deadline) 20 January 2023.

Budget:

The production price per unit should be between 50-100 DKK. The profit margin per unit should be between 100-300%. The estimated amount of units in the first production cycle is between 500-1000. The price range for the product should be between 150-300 DKK per unit, with possible lower prices when buying in bulk (3, 6, 9, 12, or 18 units). The charger for the lamp should be sold separately.

Competitors:

Løft Discs will be competing with established disc golf manufacturers such as Discmania, MVP (Lunar module), LED-light-strips (no-name), portable lamps for craftsmen (Bauhaus etc.), Parasol lamps (no-name)



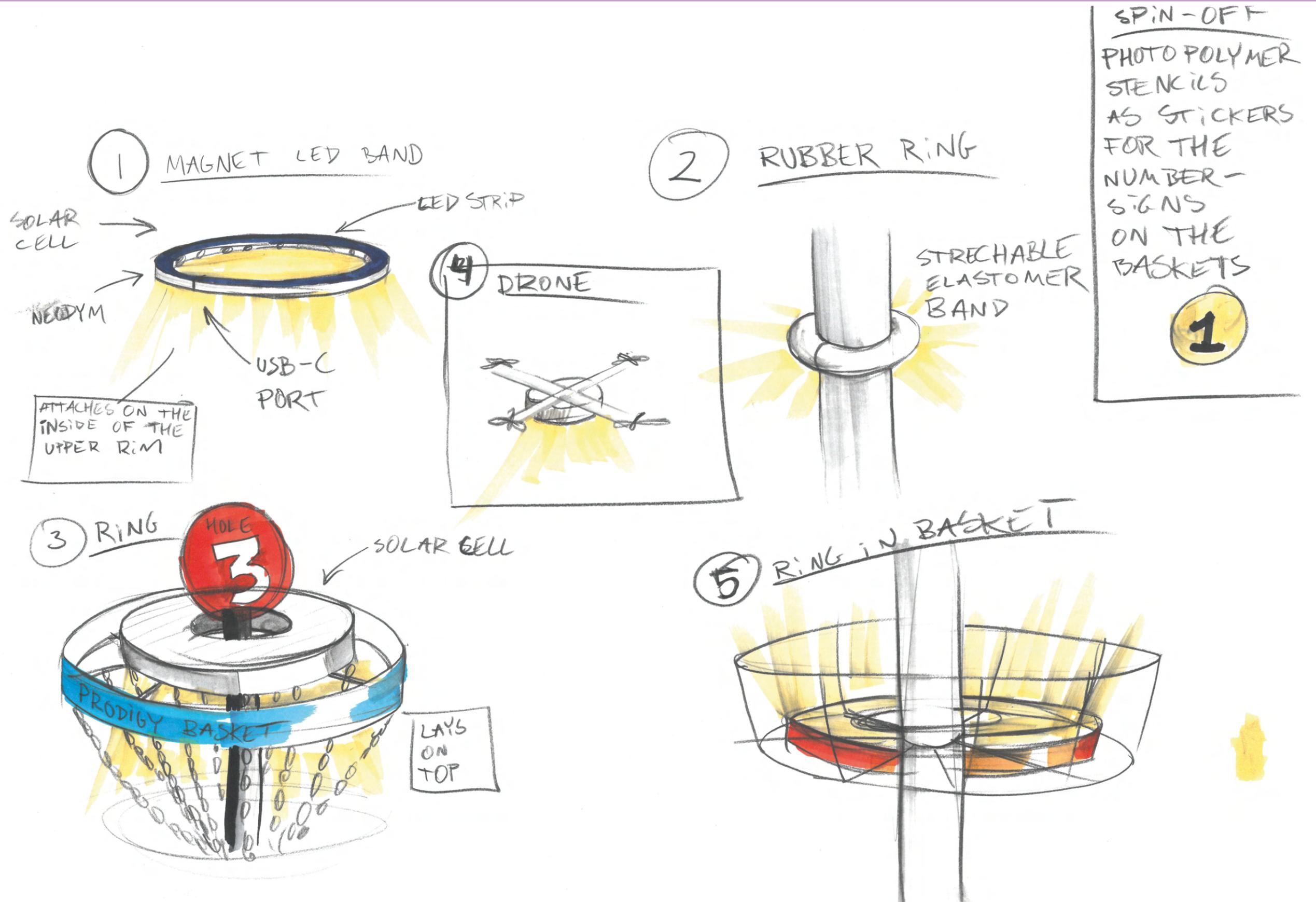
Ideation

The process was initiated with some rough handdrawn sketches of the lamp. This was followed by a handful of drawings of the desired functionality,



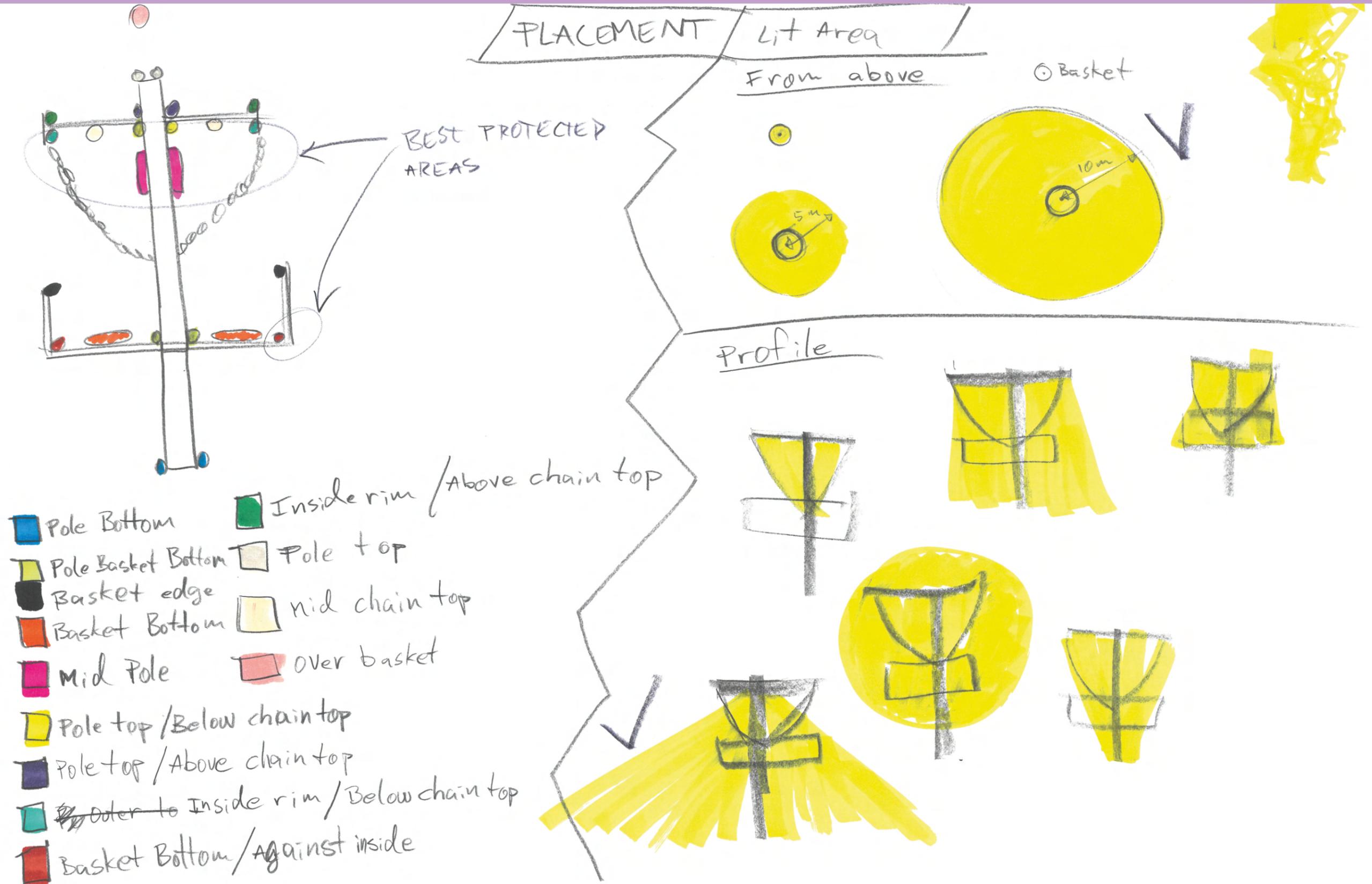
Initial drawings.

This gave some inspiration in relation to further investigate the build up, the positioning and the direction of light coming from the lamp. I could also immediately see some not viable solutions (like the drone) on this stage my favourite lamp was number one. Since it would be hidden



Position and lid area

Since a disc has a massive impact when hitting the basket, it is obvious that the lamp must be fixed to a protected area. Upon testing on baskets in real life, and via the drawing below, I found the most protected areas. The "pole top/below chains" is optimal. In relation to light I would love to have the light emitting the "landing zone" (10m radius). So this became the ambition.



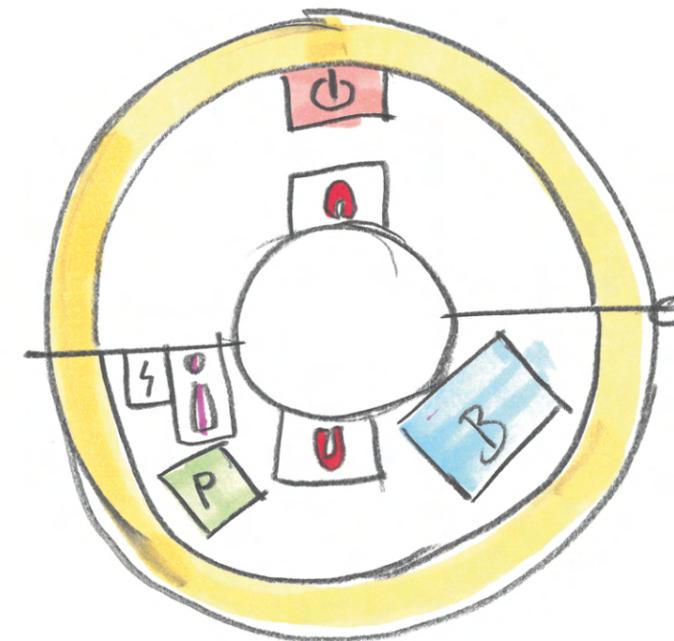
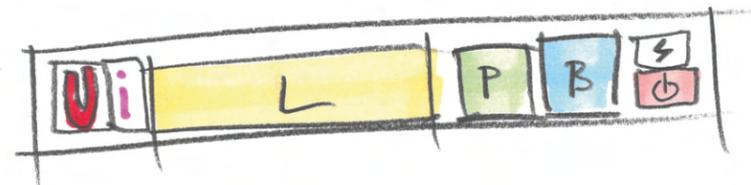
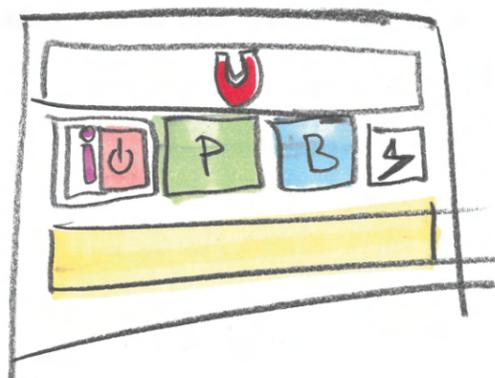
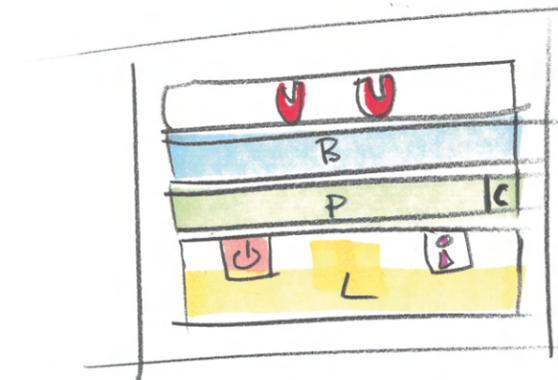
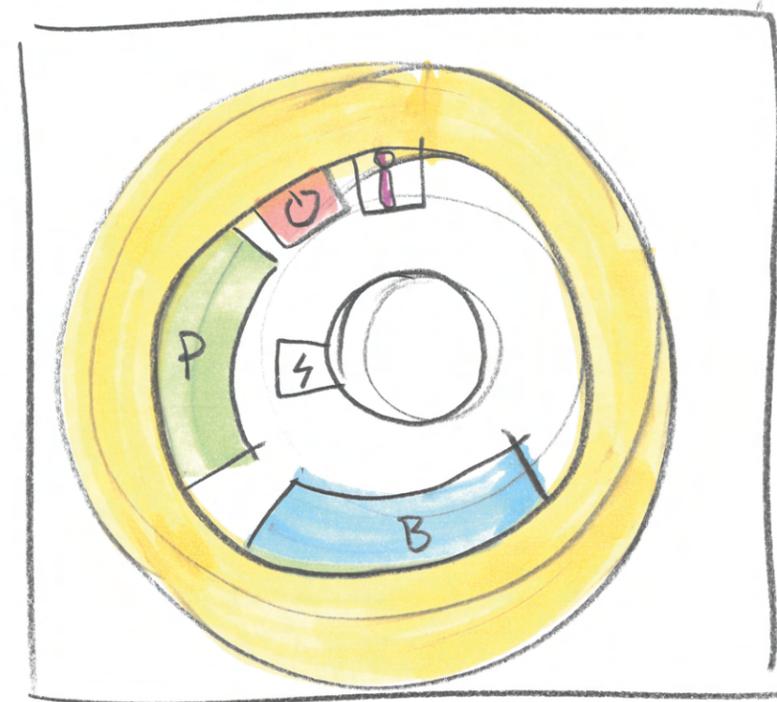
Basic Structure

I tried to combine these ideas into a somewhat interesting Basic structure.

At this stage, I was convinced that it should be fixed with magnets, since 95% of the baskets are made of ferrous materials.

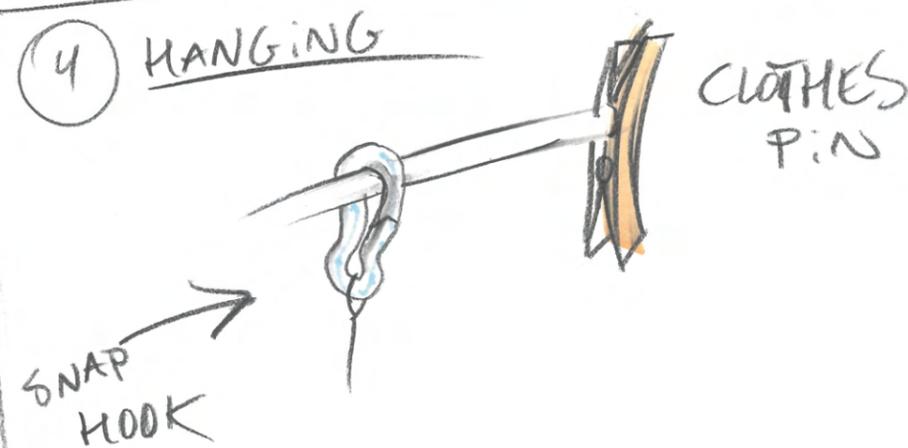
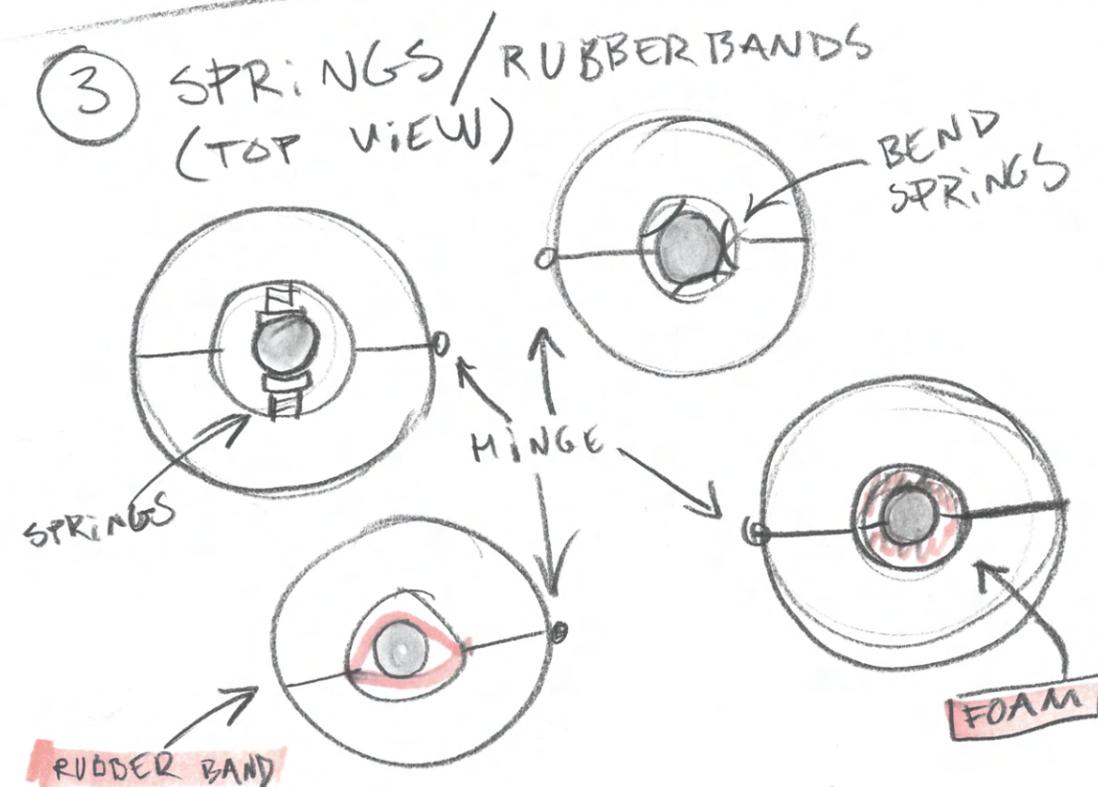
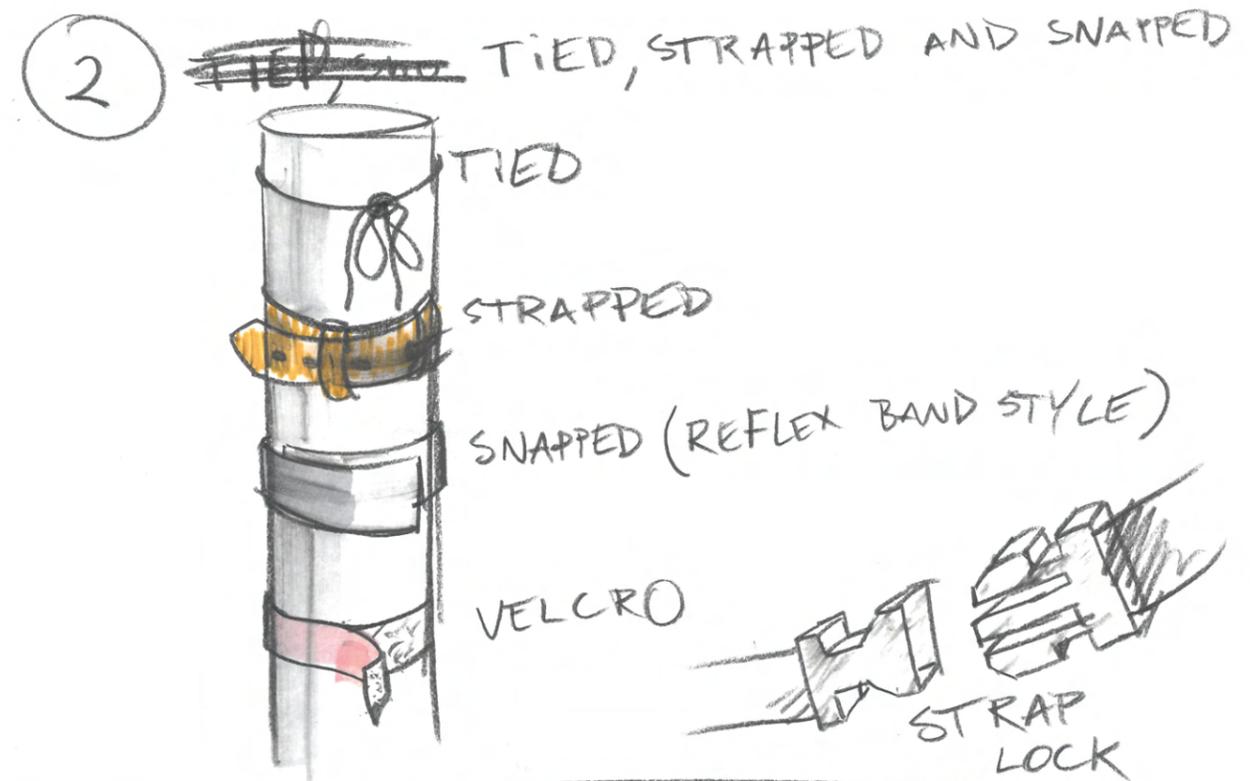
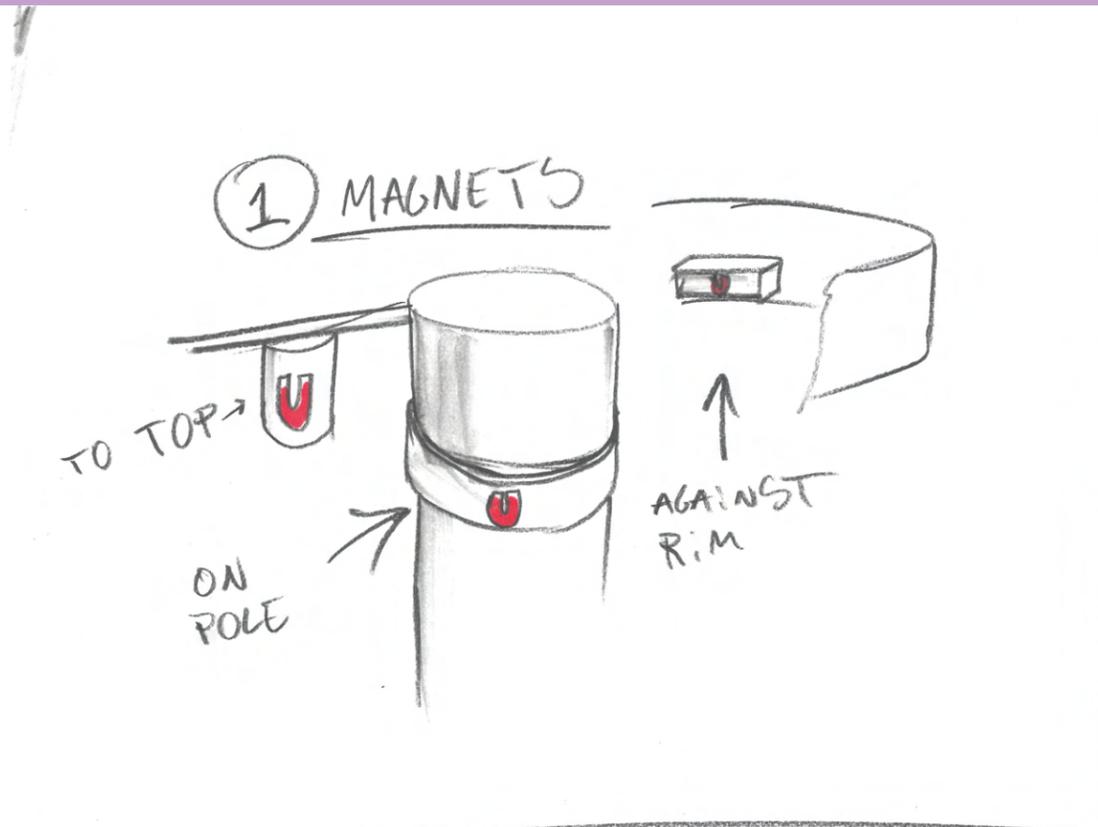
I found that the circular design would facilitate the best spread of the light and also would be possible to fix to the pole top.

-  BATTERY
-  PCB+USB
-  LIGHT SOURCE
-  POWER BUTTON
-  MAGNET
-  CHARGER
-  INDICATOR



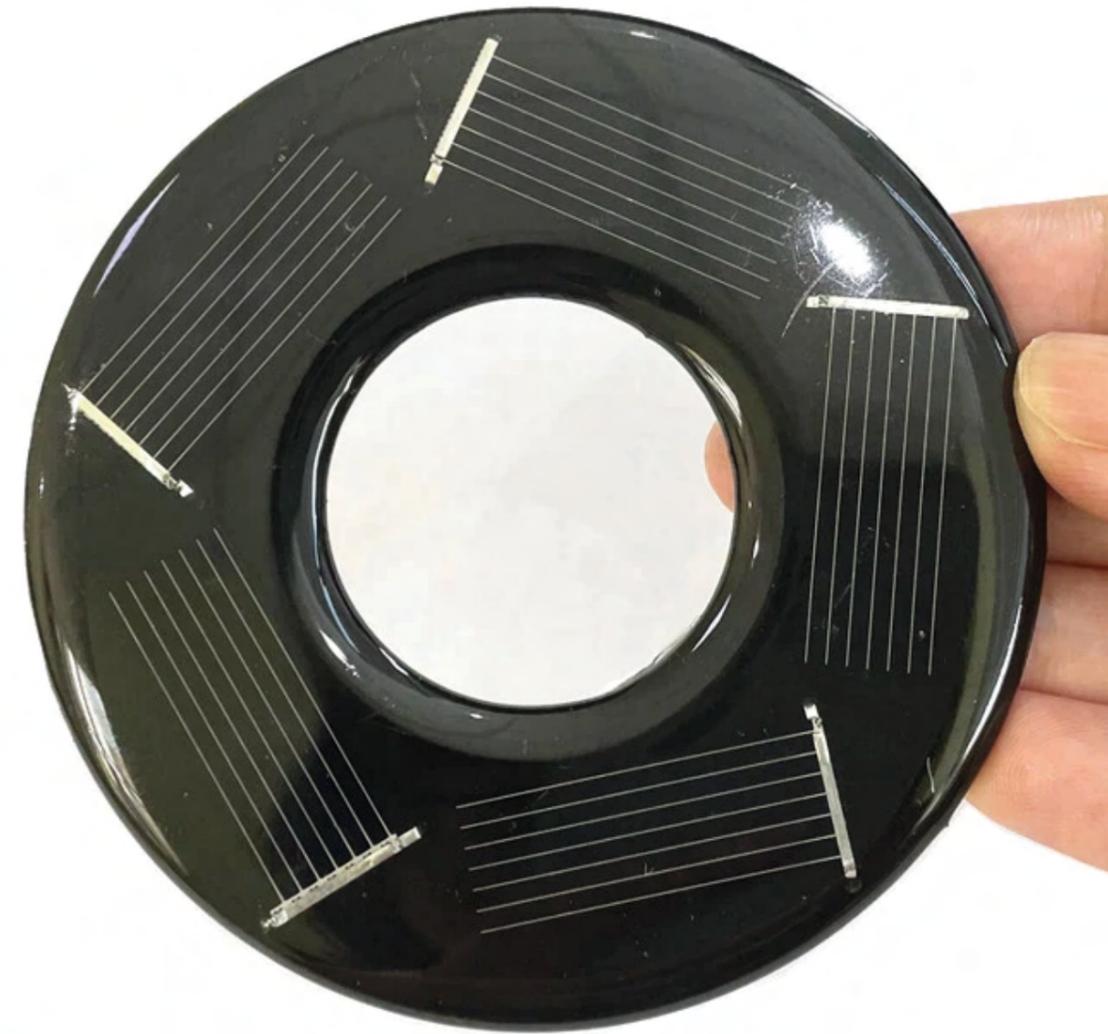
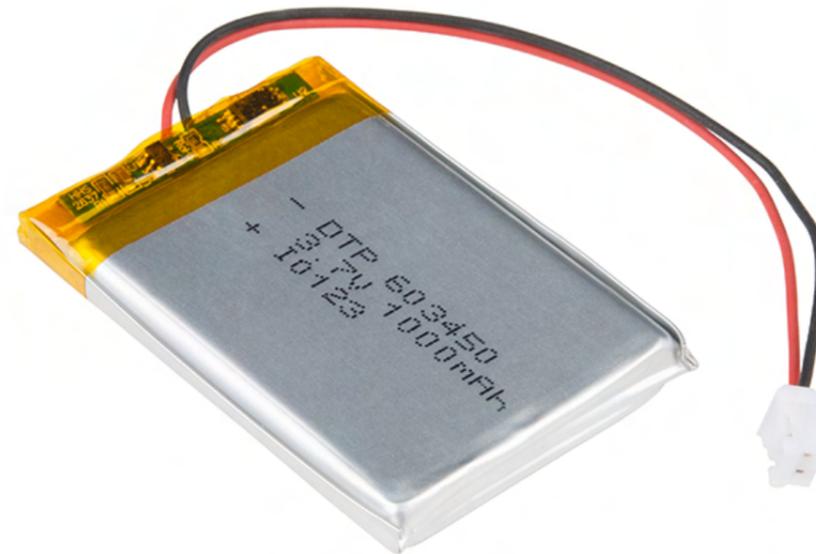
Mounting solutions

I then looked in to different mounting solutions. Obstacles on the basket prevent one from mounting from above. The lamp has to go around the pole (similar to an umbrella). From these mechanisms I felt that magnets or foam would be the most reliable solution.



Power Sources

I looked in to different power sources. Although solar seemed attractive it is not reliable enough. Maybe for garden lights, but not for this scenario. I also looked in to the possibility of using a power ball as a power generating gyro. I realized I could not prove this concept and that it would be to bulky in design. Li-Ion or Li-Pol batteries seemed like the right solution for the job. Since I wanted to include the possibility of charging



A little help from AI

As inspiration for the mood board, but also for lamp shapes, I tried to use AI.

From ChatGPT I learned that the standard pole diameter is 45-54 cm. I did though, look in to this on www.pdga.com (The main disc golf association). They have lists of approved baskets. When looking into it the majority (95%) of basket poles are 35-55mm in diameter. I used this as a baseline in my later design

From Dall-E I got a lot of inspirational imagery.

Disc Golf Basketlight

Iterations through Dall-E
<https://labs.openai.com/>

“led band on the inside of a disc golf basket standing in the dark”



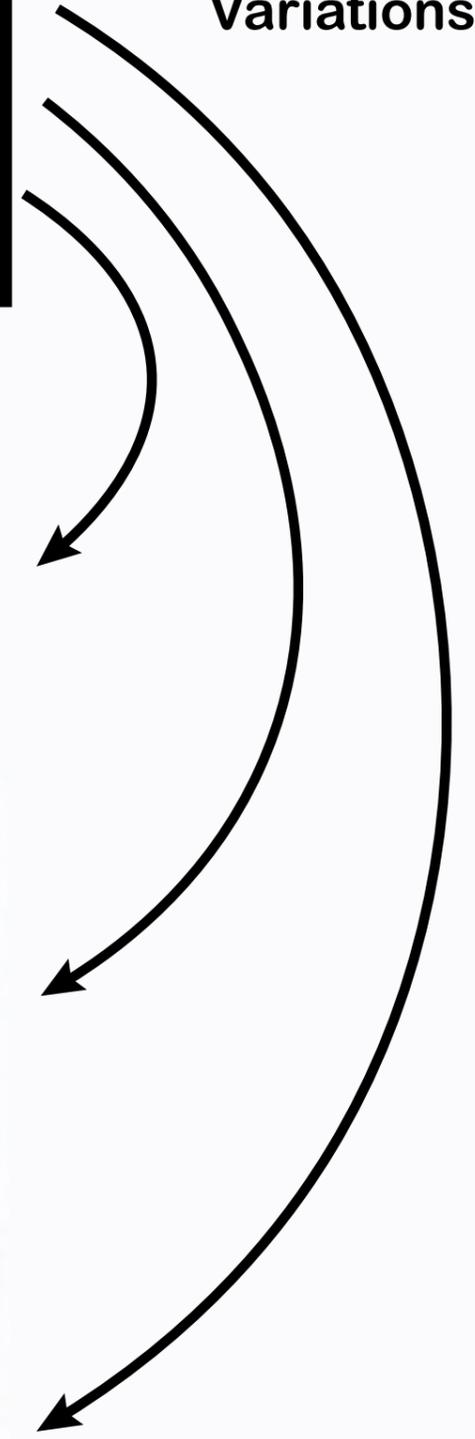
“A disc golf basket in dusk. Light comes from a ring of LED on the inside of the top rim.
The whole basket is lit by this light. the light is 4200K”



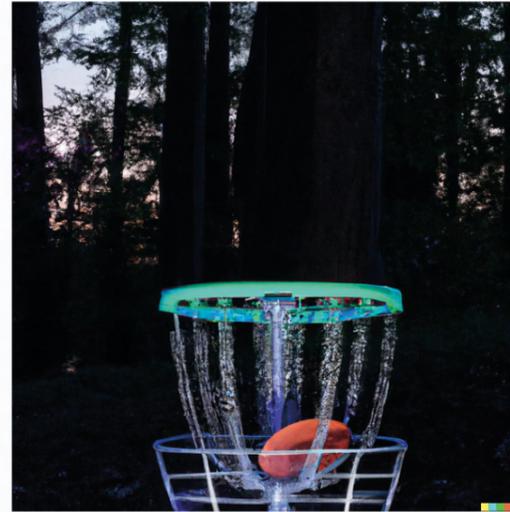
“A disc golf basket during dusk with a ring of led lights on the inside of the top rim emitting white light towards the center of the basket in a 45 degree angle”

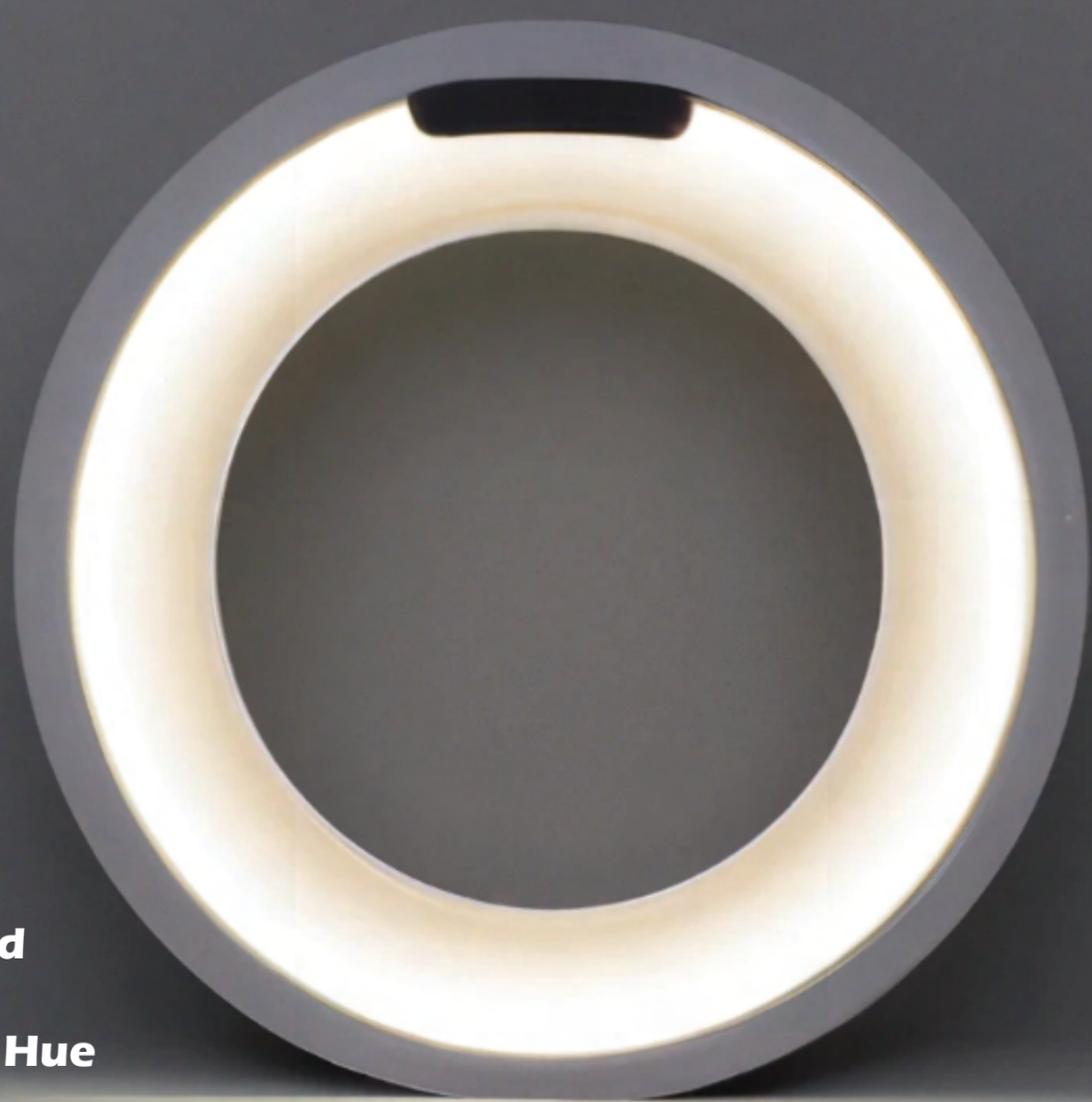


Variations



“A disc golf basket in dusk. Light comes from a ring of LED on the inside of the top rim. The whole basket is lit by this light. the light is 4200K”





Inspired
By
Philips Hue



Inspired
By
Military Gear



Inspired
by
Star Trek

FORM COLOR GRAPHICS

Asking the users

I asked the users in a disc golf debate group on facebook.

My key findings was some alternative lamp solutions (parasol lamps, lightchains, craftsmens lamps) and I also learned about a few competitors.

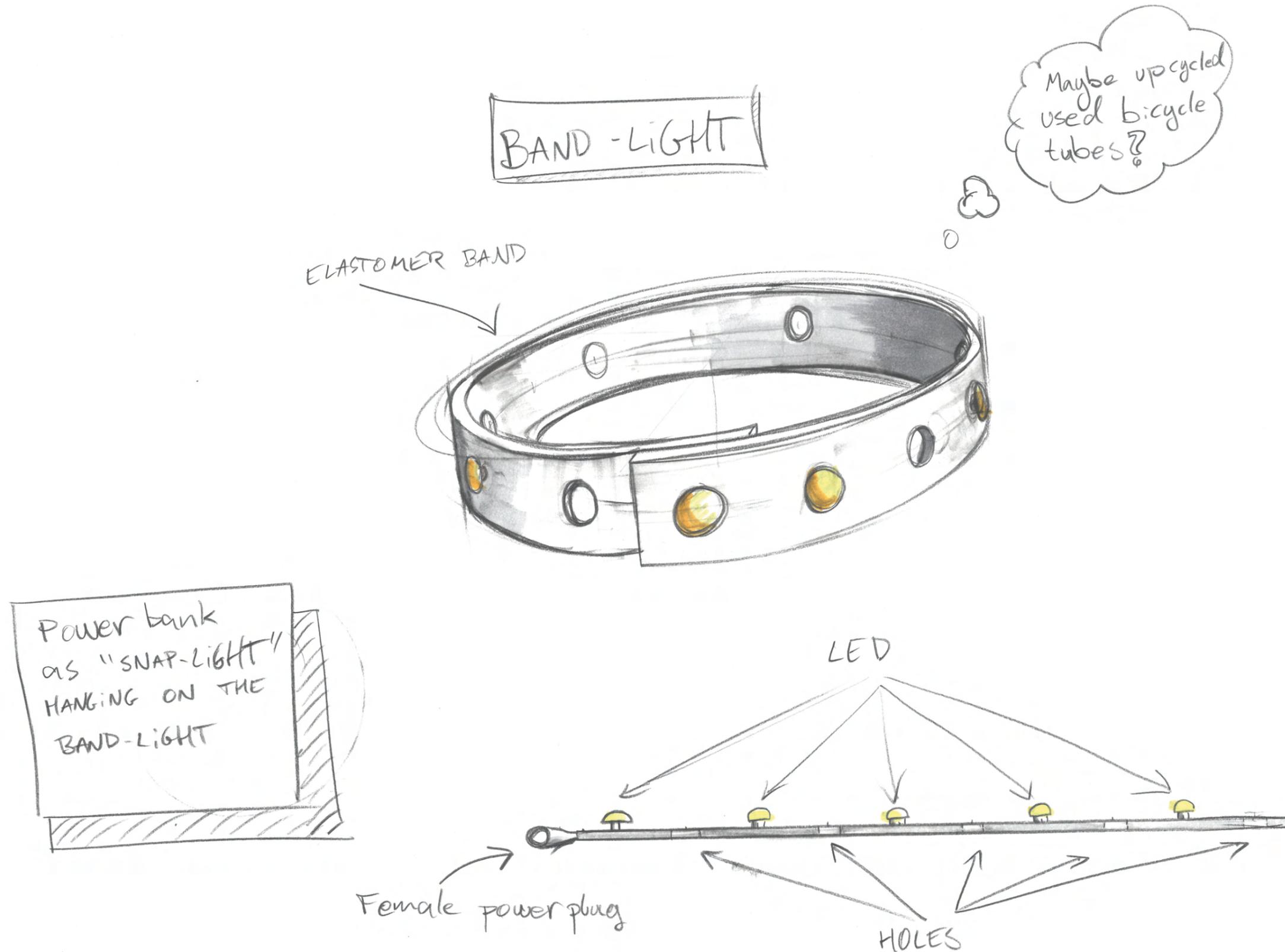
I looked into all the above. The parasol lamp came in to play at this point of time.

Narrowing down

I was now ready for some concrete more detailed solutions.
This left me with a handful of possible concepts.

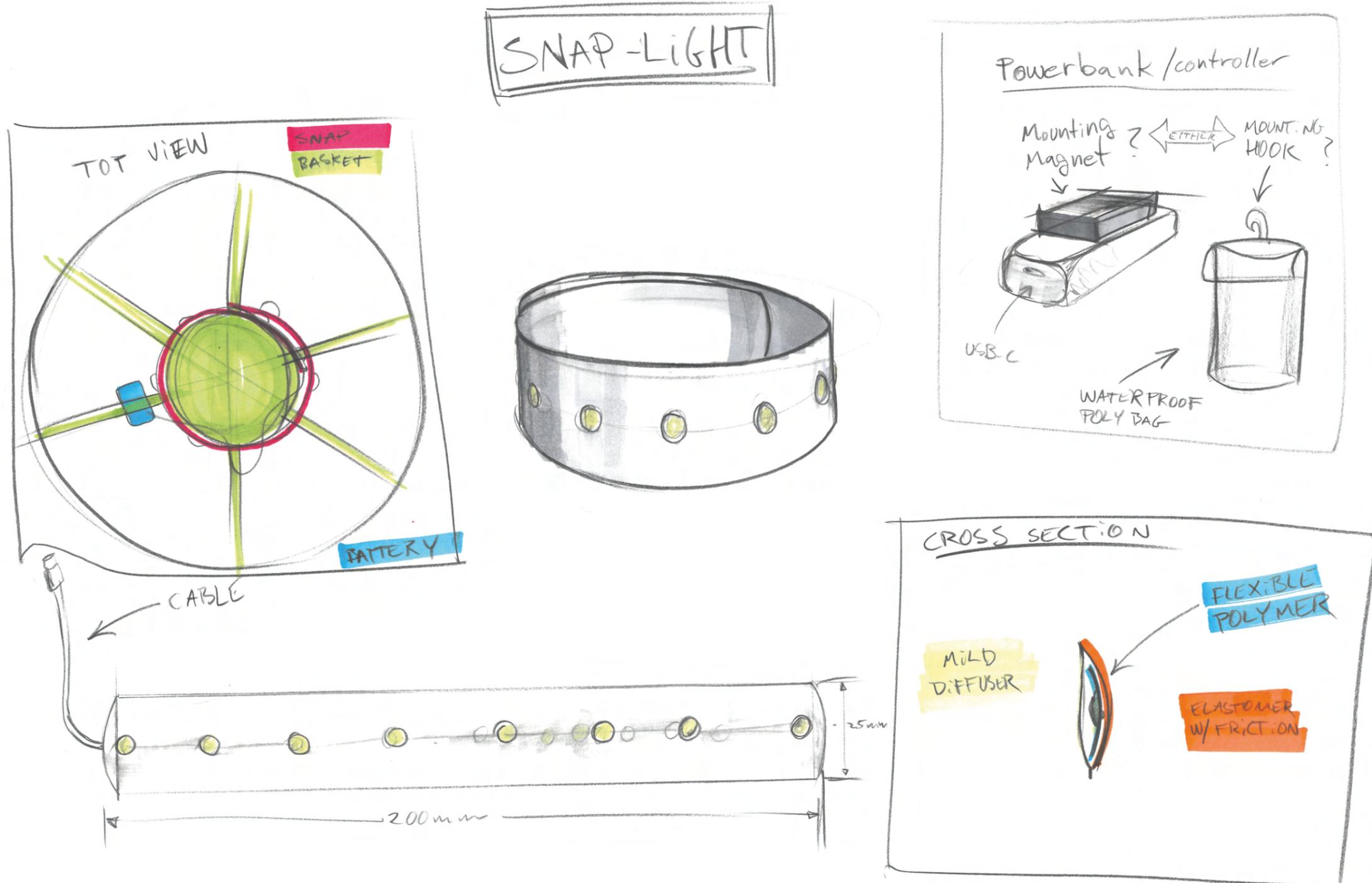
The wrist watch snap

This concept's main idea is to have an elastomer strap with holes and LEDs. The trade-off seems to be an external power supply/power bank and a bad light angle. This concept does not seem promising.



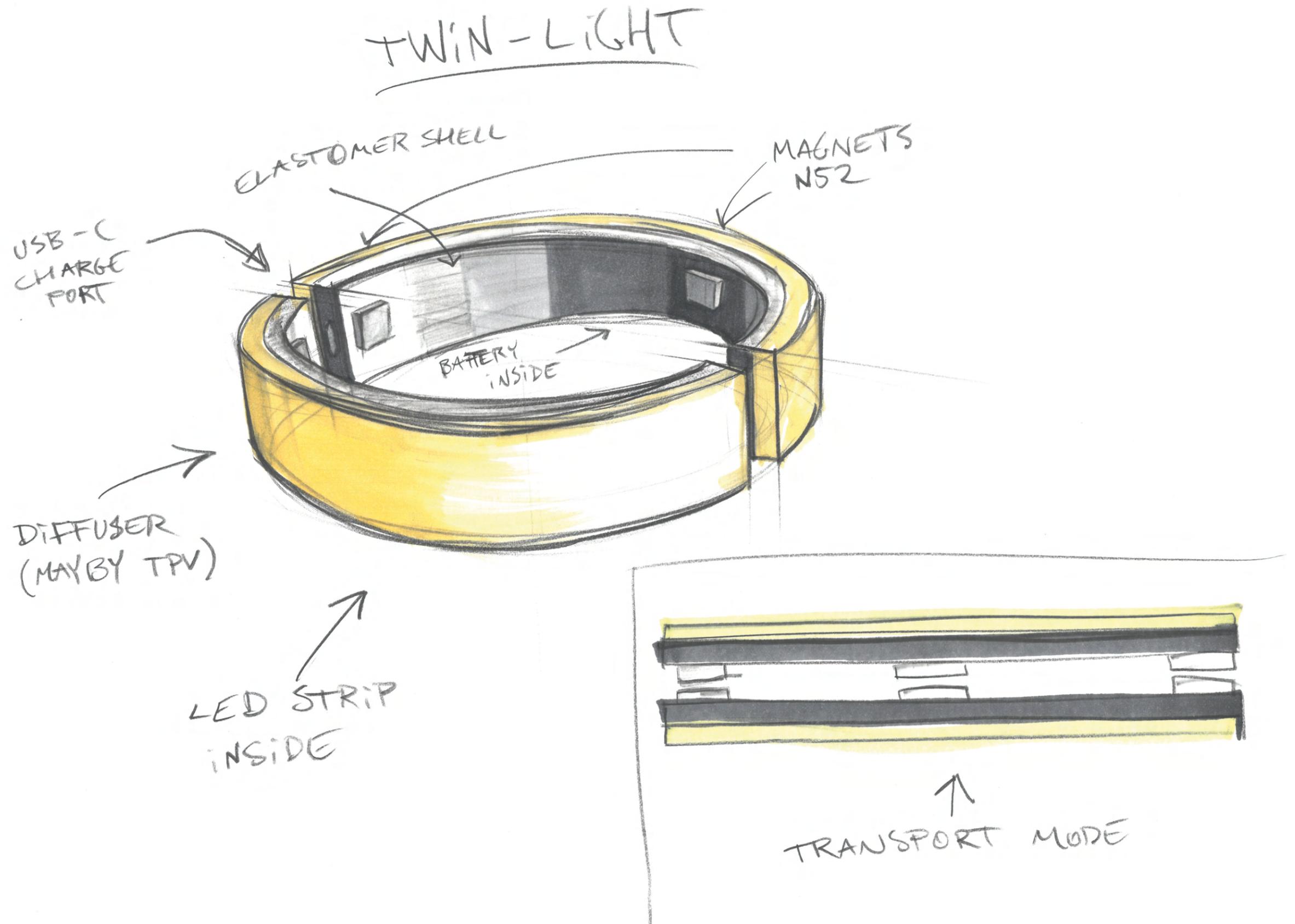
The reflex strap.

As with the wrist watch strap, this would just snap around the pole. It has both of the same trade-offs. It is, though, an intriguing solution.



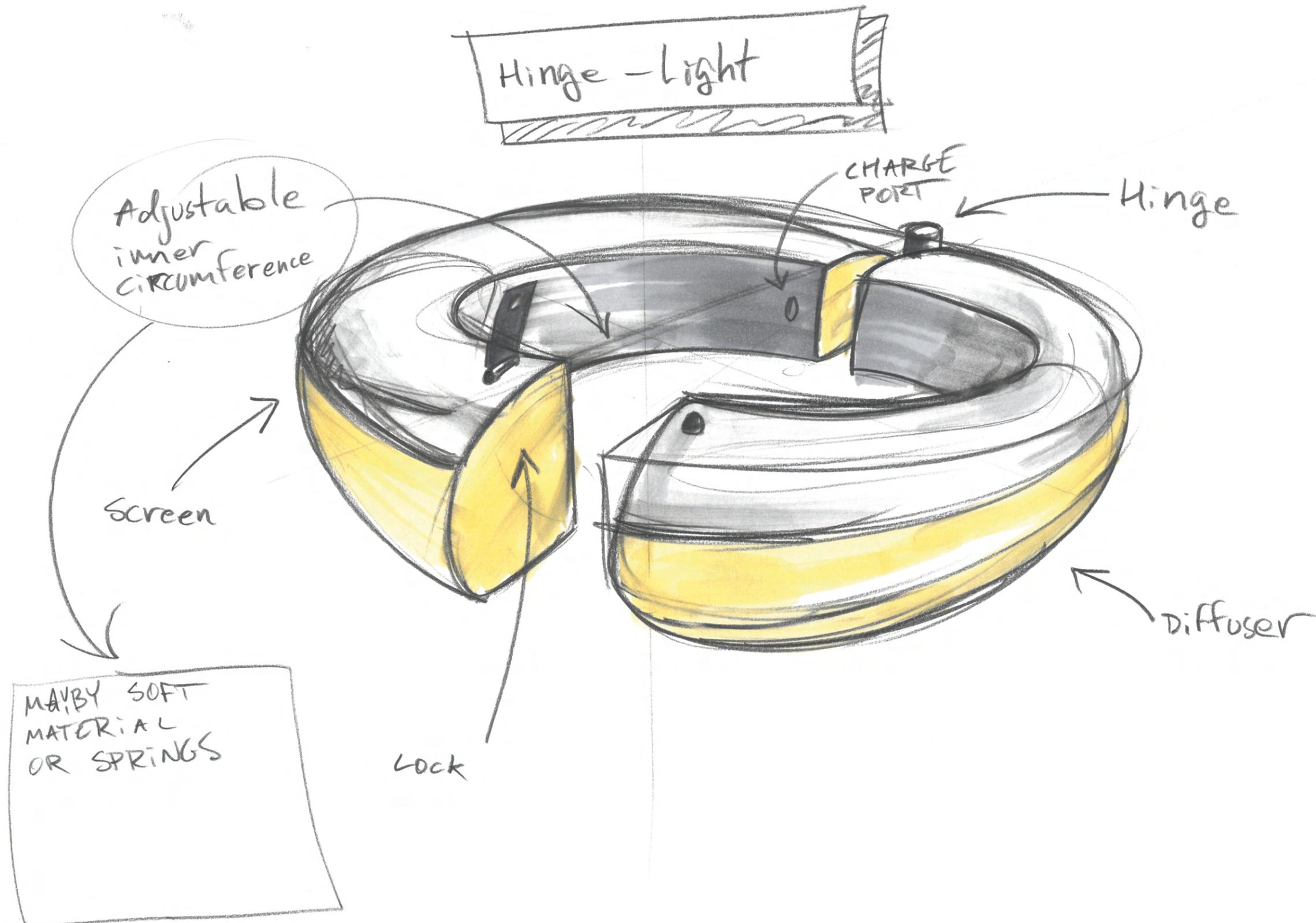
Magnets on the inside

I see that this concept lives up to the ease of transportation, since the two halves can attach to one another. This came in on a first place.



The upgraded parasol lamp

This lamp has the main advantage that it is already a proven concept. Although it is created for another scenario, I could upgrade some features to suite my design brief. This is also a favourite



Choosing between the two

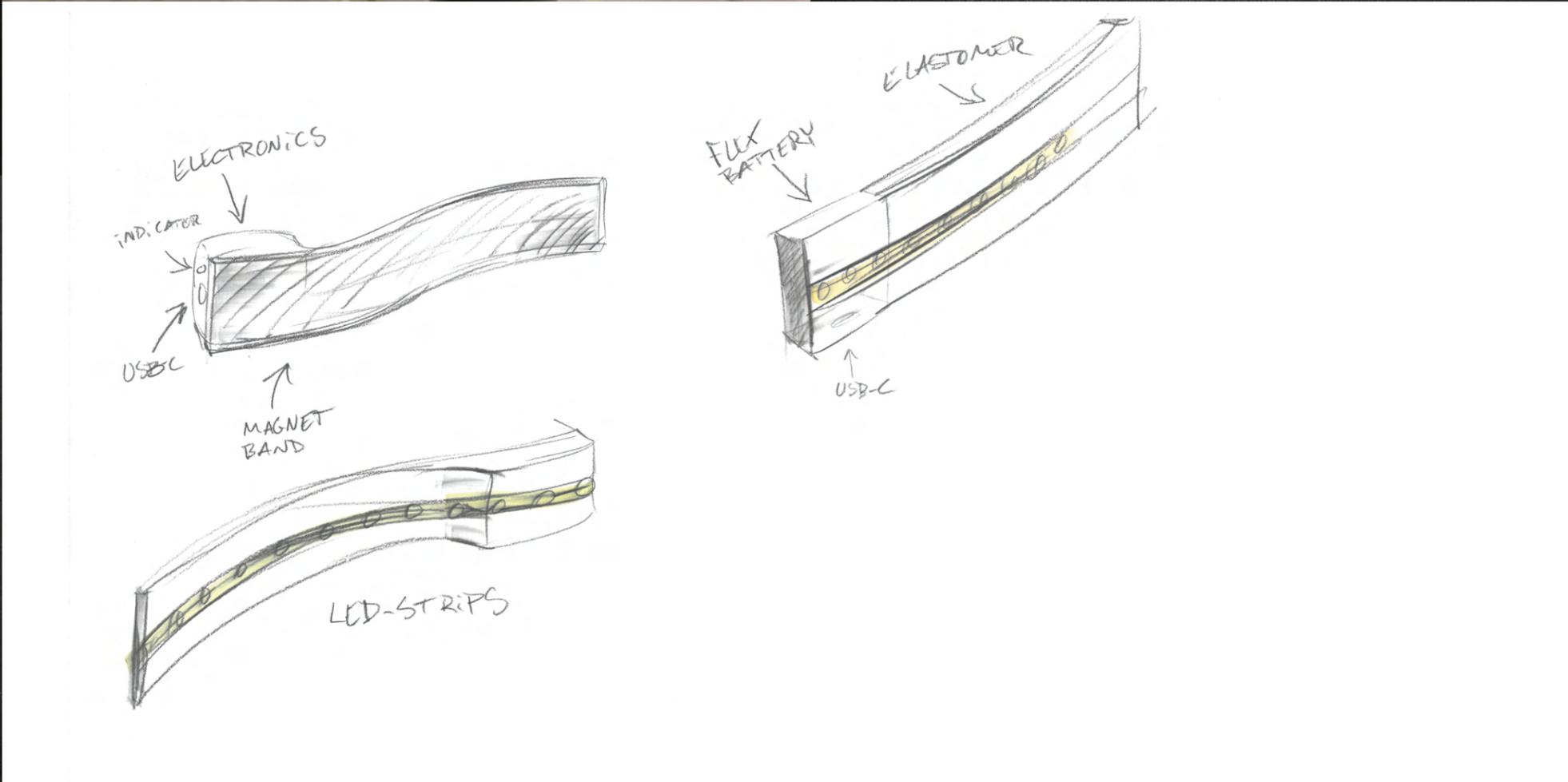
With the “Twin light” and the “upgraded parasol lamp” as favourites, I went further into the process.

Long story short after some drawing and prototyping, I realised that it would be too difficult to include battery and electronics in the magnetic solution.

Since the main function of the parasol lamp already exists, I did not prototype it. I went straight on to CAD.

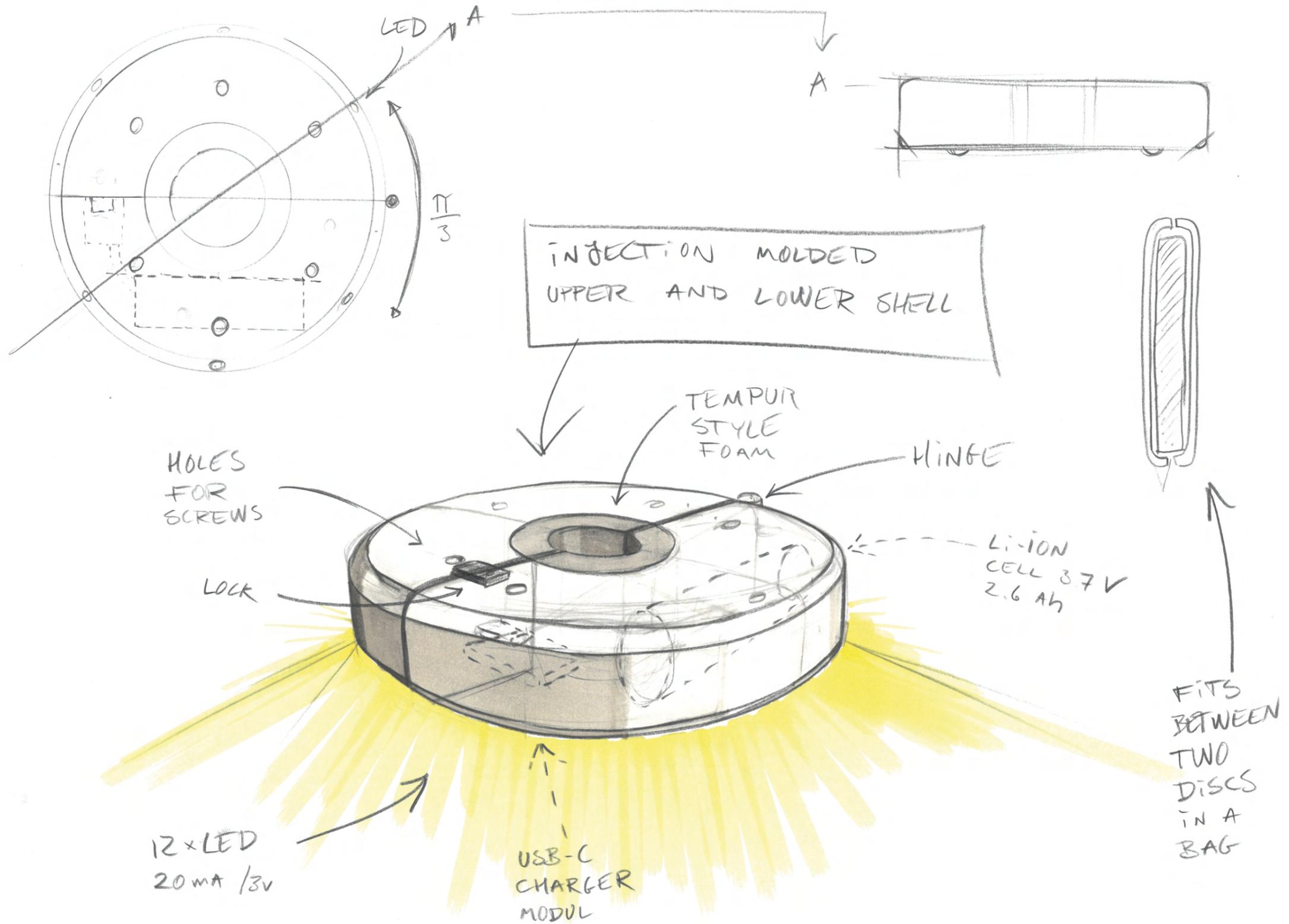
The magnetic solution.

I felt it would be best to use only one strap. Since it would be more convenient to carry only one device. It was very difficult to hide the electronics or place them in any meaningful or aesthetic maner.



The Parasol lamp

During this iteration I realised some new stuff. This version could be transported inside discs. It would emit light in a desired angle. It had room for electronics. It could be easily mounted. I had to kill one of my darlings, though. The magnets.



Playing with electronics

I tried to get an overview of the internal components. Just to have an idea of the size limitations and relational positioning in the CAD model

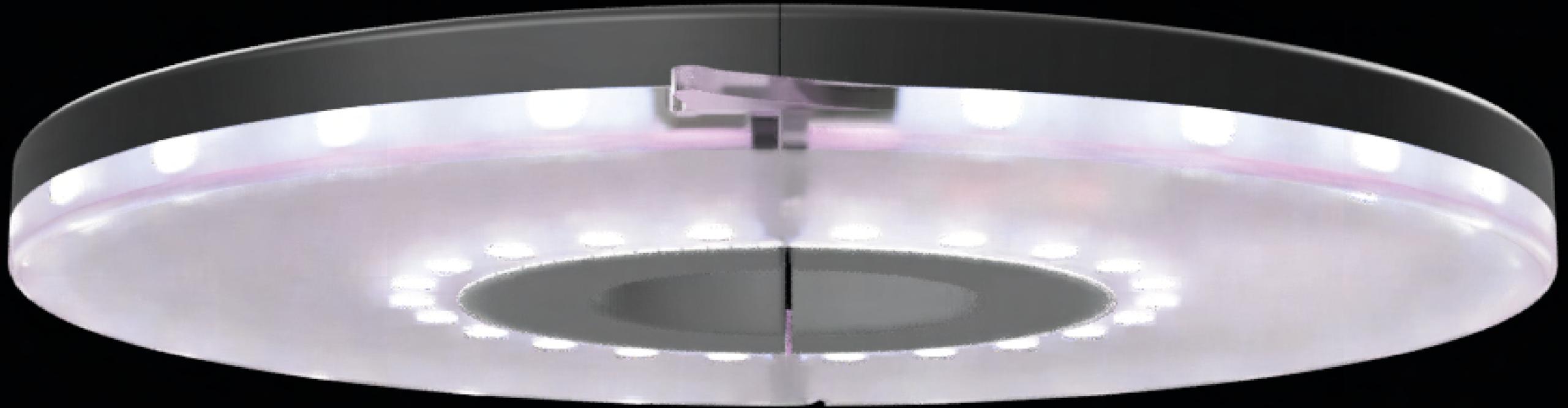


CAD modelling

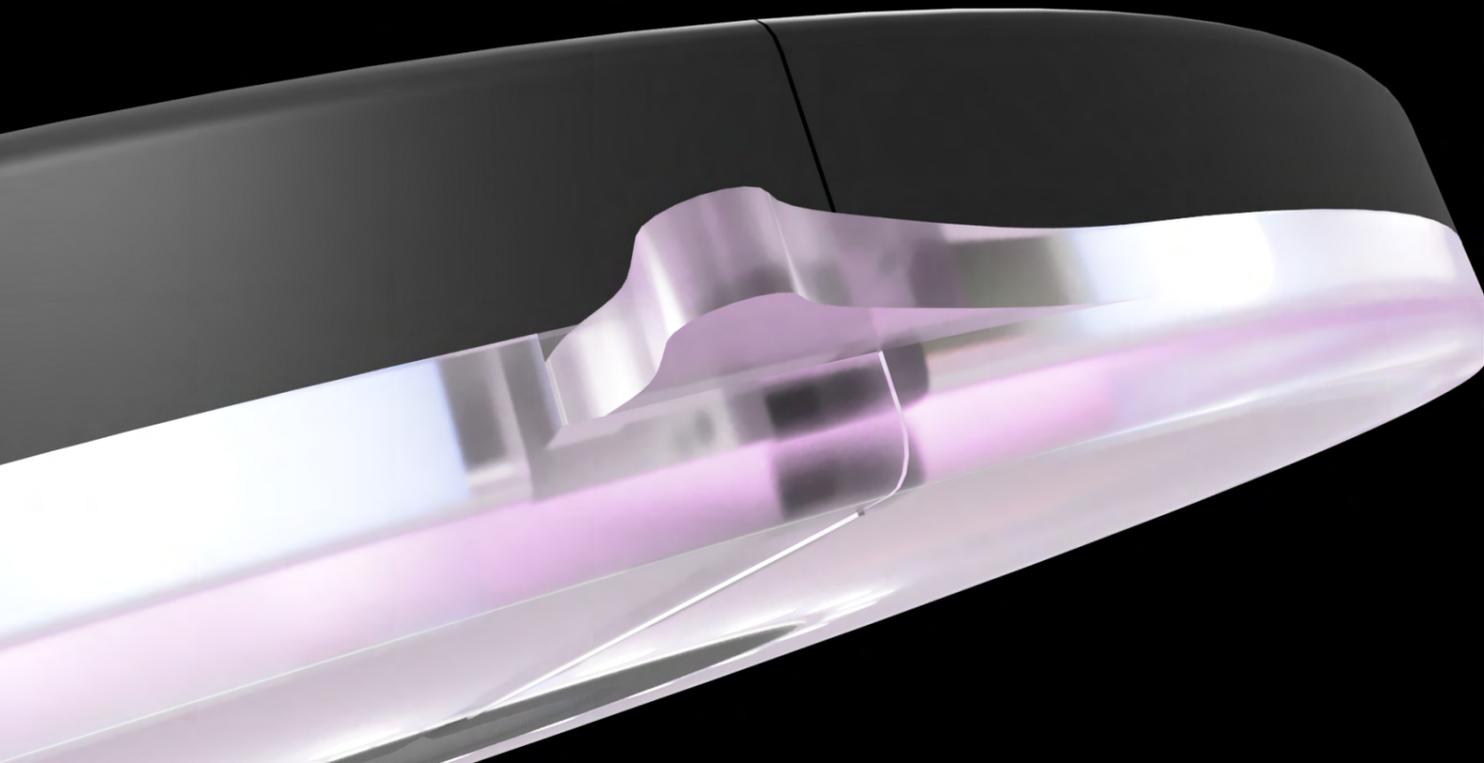
While working in Fusion 360 I experimented a lot. I made the different components to fit. I constructed the model so that it was water proof. I integrated the styles from the mood board. I placed a fitting so that the different openings would not allow water to enter. I created the design, so that it could not be charged while operating (it can blow the LEDs).

On the following pages I will try to create an overview of the features

Even light



Snap opening



Magnetic Power button

USB-C charging

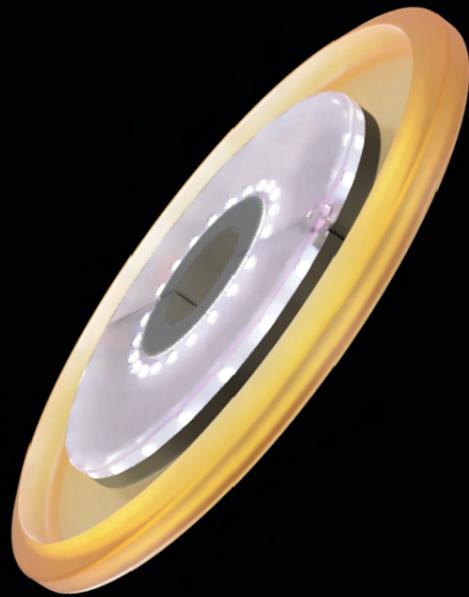


Pogo connectors will disconnect when charging

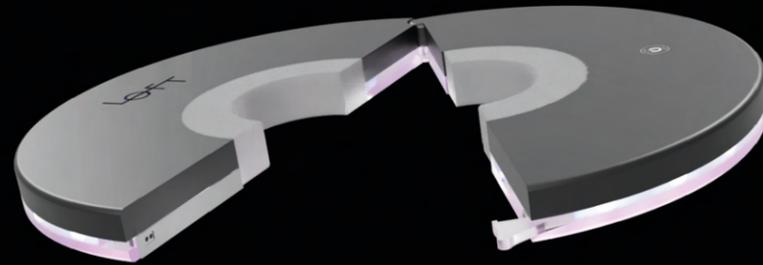


User scenario

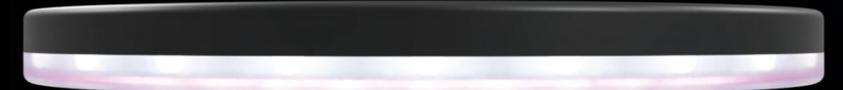
Carry the Photon
in a disc

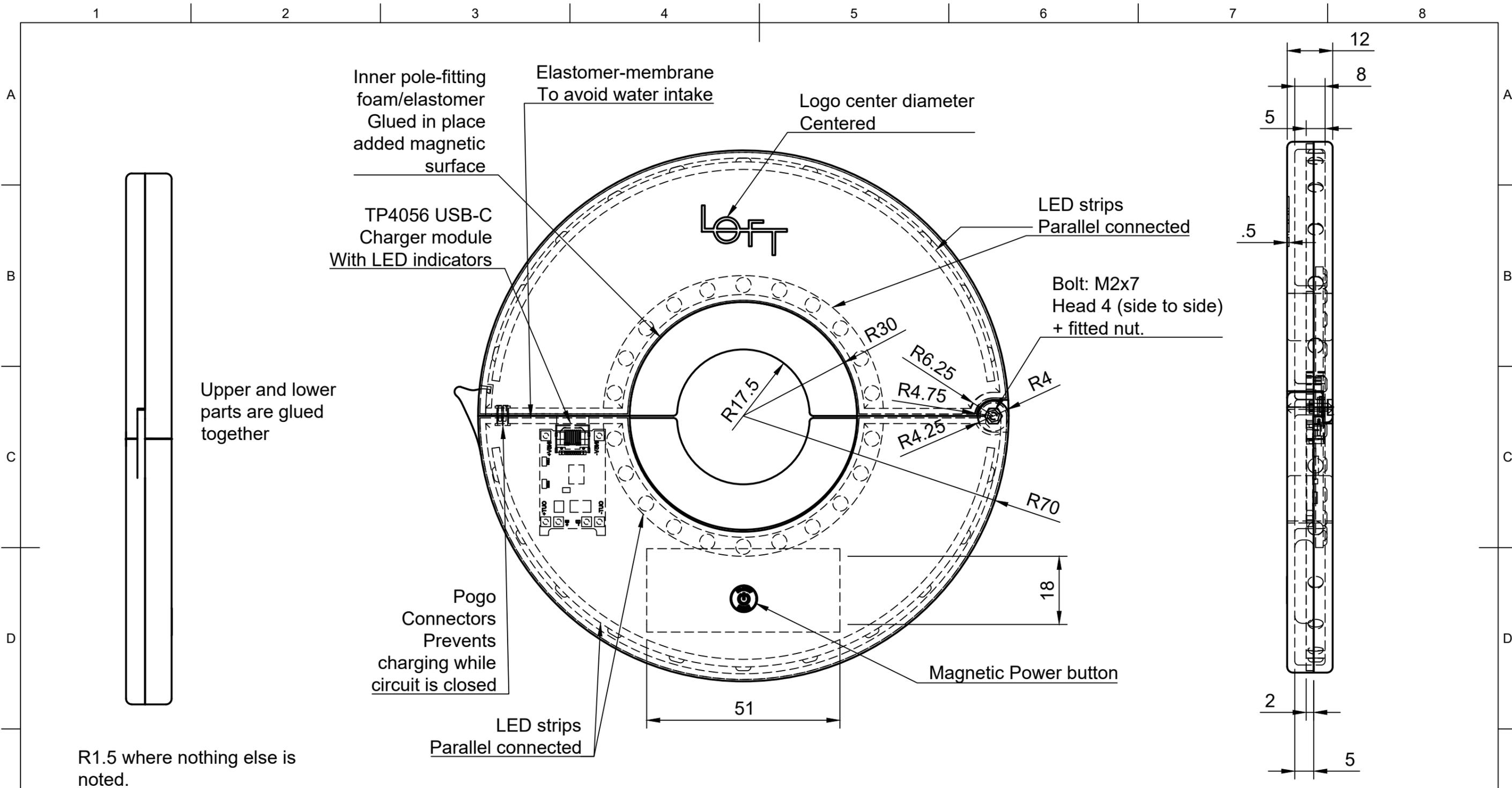


Open it using the
small tap.

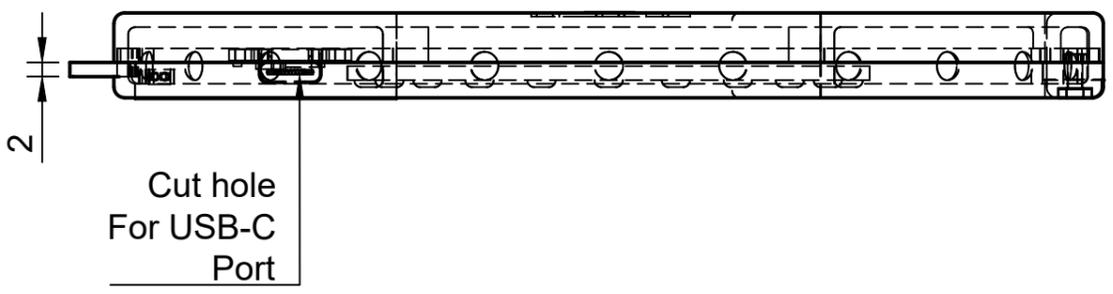


Close it around
the pole
and turn it on





R1.5 where nothing else is noted.



Dept.	Technical reference	Created by Morten Deurell 20-01-2023	Approved by
Units mm Materials Polycarbonat/ABS Steel/brass PCB LED		Document type System drawing	Document status
		Title Photon	DWG No.
		Rev.	Date of issue
		Sheet 1/1	