

**DM2316-DM2601  
Design Process 2  
(2021/2)**



**Project 2 (Minor  
Project)**

**Bora Sen 2017194**



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This term, we did a micro project for the company “Scalextric” in the Desing Process 2 module. They wanted a new controller design for them. I chose the first brief which is the analogue controller brief. I worked on this project throughout the 2nd term, did lots of revisions, corrections and spent a lot of time on it. Hope you will like it.

# Gantt Chart

# PDS

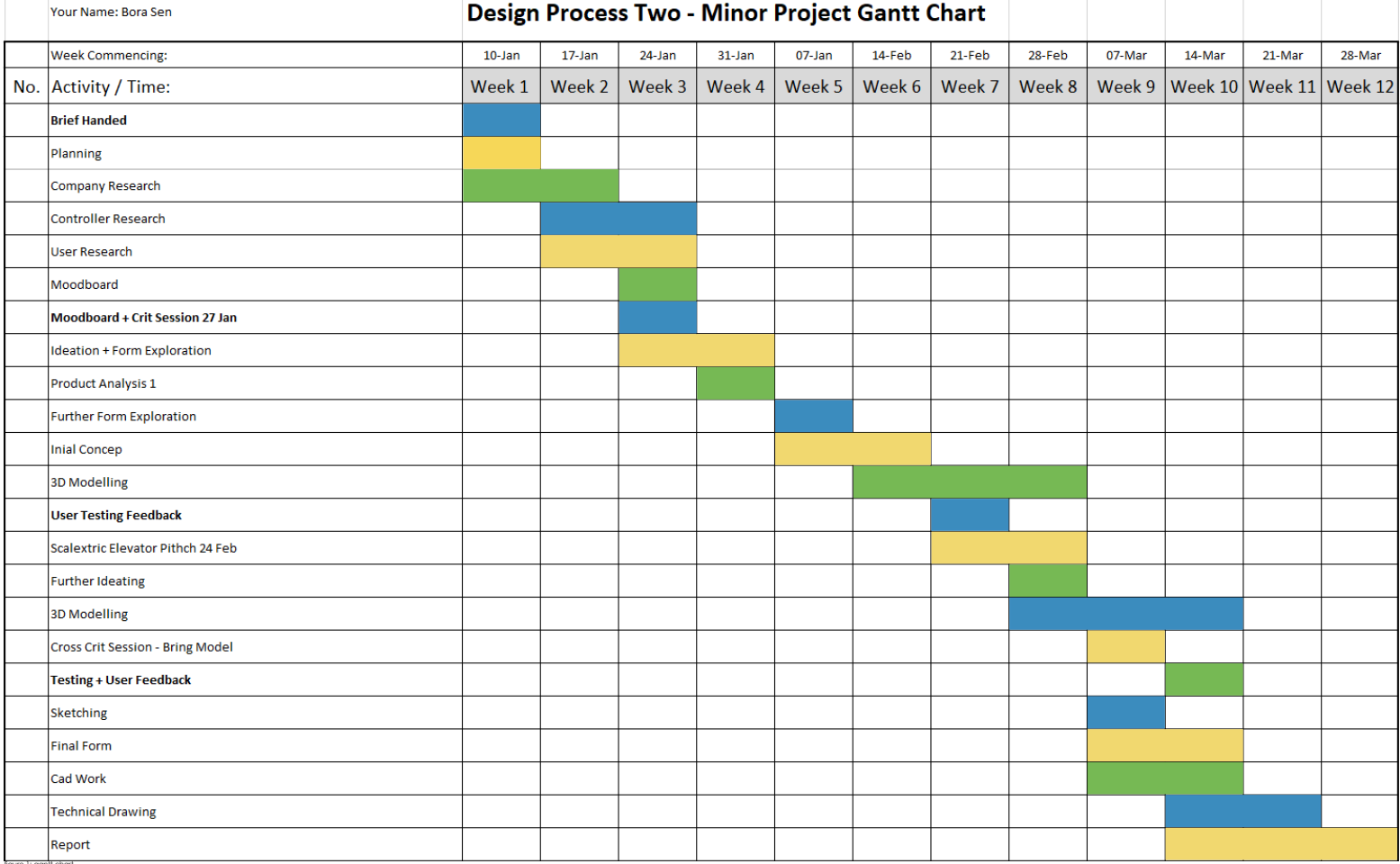


Figure 1: gantt chart

Target Market / Age Group:

Size of Hand Controller:

Weight of Hand Controller:

Input Device (button, trigger, etc.):

Connectivity & Power source:

Length of Service Life:

Product Lifespan:

Cost of Product / Retail Price:

Manufacturing Processes Involved:

Manufacturing Volume:

Aesthetics / Materials Used:

Haptics / feedback technology:

Safety Features:

Safety Standards:

Product Disposal:

5 years and older

144 x 66.55 x 68 mm

200 grams

1 throttle button, 2 switches, 1 cable holder, 1 retractable cable reel,

Connected by wire to the connector.

5 years

4 years

35£

Injection Molding, CNC Machining

10.000 units

ABS Plastic, Aluminum, Rubber, Polyester, RGB Lightning,

There is no electronic haptics because of the brief that I have chosen

There is no battery inside which prevents any explosion. The cables are stored inside a cable reel which secures the cable.

Complies with BSI standards

Aluminum and ABS plastic is going to be recycled. Cables can be used again



# Company Research

“Scalextric” is an analogue and digital slot car manufacturer based in Hampshire, England. The production of the products began in 1957 since then they are the leading slot car racing company. They have turned to digital technology in 2004 and started its first digital racing set. The company is currently owned by the brand “Hornby”.

There are some other companies in the market that are Scalextric’s competitors which are: Carrera, Fly Shot, Ninco and Racer.

figure: scalextric race track and lap counter figure: scalextric set



figure: scalextric car figure: scalextric car

# Controller Research

The analogue controllers have a very easy principle of operation which involves a resistor or a rheostat which changes the electric power that goes to the racetrack. The user can change the level of electricity by pulling the trigger which slides the cursor that is touching onto the resistor. Thus, more the user pulls the trigger, faster the car goes.

Higher the resistance of the rheostat gets; sensitivity increases accordingly and generally the resistance of a controller ranges from 10  $\Omega$  to 60  $\Omega$ .

figure: old analogue and digital controller

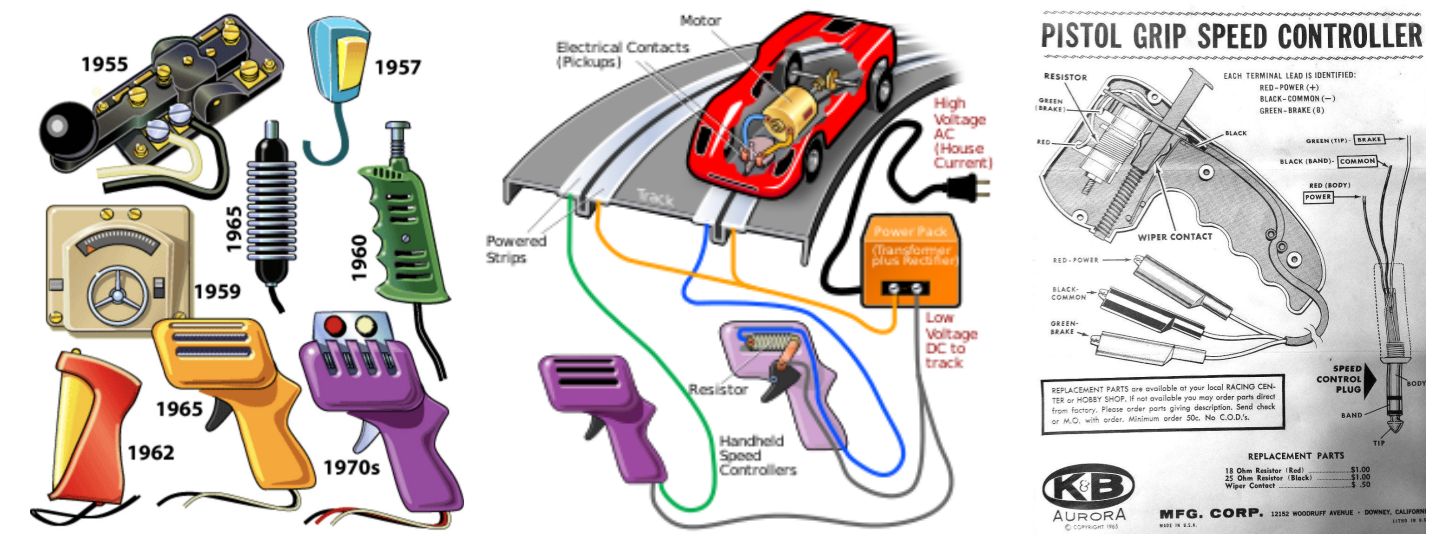


figure: previous controller designs over the years

figure: slot car racing working theory

figure: old speed controller cross section view

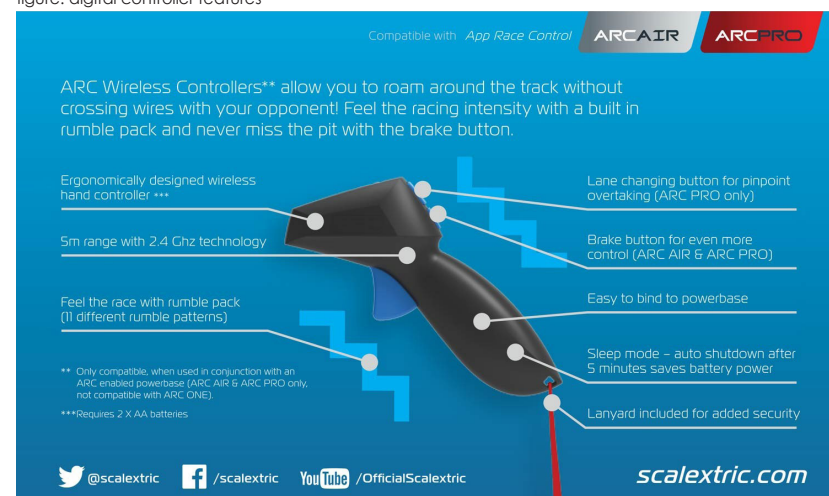


figure: inside of the analogue controller



The design of the controllers has been changing slightly over the years of production but Scalextric controllers are mainly has a trigger design that looks similar to a gun shape. The ergonomics of the controller can be differed from one design to another because every user has a different hand size but the ultimate goal of a controller is to have the most ergonomic design and the best sensitivity on the trigger while remaining lightweight. The analogue controllers today are generally made out of ABS plastic which is easy to manufacture and relatively cheaper than other materials that can be used.

figure: digital controller features



# Mood Board

figure: scalextric analogue controller racing



figure 6

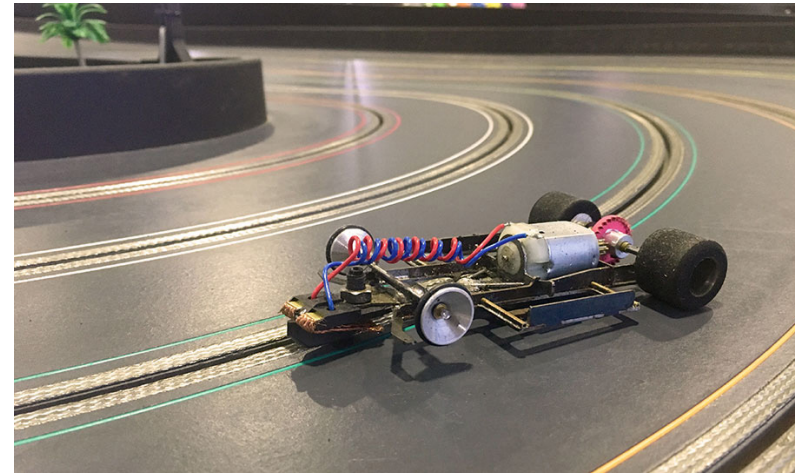


figure: shift indicator lights on a wheel accessory



figure: inside of the analogue and digital controller

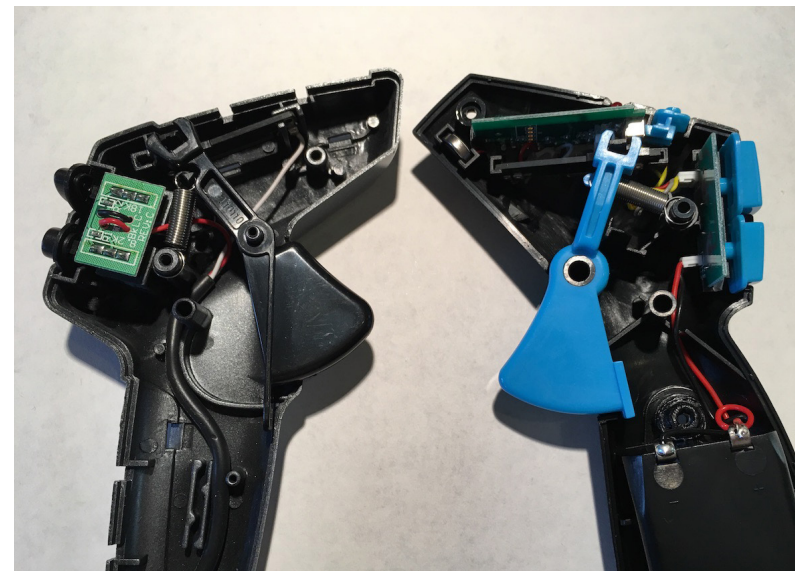


figure: slot car exploded view

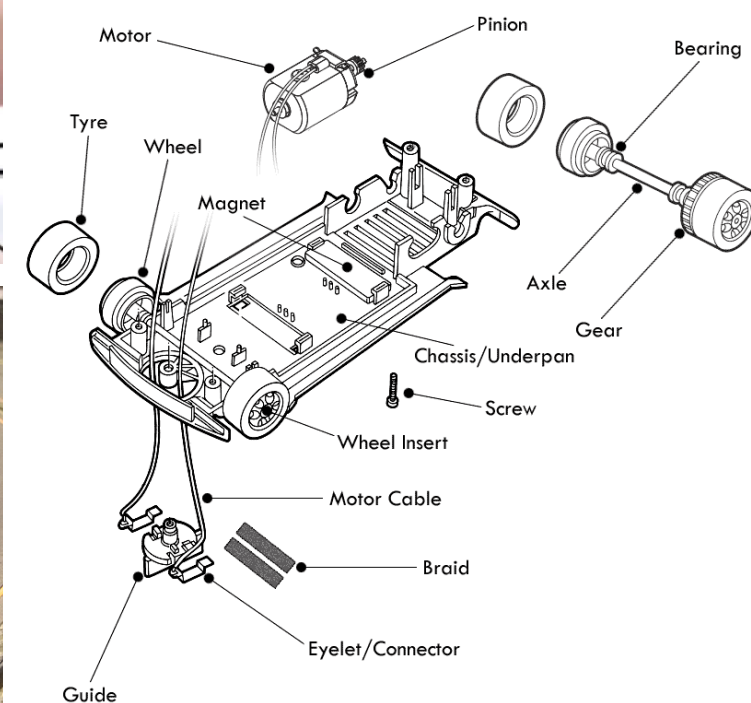


figure: some switch button examples





# Online Surveys

1. What is your initial thoughts about the design of the controller?

The controller kind of seems to be too thick but has good handling spots to hold it comfortably

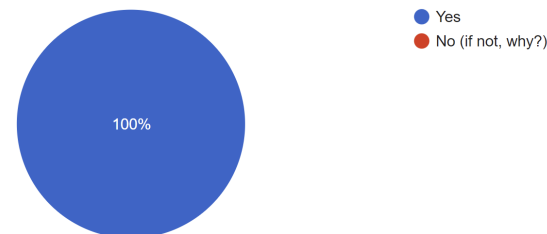
Looks comfortable to hold. Nice finish

Aesthetic

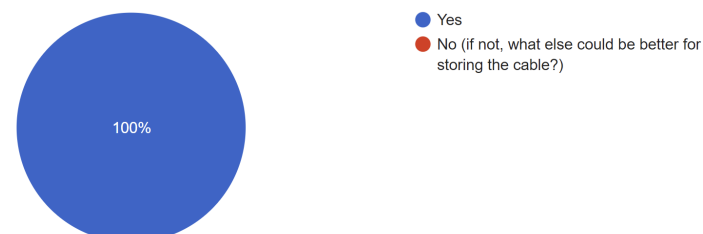
it looks like a proper controller. it looks aesthetically pleasing.

Looks decent

2. Do you like the colour selection of the product?



3. Do you like the retractable cable feature?



What do you think about the throttle button? Do you like the idea of using the throttle with your thumb rather than your index finger?

I prefer using my thumb than the index finger. The throttle looks nicely shaped with detailing that can allow you to fit your thumb nicely.

Yes

With my thumb

i would like to prefer to use my thumb because its much easier to control the sensivity of the button.

Yes I love the idea

What would you recommend to improve my design?

Have the body of the controller a bit slimmer because if the body of the controller is bigger and thicker the harder it is to grip comfortably

Final model looks great. If you want you can experiment with different finishes.

Softness is important

i want it more colorful but this looks elegant so that's okay.

Your design is great no need for improvement

# Anthropometrics and Ergonomics

As the first step of designing process, I thought that I should research about the dimensions and the ergonomics structure of an human so I found and read many different studies on it.

My product needs to be able to used by different age groups so I had to be very carefull about the sizing of my product. The user needs to be feel comfortable while using the controller thus I have picked the best suitable dimensions for my controller design.

I have made the initial physical models according to these measurments then by the design improves, I made some changes on the dimensions of the controller design. You can see the difference between my physical models clearly.

figure: hand measurements of men, women and children

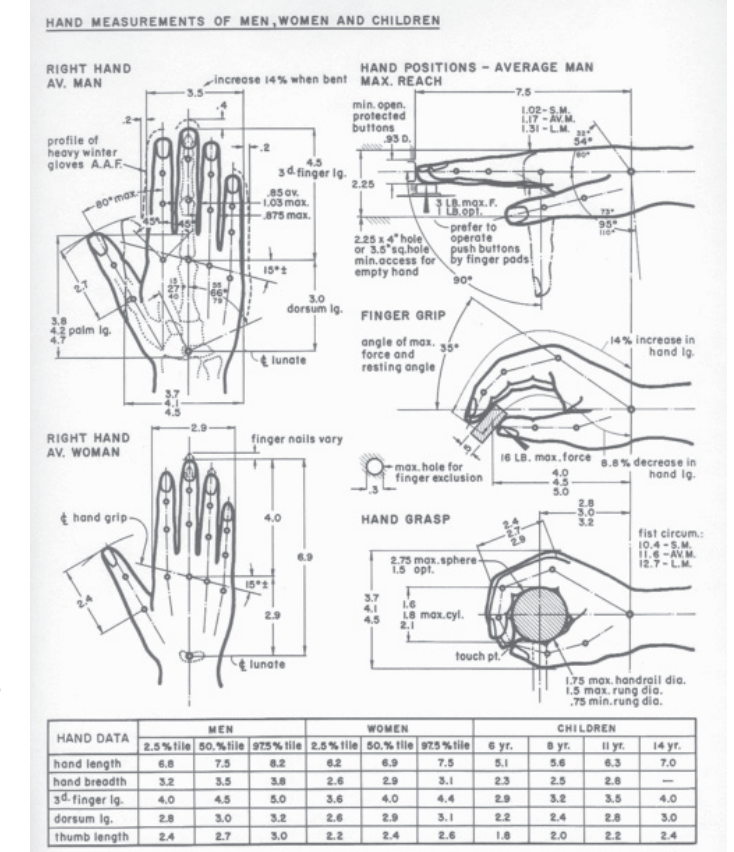


figure: hand measurements and ergonomics

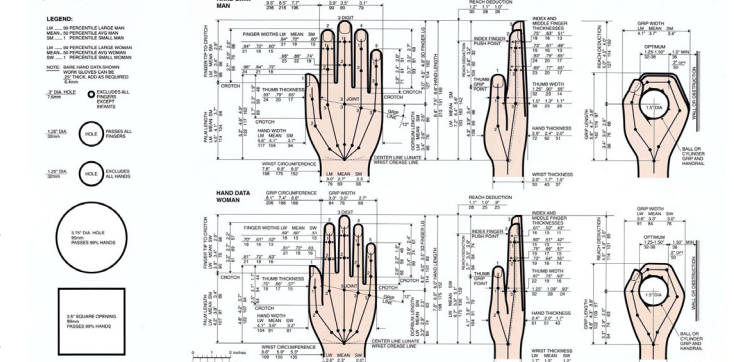
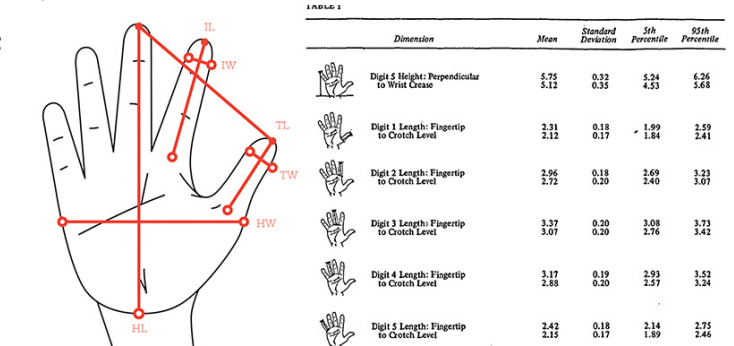


figure: hand dimensions





# Initial Sketches

figure: controller form and design exploration

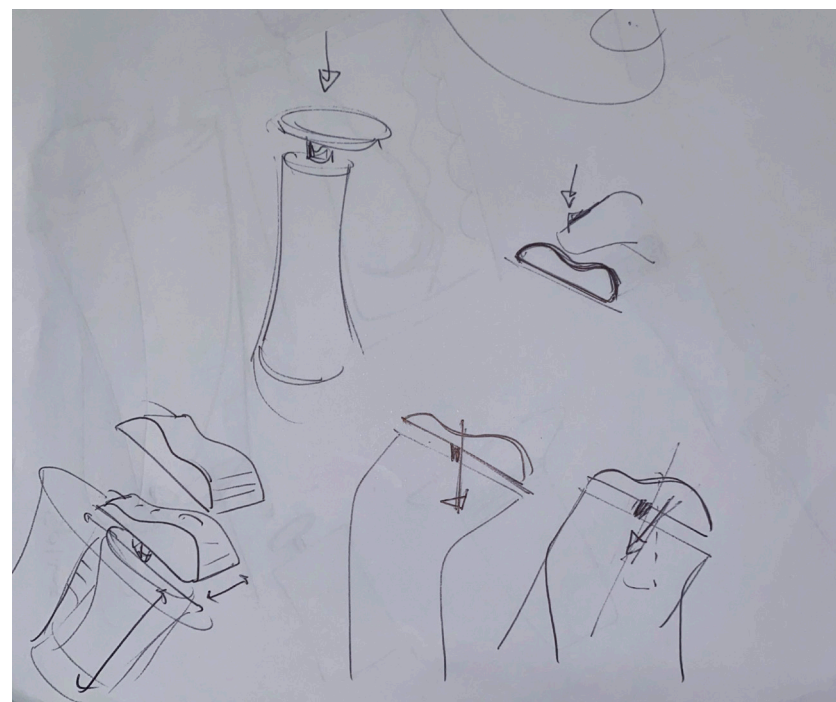
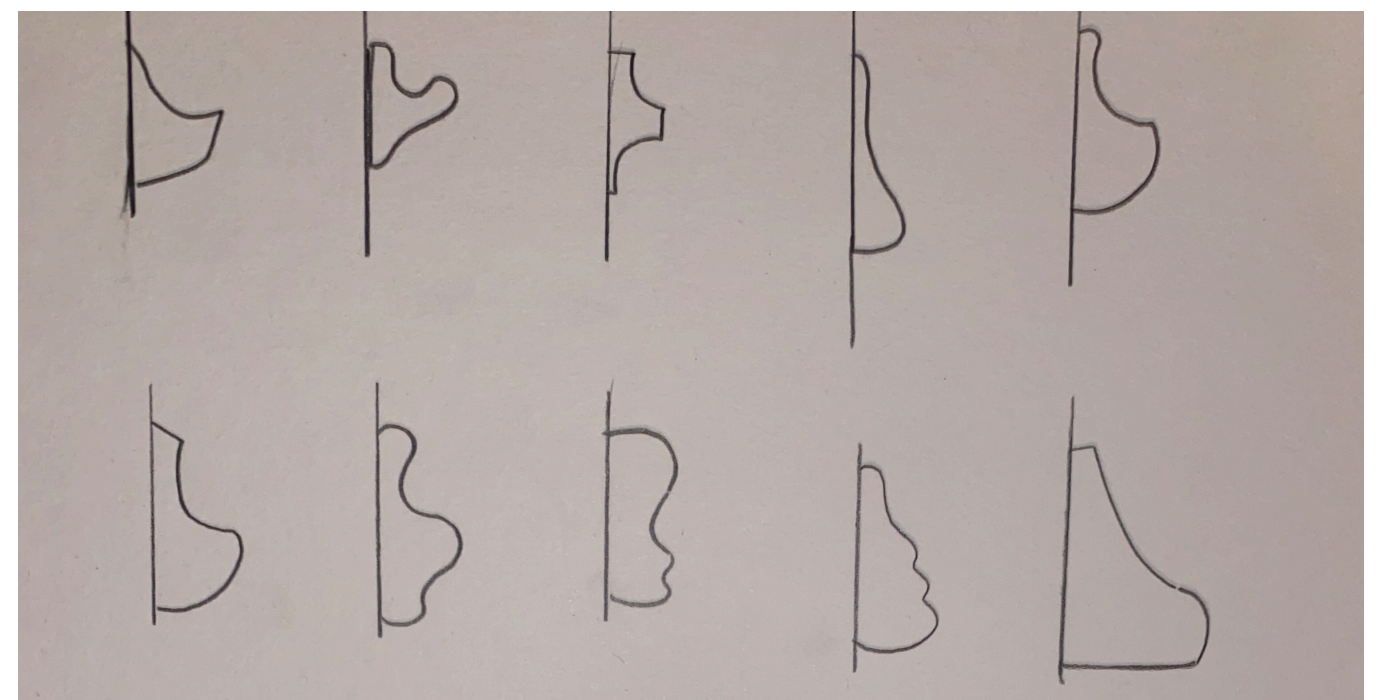
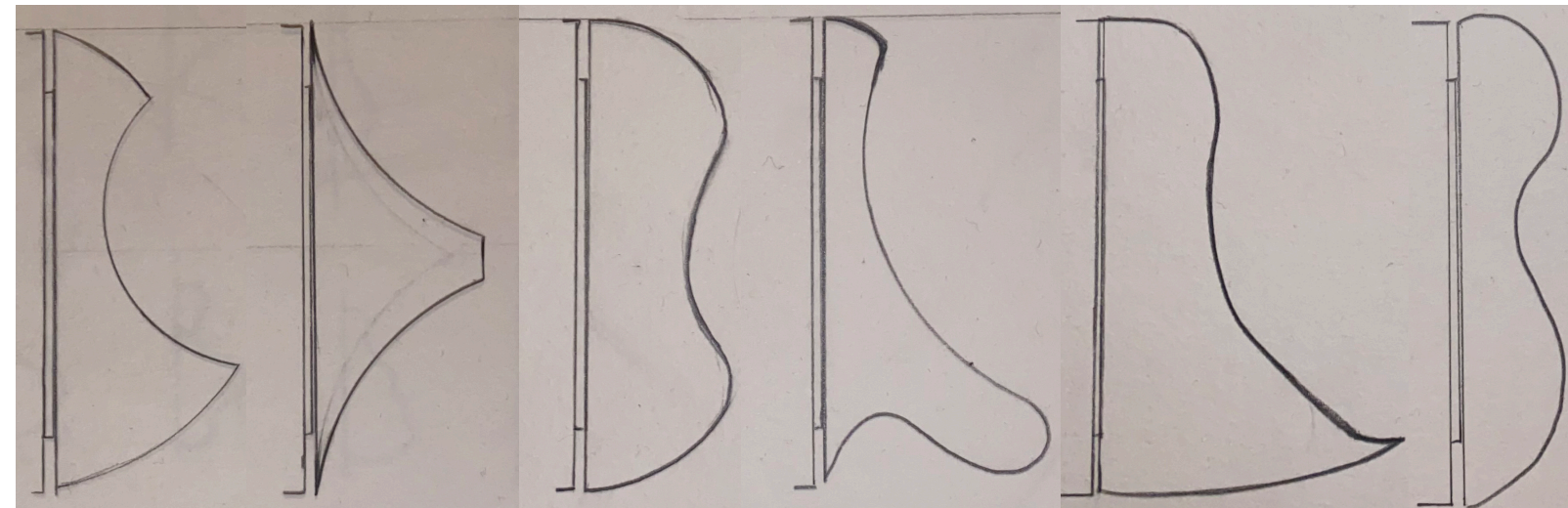
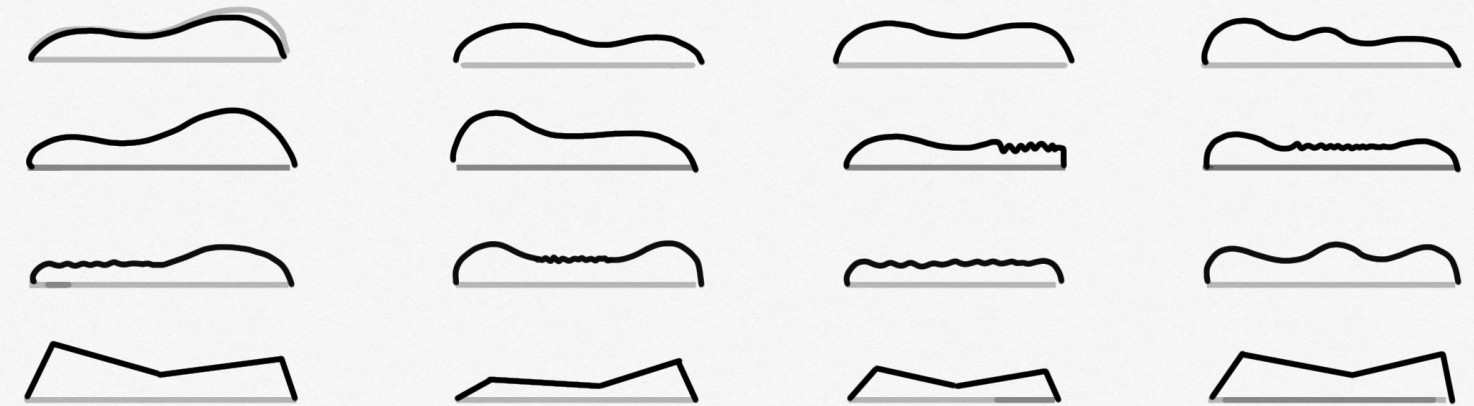


figure: throttle button form exploration

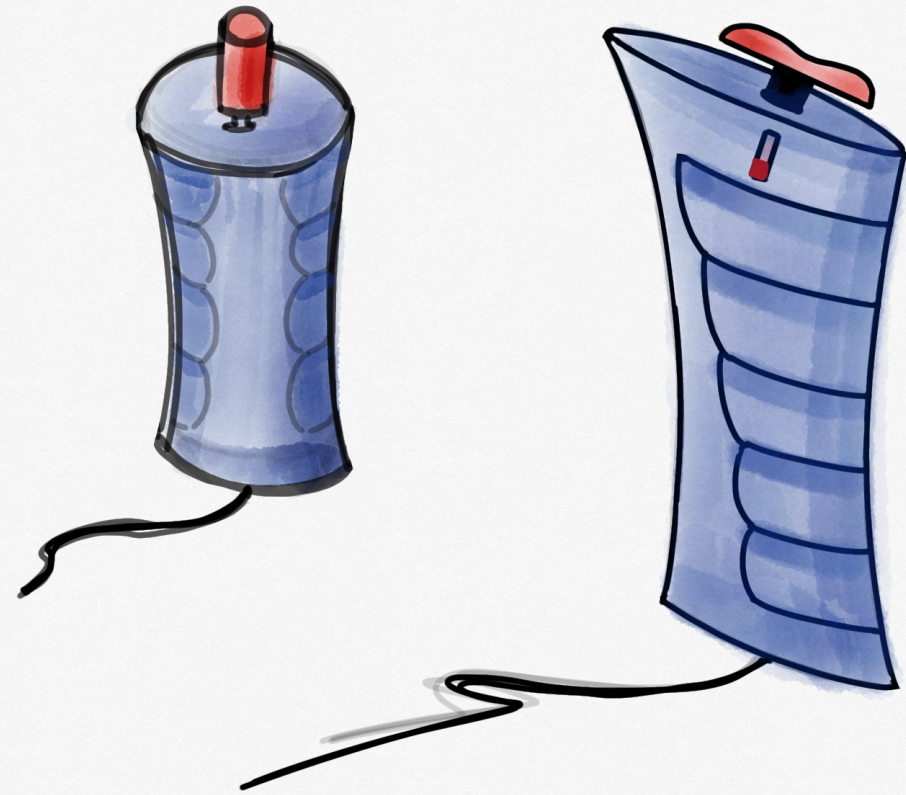
Throttle Button Design:





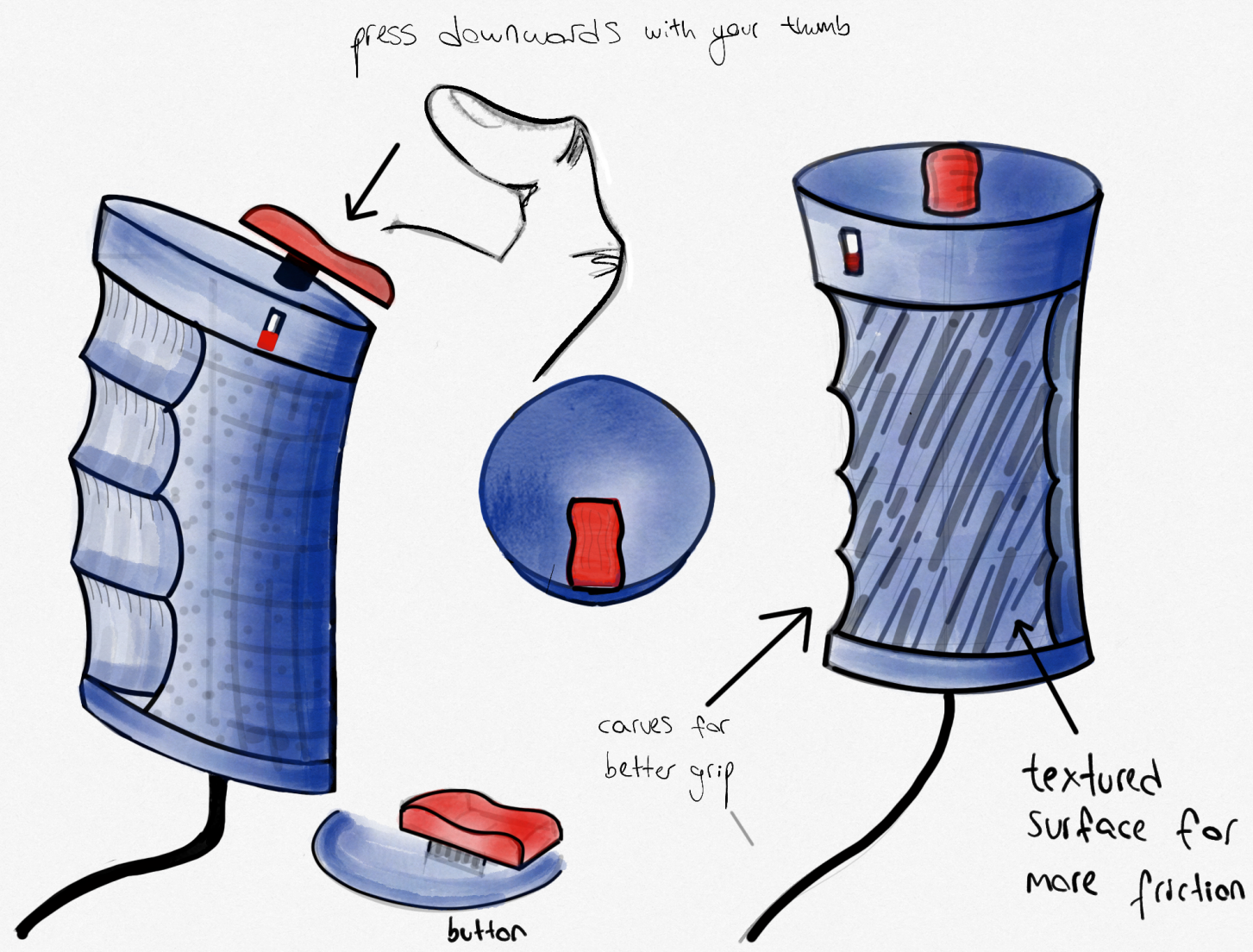
# First Concepts

figure: first concept



## Sketches 2

figure: second concept



# Final Concept Before Further Development

## Sketches

figure: final concept initial sketch

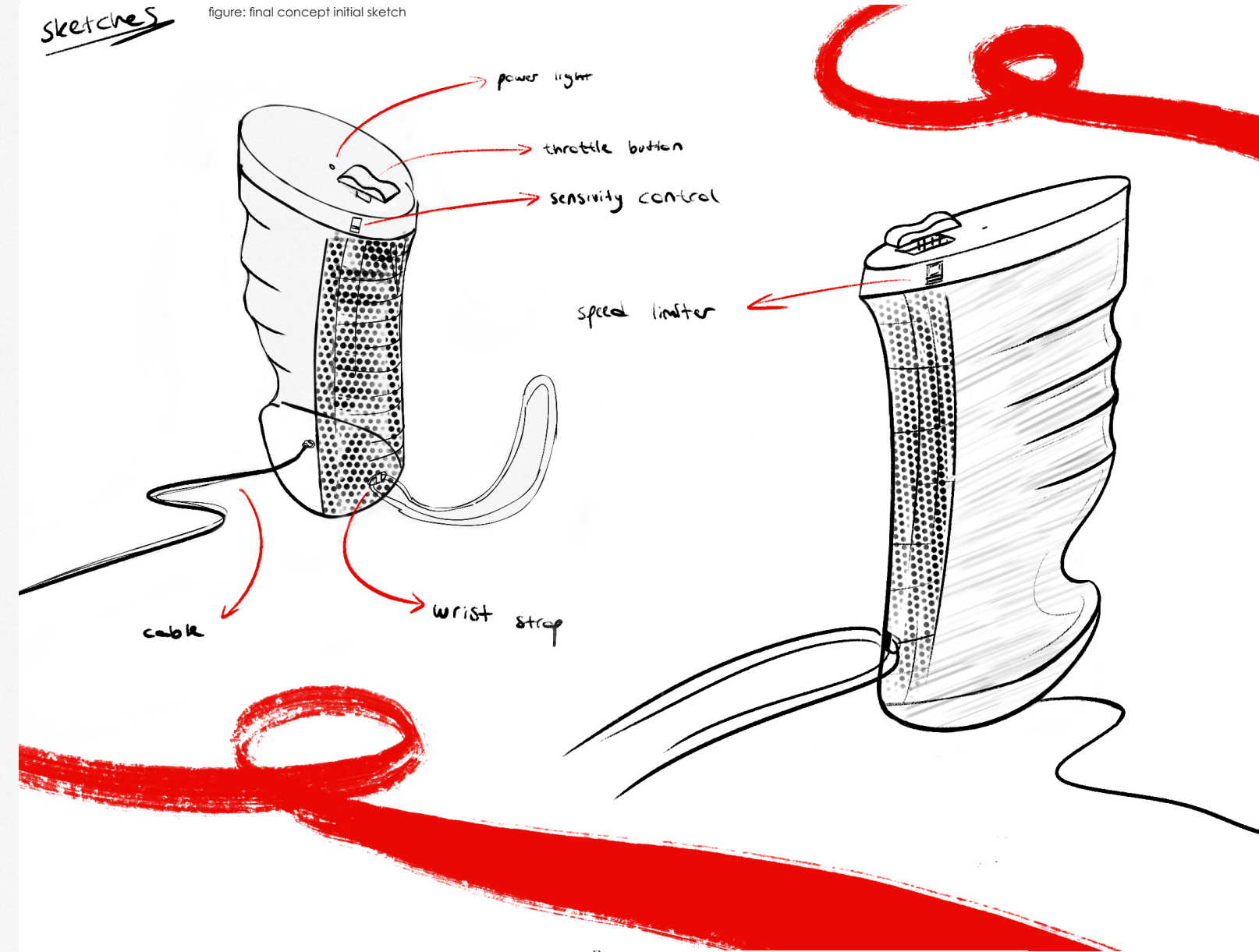
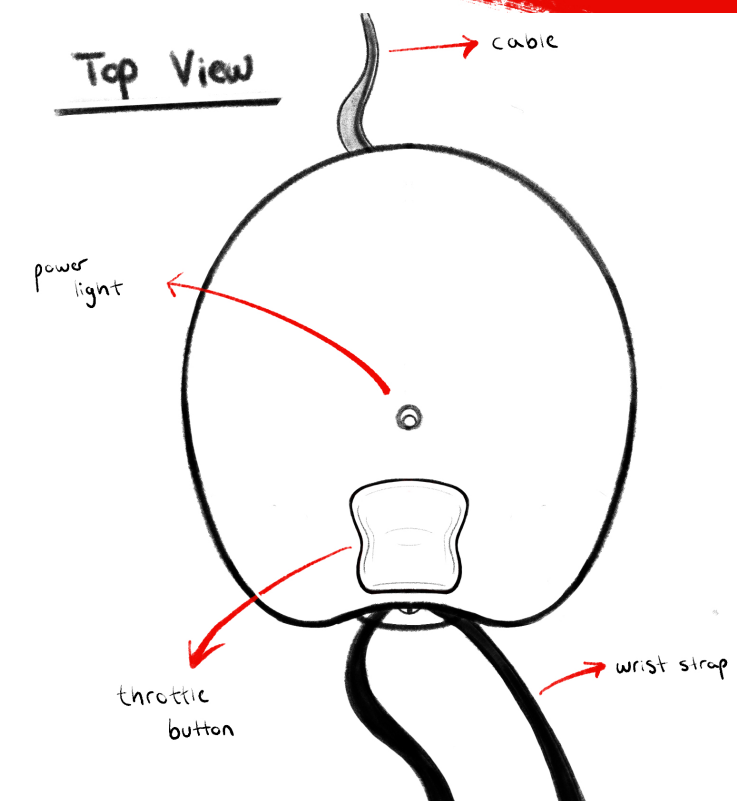


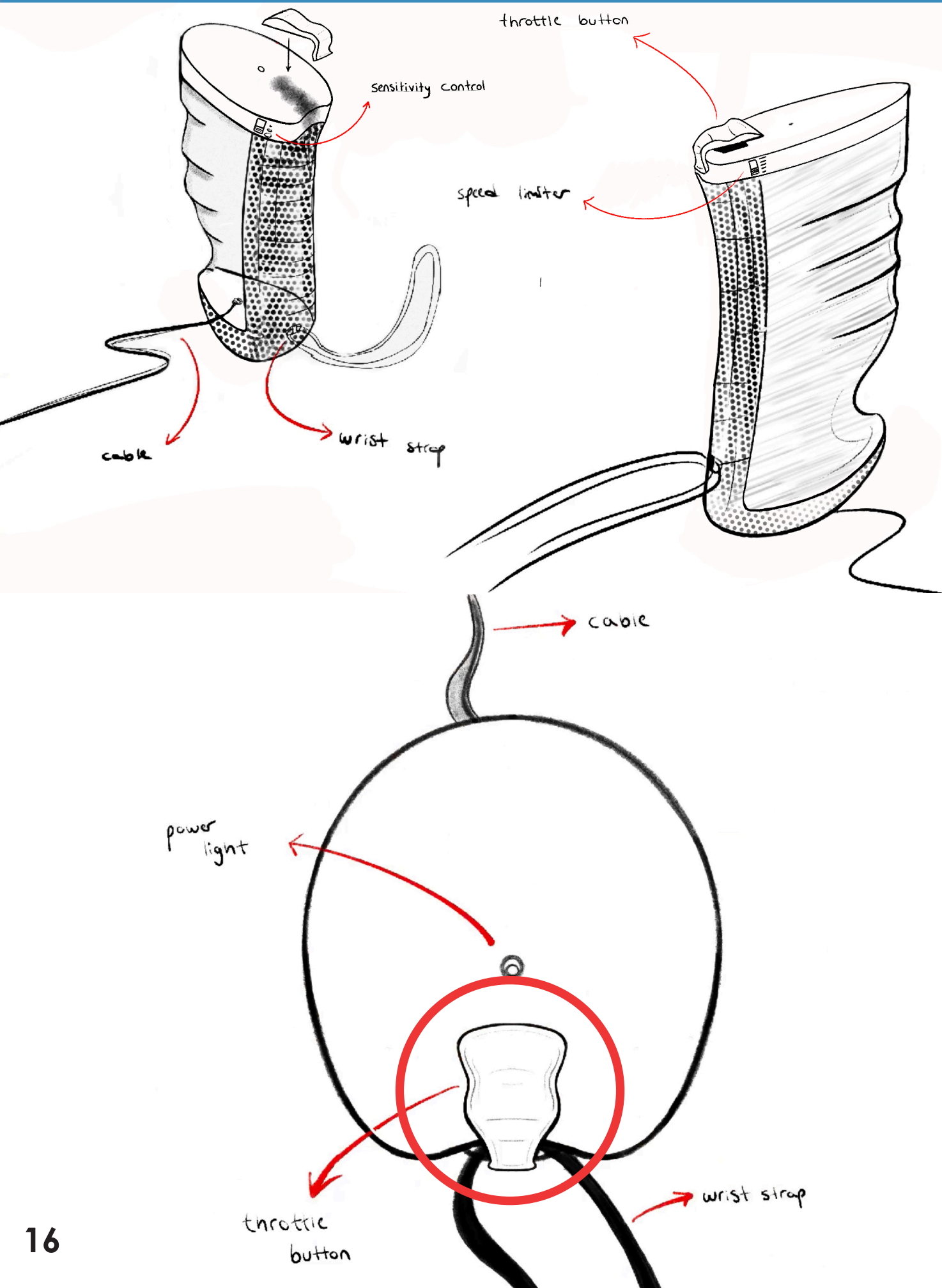
figure: top view

## Top View



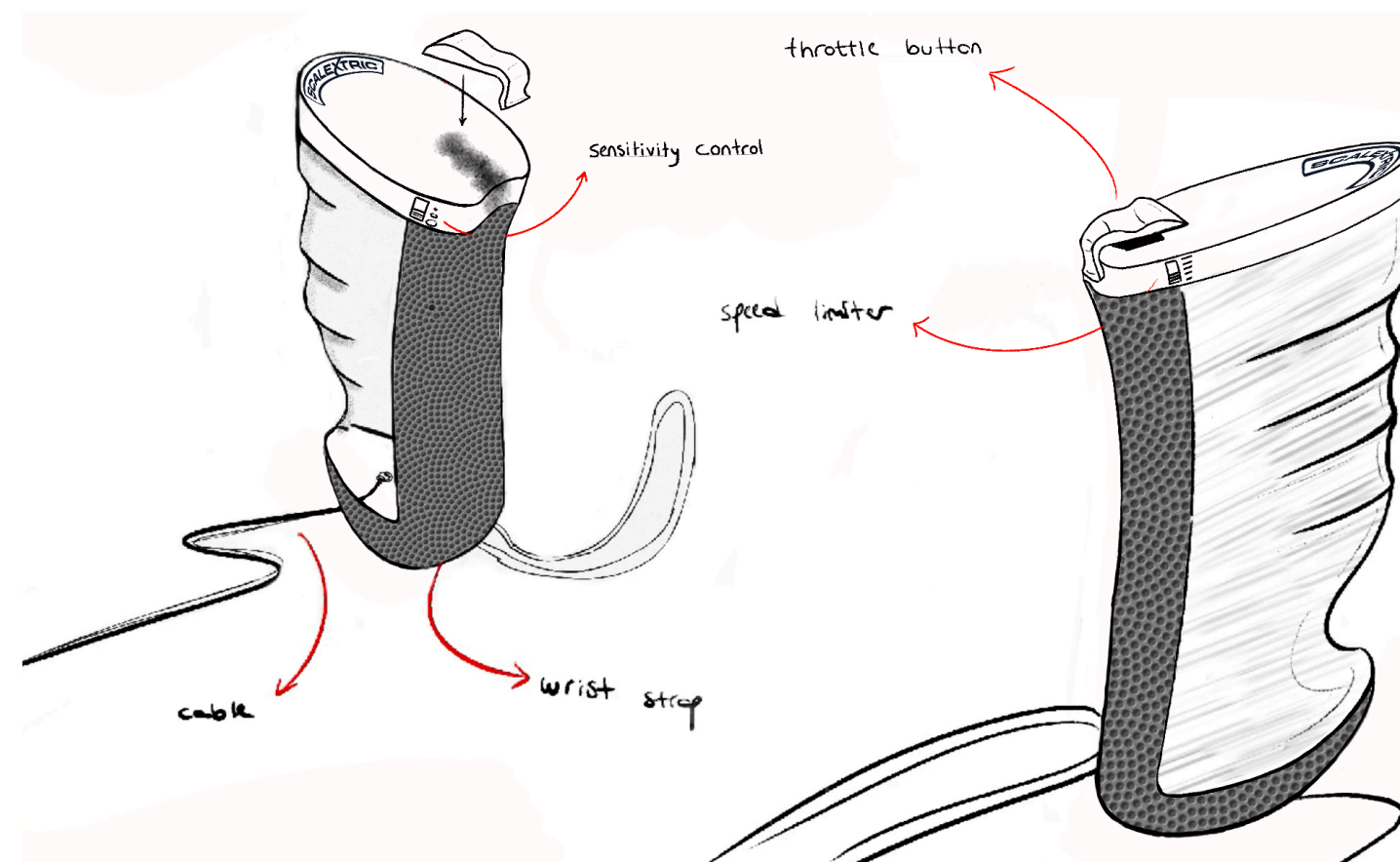
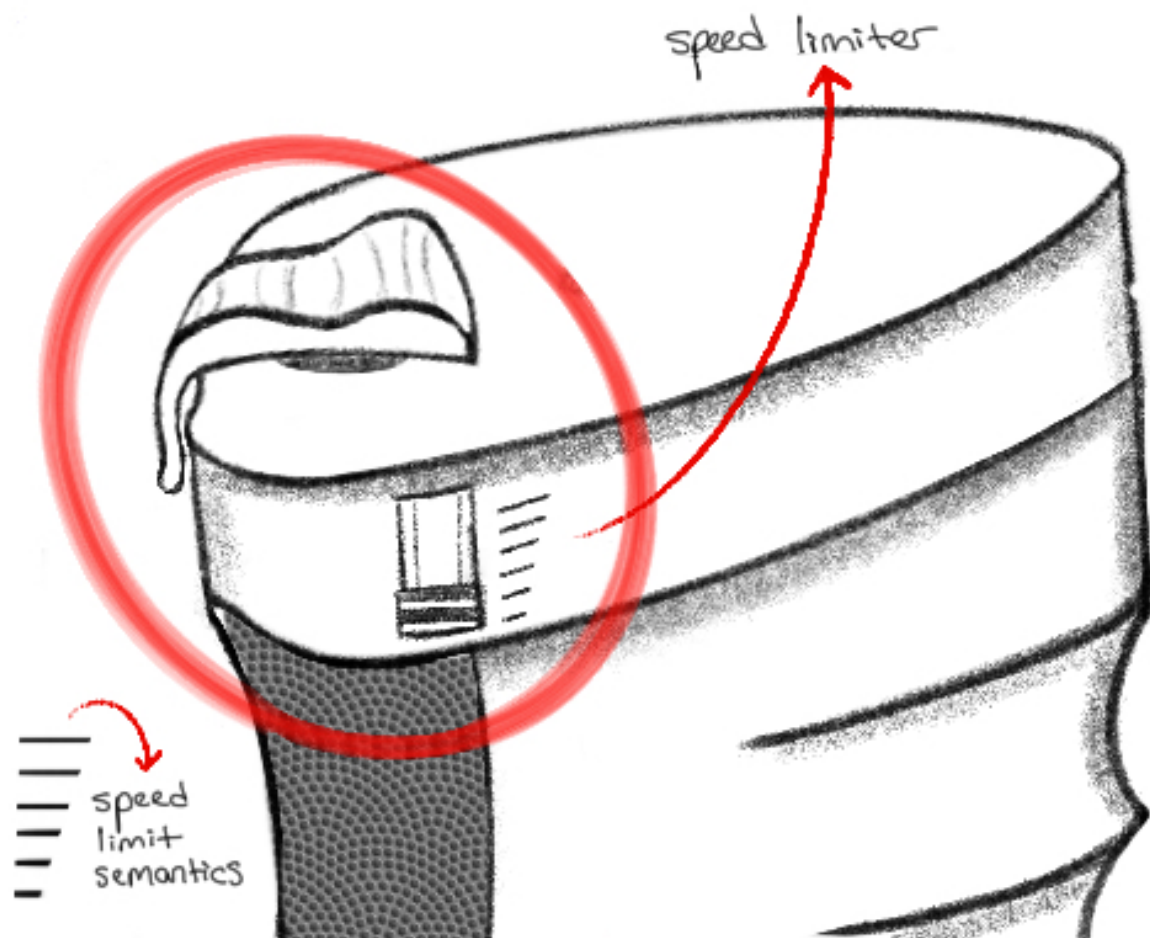


## Further Development



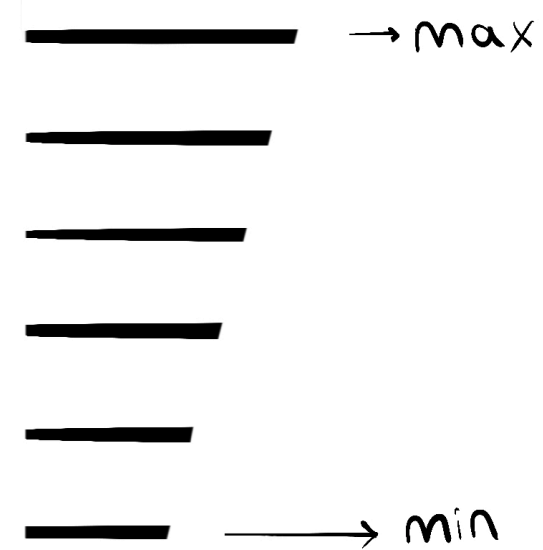
## Last Concept Design



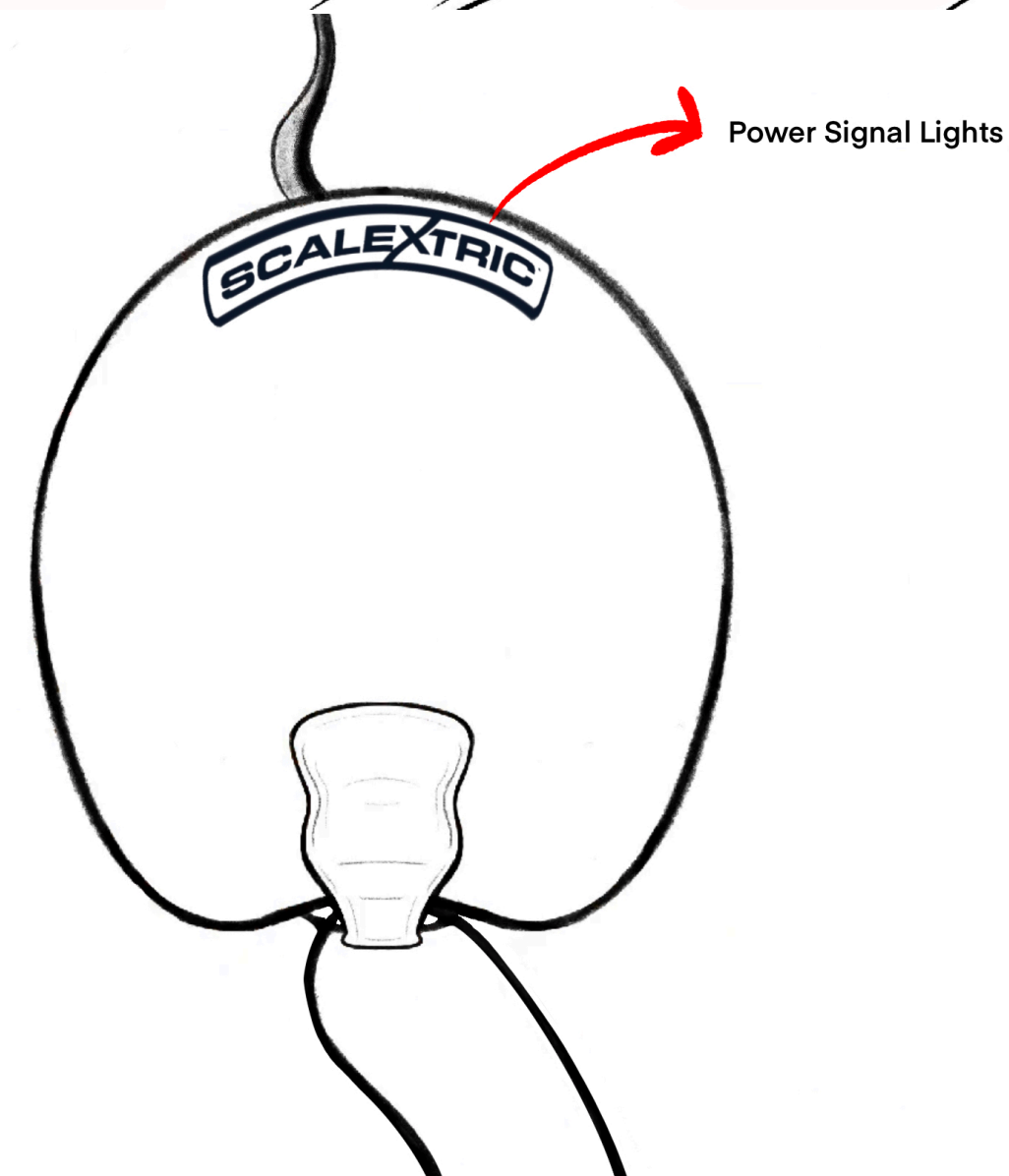
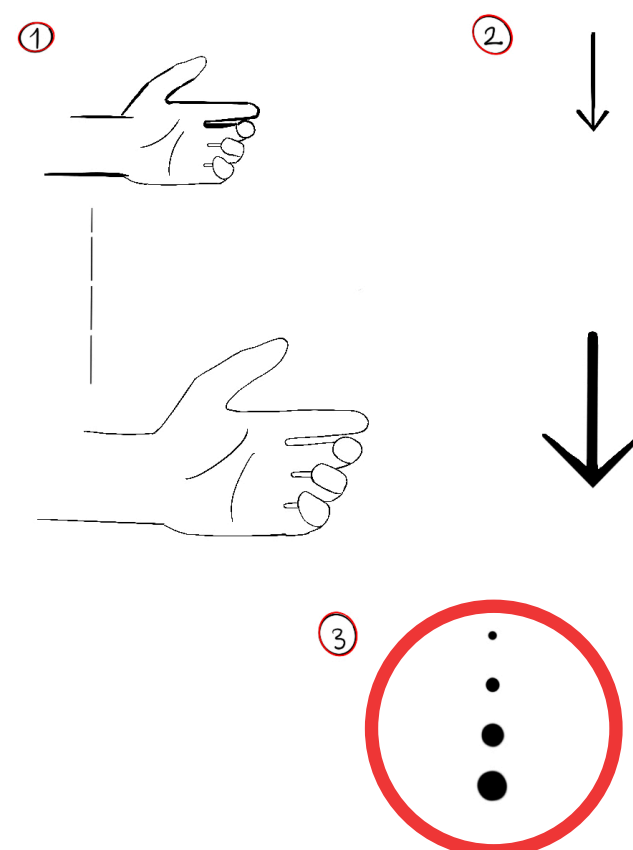


## Semantics

Speed Limiter:



Sensitivity Control:

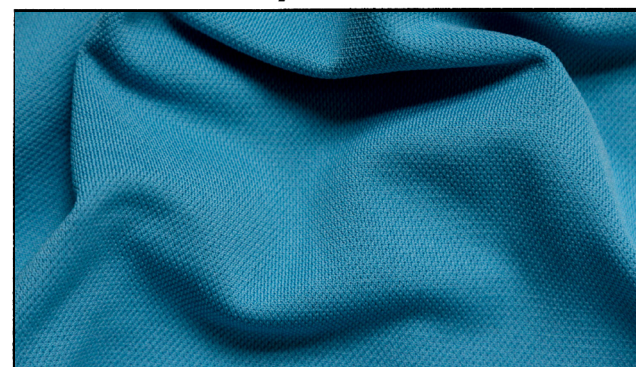




# Materials

## Polyester

The wrist strap is made out of a mixture of polyester and rubber. Polyester gives the elasticity to the wrist strap.



## ABS Plastic

The main body and the throttle button of the controller is made out of ABS Plastic which is low in cost and yet very durable.



It has different finishes for different parts of the controller.

## Aluminium

Both speed limiter and the sensitivity switches are made out of aluminium. It is a very durable material while looking aesthetically pleasing. It costs more than ABS plastic that is why it is only used in those switches rather than the entire body of the controller.



## Rubber

As it is been written earlier, the rubber is used for the wrist strap alongside the polyester.



## RGB Lightning

The power lighting has RGB lightning inside which is able to illuminate loads of shades of colour and bright.



# Texture

For the injected moulded plastic part as I show in the sketch, I will be using dotted plastic texture.

This increases the friction on the surface which makes it easier to hold the controller without having any instabilities even with a sweaty hand which can be the case when playing slot racing.

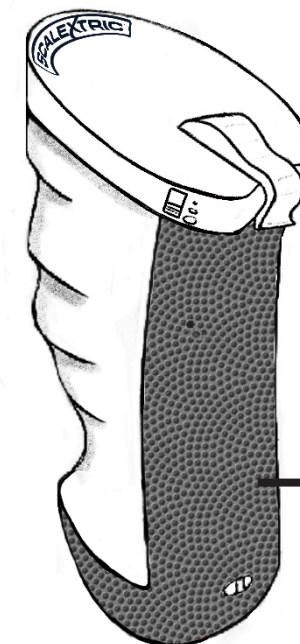


figure: dotted plastic surface

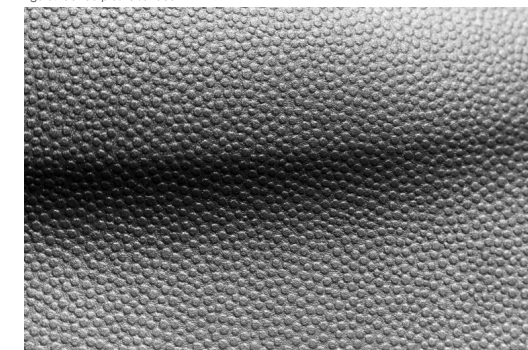
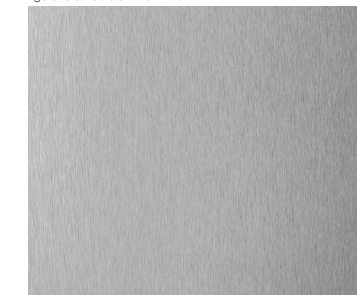


figure: low gloss ABS plastic finish

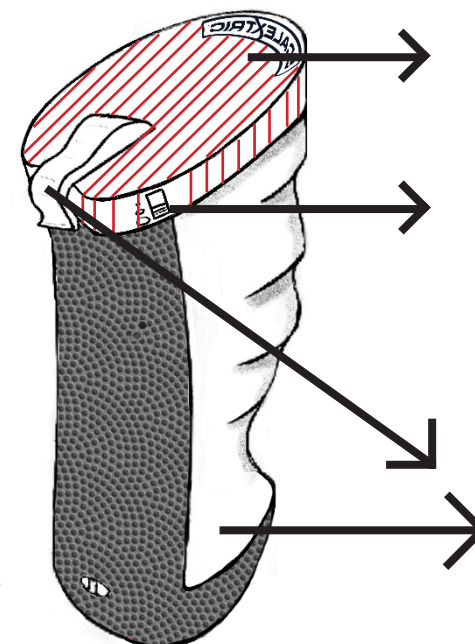


The top of the controller has a low gloss finish. The user do not have an interaction with the top of the surface thus the surface do not neet to have more friction.

figure: brushed aluminium finish



Both speed limiter and the sensitivity switches are finished with a brushed aluminium finish. They have colouring on to it thus it is very recognaziabale already so I do not want to make it more glossy and eye catching



The rest of the surfaces which is contacted to the user's hand is finished with a soft touch. It has more friction than a standart finished plastic and it prevents user's fingers to slip while looking aesthetically pleasing.



# Colour Selection

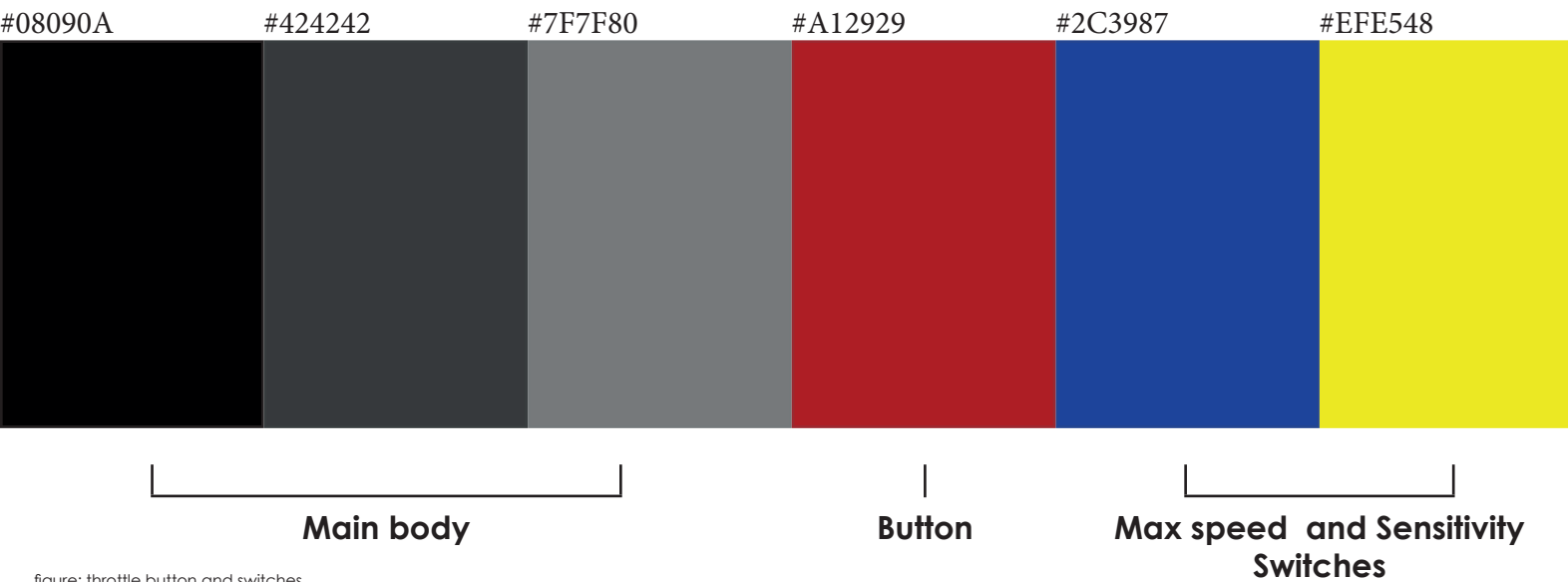
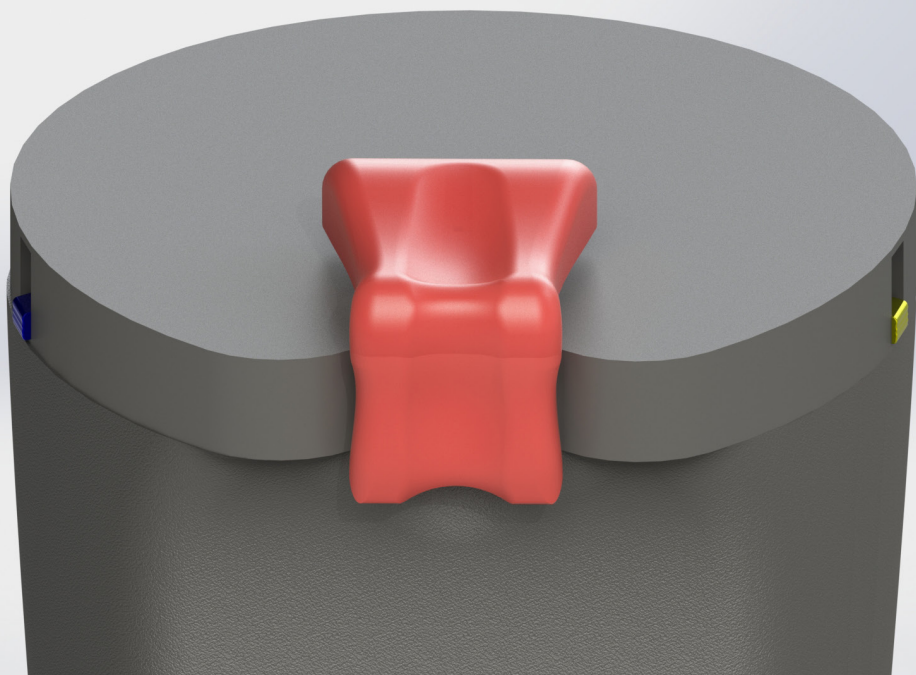


figure: throttle button and switches



## RGB Lighting

There is going to be a RGB lighting on top of the controller which indicates whether the controller is connected to the track and if it is on or off. It also gives a feedback when the user uses the speed limiter and sensitivity switch.

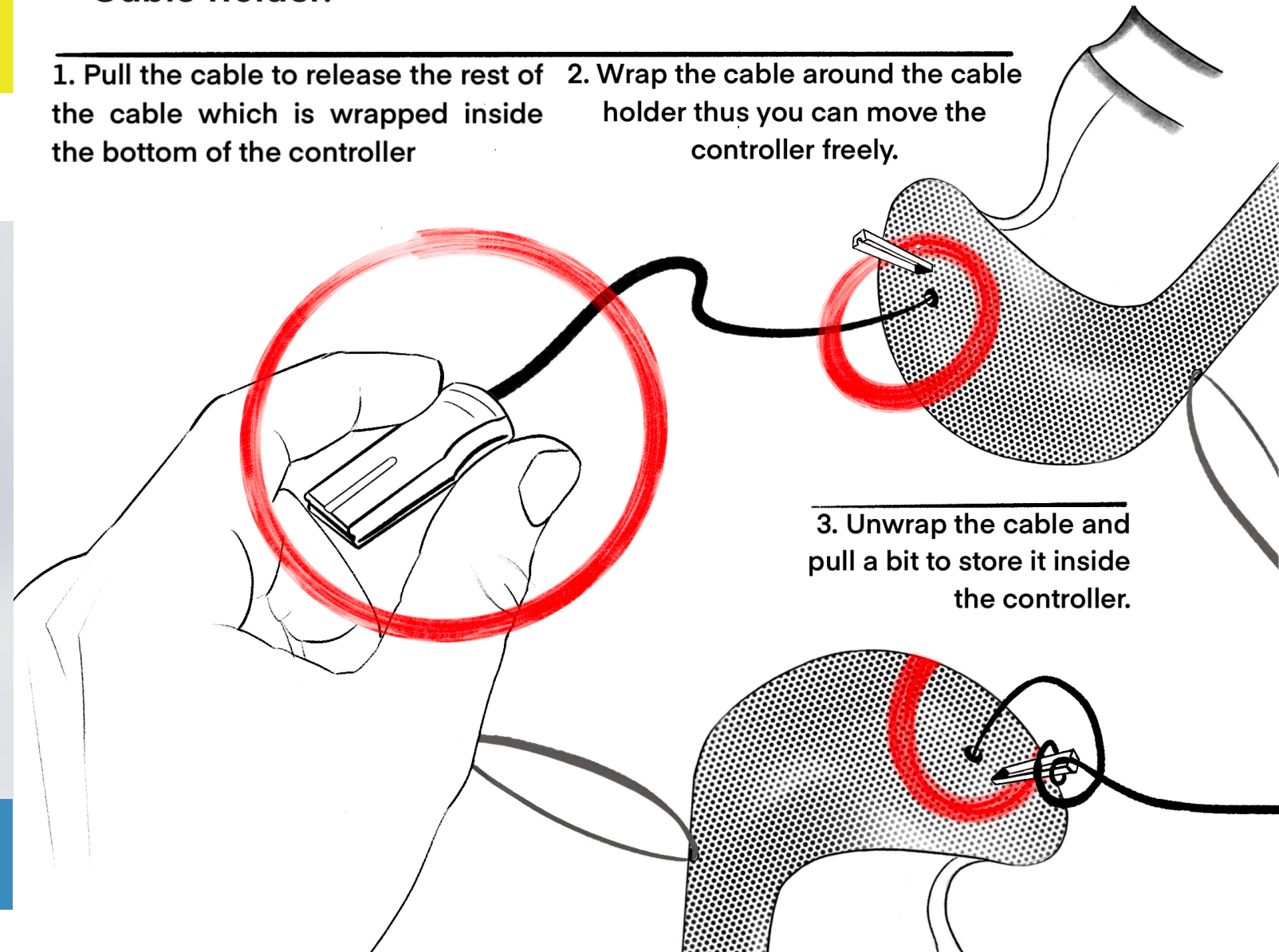
It can illuminate 16,777,216 different colors but I chose two colors which are the colors of Scalextric logo.



# User Experience

## Cable Holder:

1. Pull the cable to release the rest of the cable which is wrapped inside the bottom of the controller
2. Wrap the cable around the cable holder thus you can move the controller freely.



3. Unwrap the cable and pull a bit to store it inside the controller.

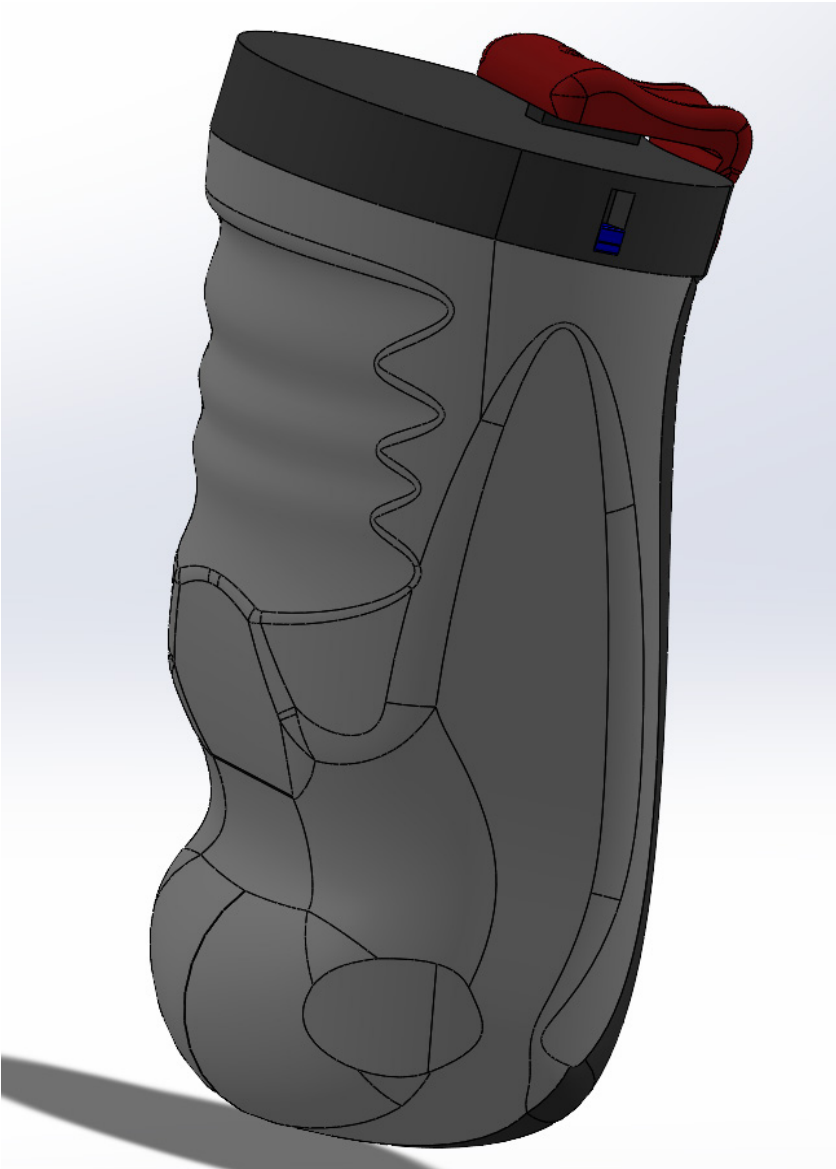
# 3D Modeling

## First CAD Model

figure: first cad assembly render



figure: first cad assembly solidworks screenshot



## Final CAD Model Parts





# 3D Modeling - HandyCon

Final CAD Model

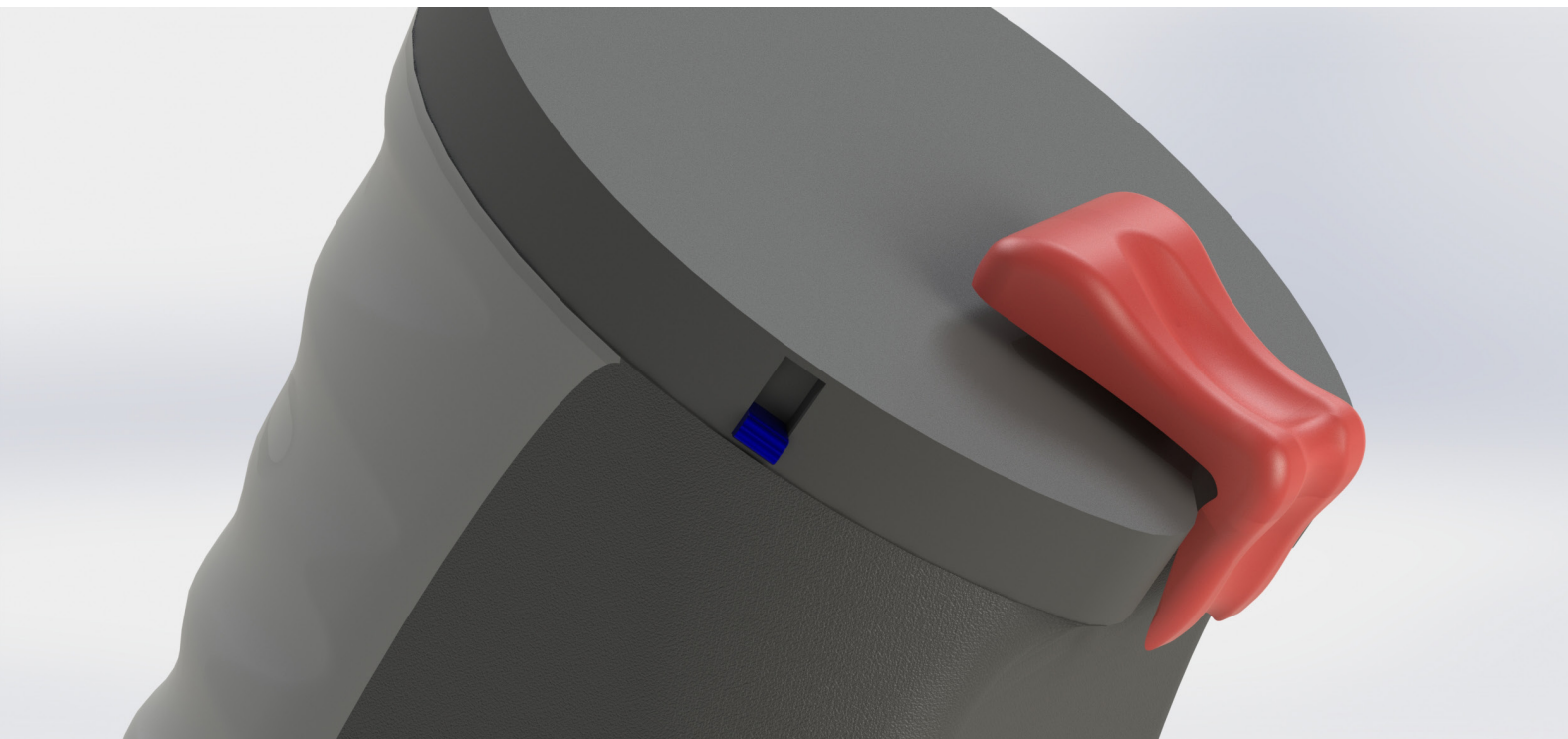


figure: wrist strap cavity

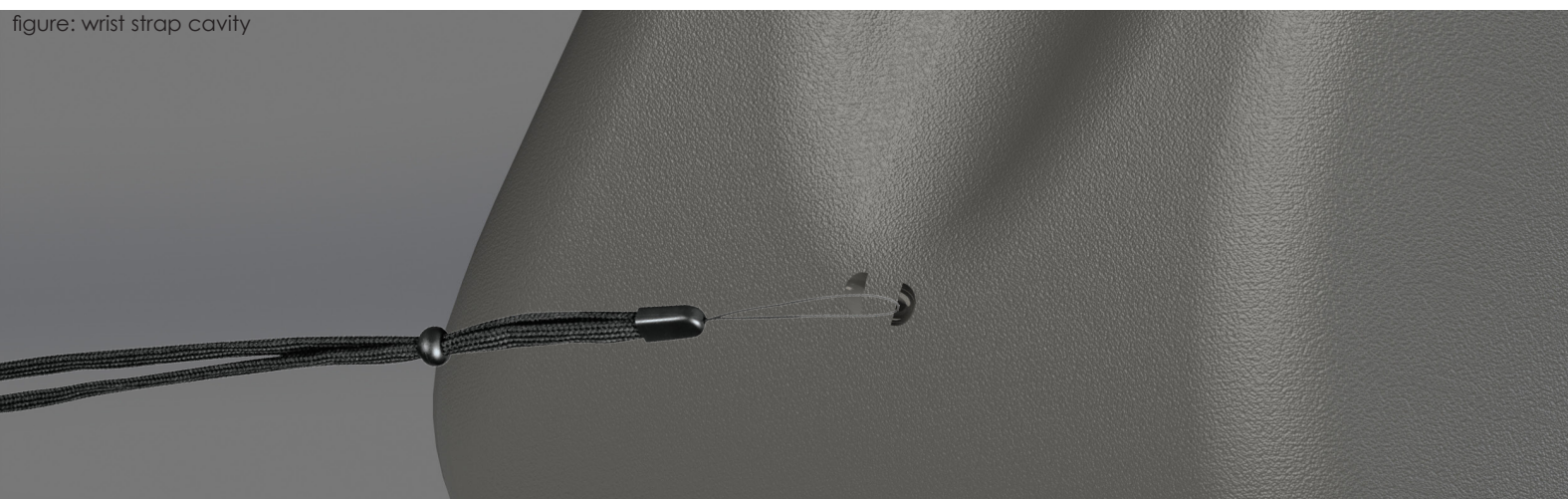
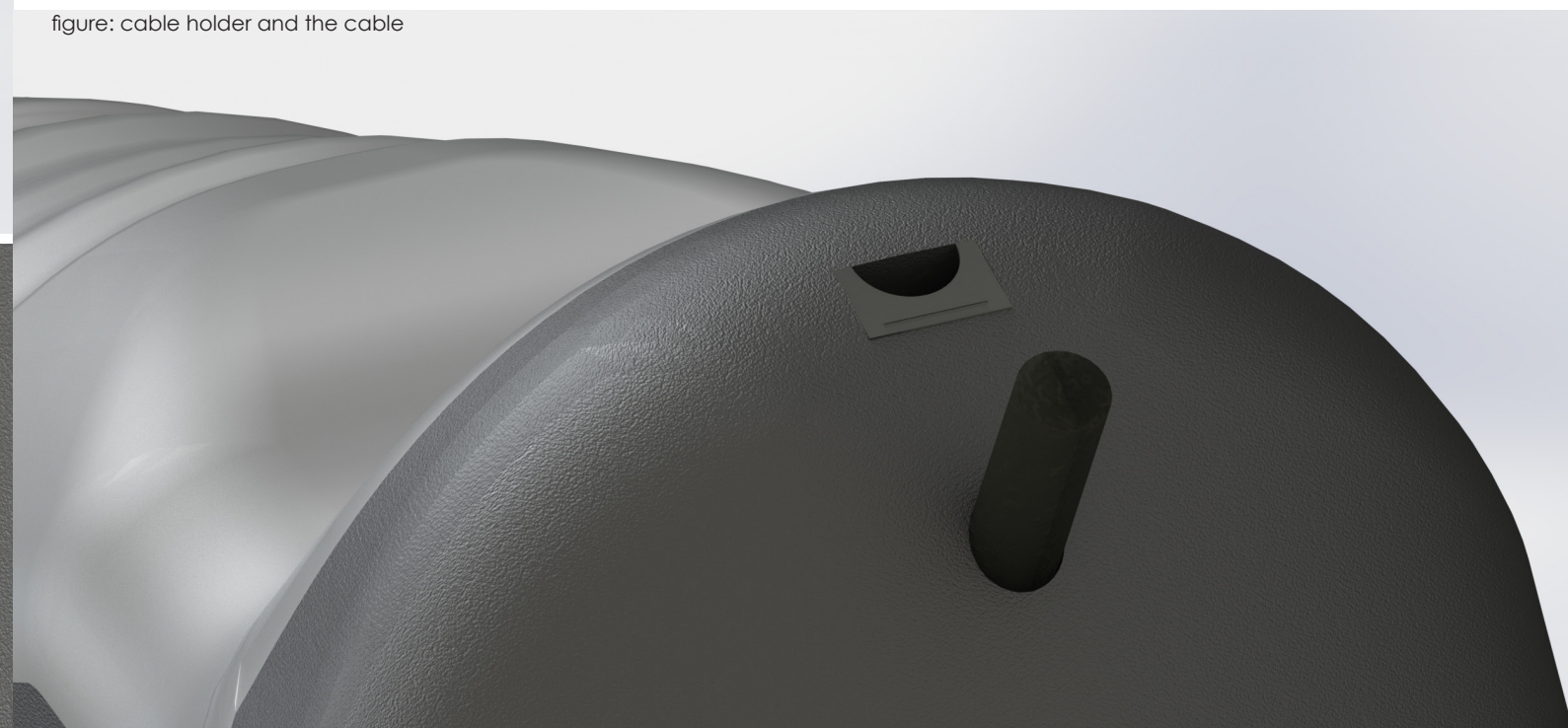
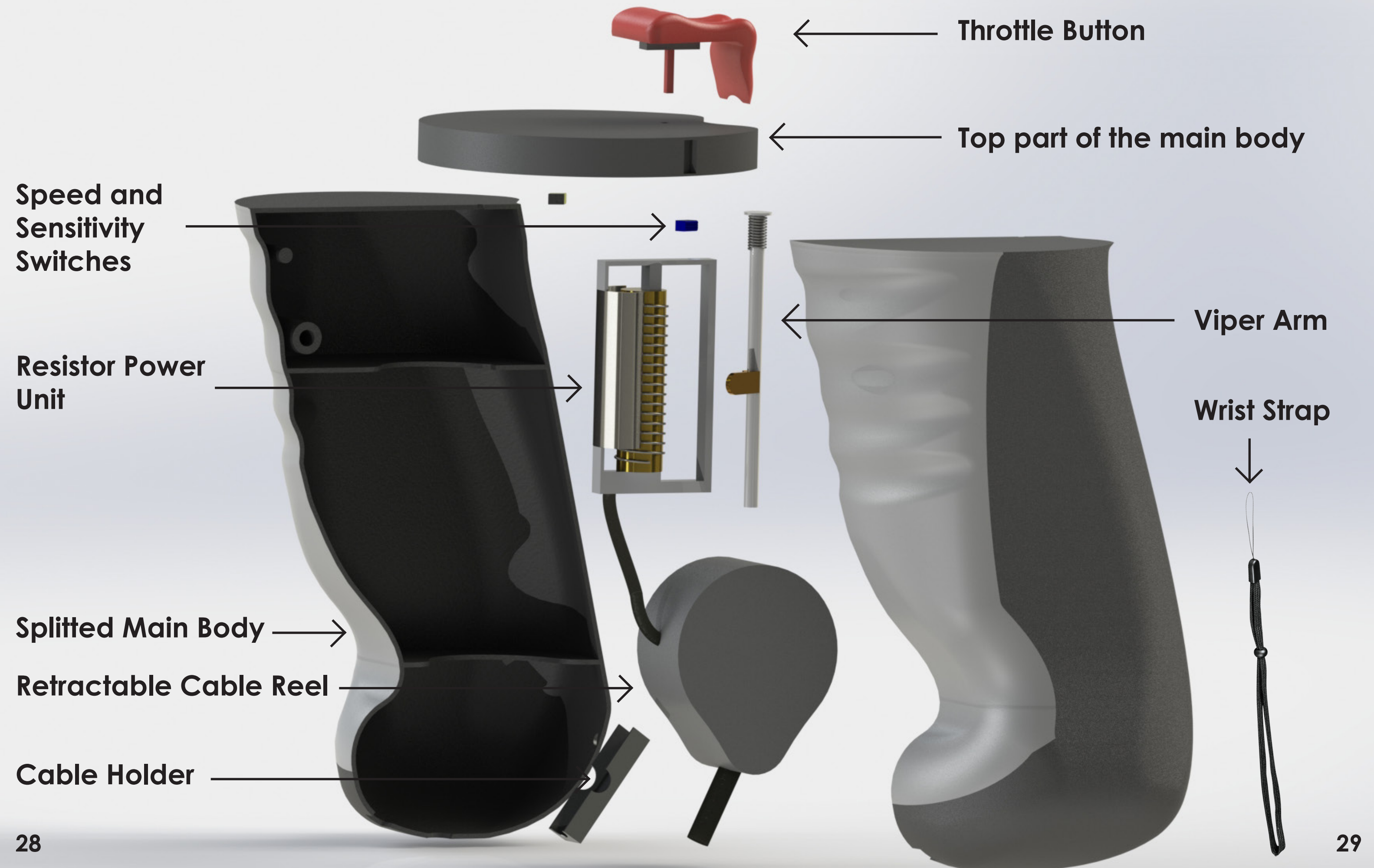


figure: cable holder and the cable





# Exploded View Render





# Cross Section View

figure: cross section view of the product

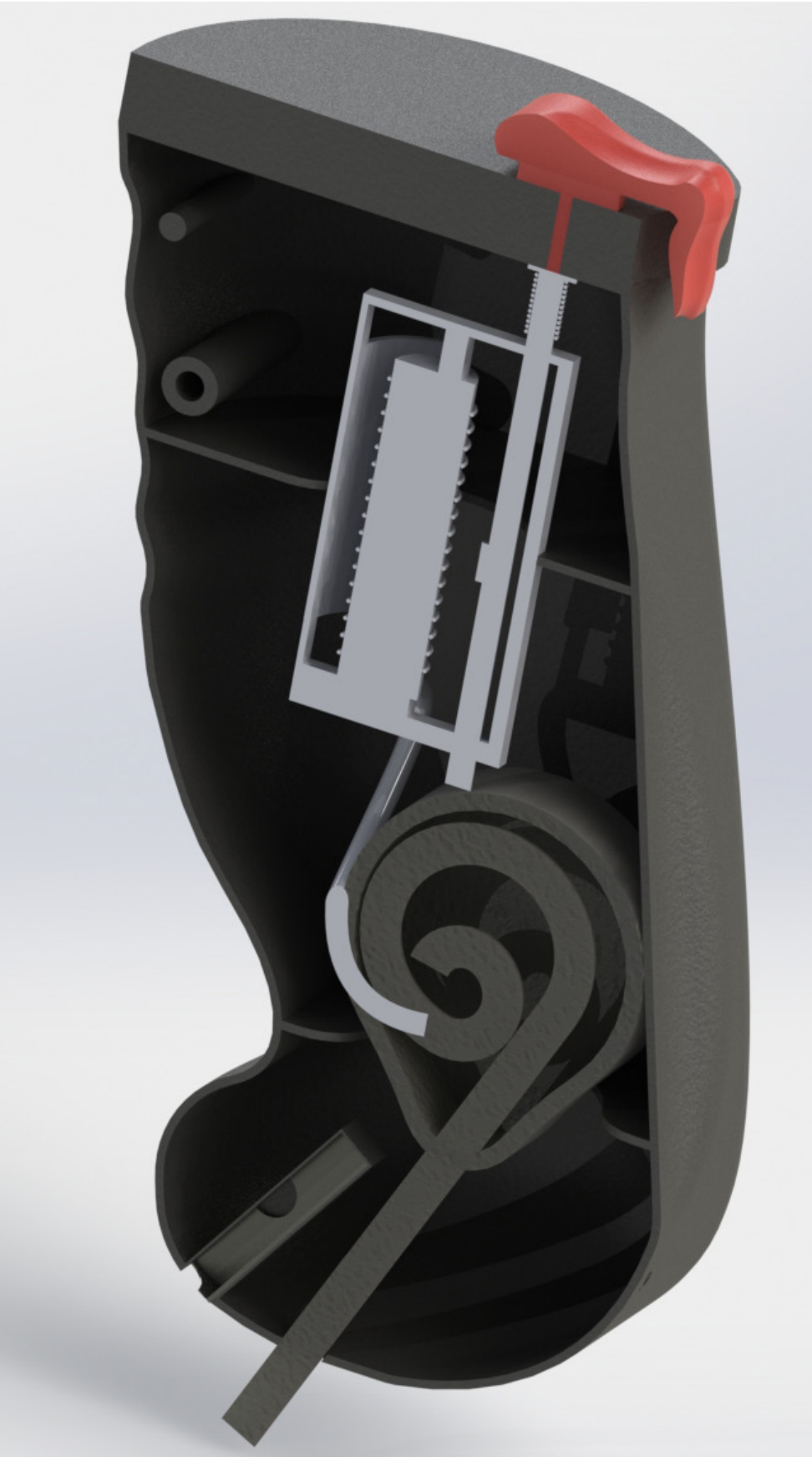
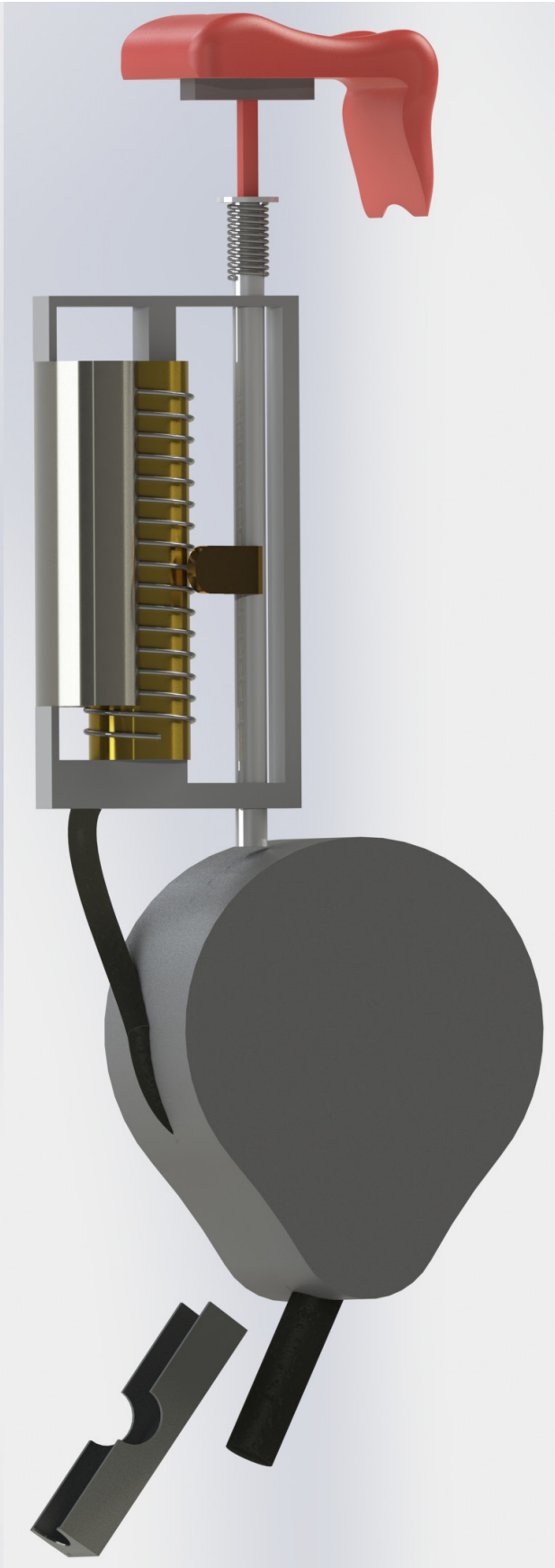


figure: inside components

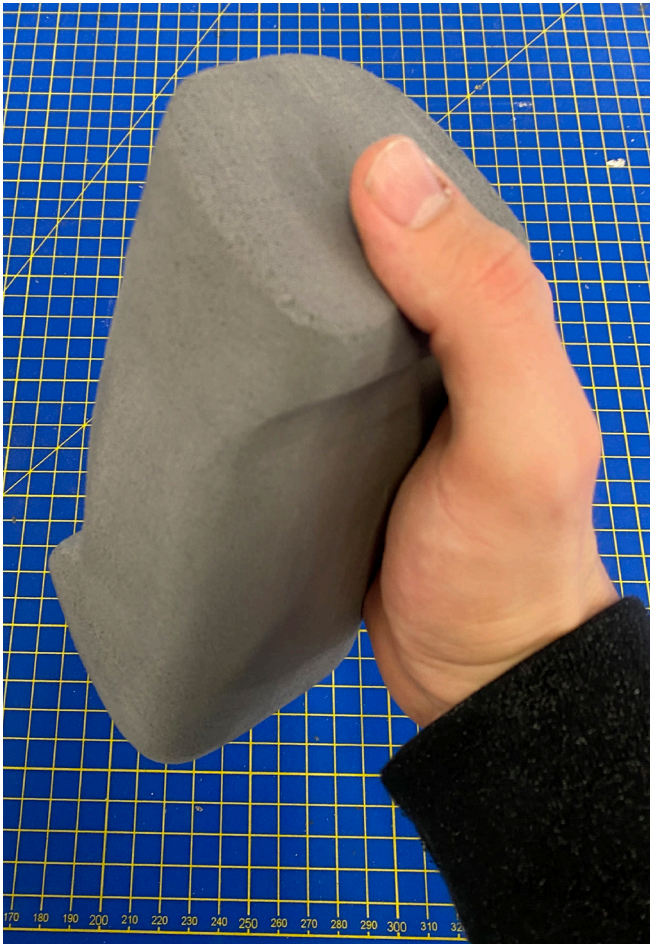
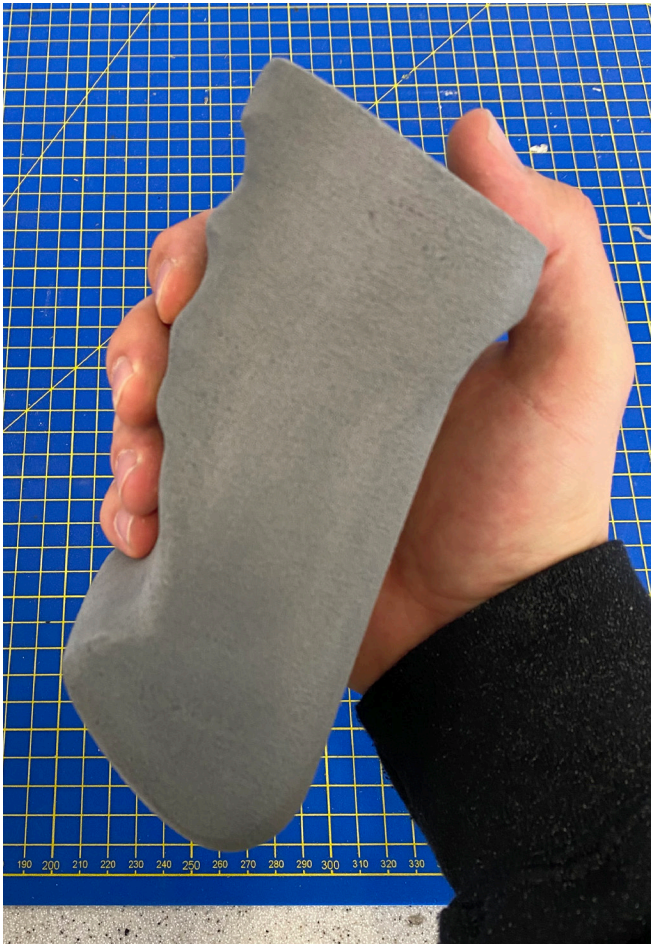


# Physical Model

figure: first physical model

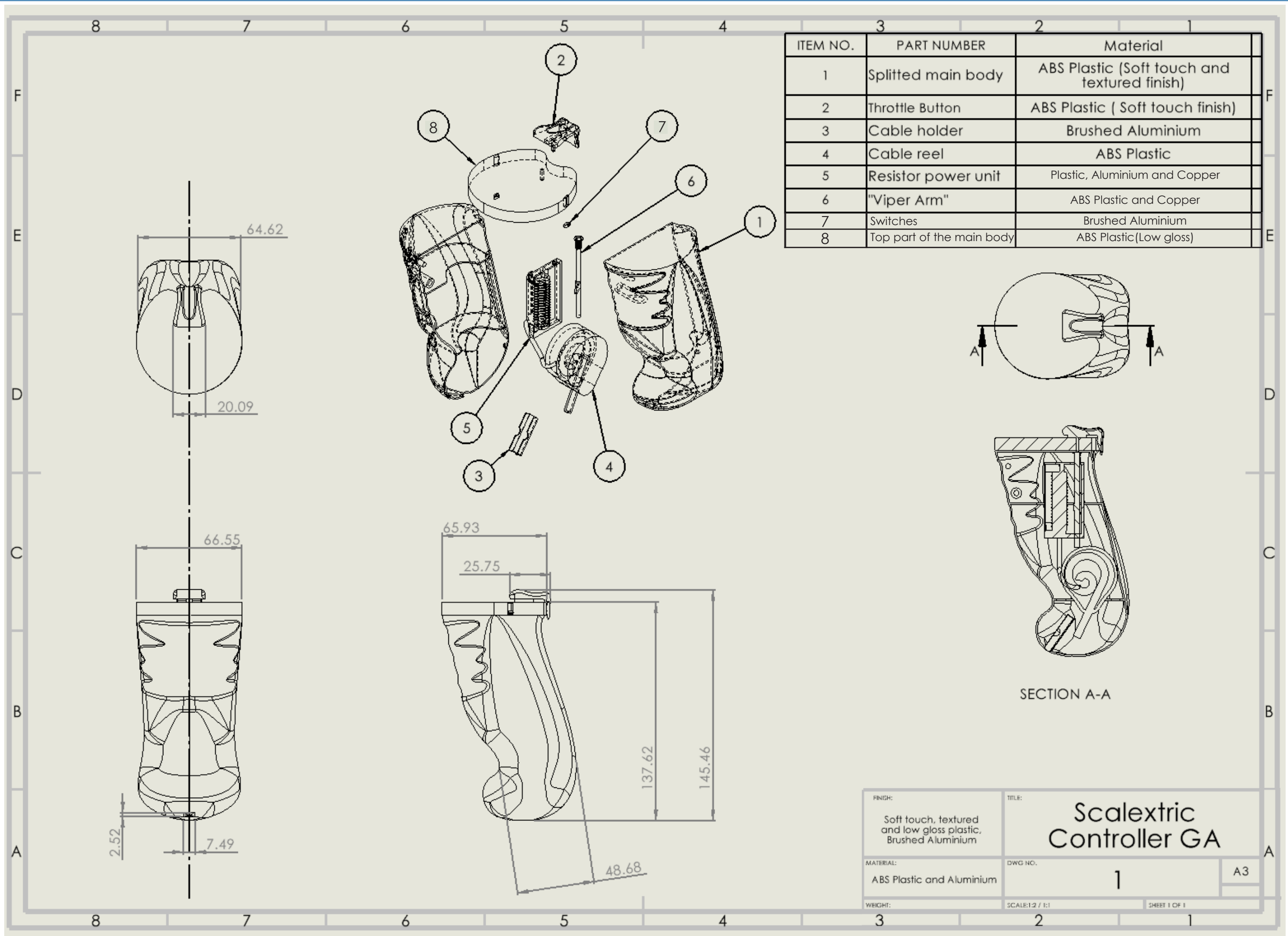


figure: last physical model for the understanding of form and dimensions





# GA Drawing

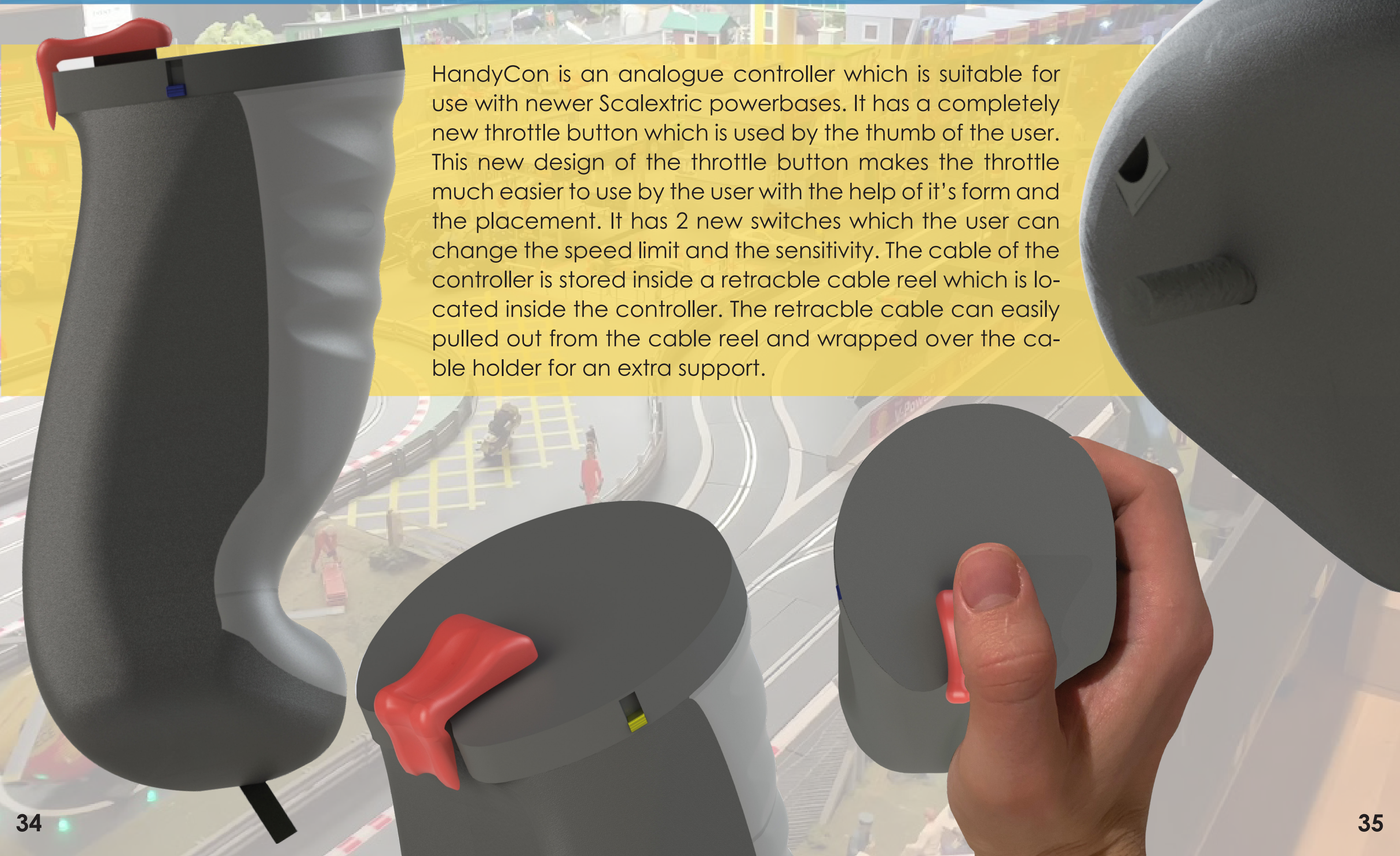






## HandyCon - Analogue Controller

HandyCon is an analogue controller which is suitable for use with newer Scalextric powerbases. It has a completely new throttle button which is used by the thumb of the user. This new design of the throttle button makes the throttle much easier to use by the user with the help of its form and the placement. It has 2 new switches which the user can change the speed limit and the sensitivity. The cable of the controller is stored inside a retractable cable reel which is located inside the controller. The retractable cable can easily be pulled out from the cable reel and wrapped over the cable holder for an extra support.





# Evaluation

First, it has been a great second term for this module as the first term. Luckily, we are able to work with different companies from different sectors so this term we have worked with Scalextric which is a well-known slot car manufacturer. I did not have a Scalextric car back in my childhood but I have always dreamed of one, so it was a different experience for me to design a controller for Scalextric.

I researched about different aspects of a controller during my design process. Technology and research part of this project was very challenging but beneficial at the same time.

For this project, I needed to work more on my Solidworks model because my design was much more complicated than my previous works on Solidworks. So, I have spent lots of time just on my CAD model but at the end of the day it really improved my Solidworks skills which is mandatory to be a product designer.

I did lots of revisions and improvements on my product during the design process. I encountered many problems and missing in each step of the design but at the end I have reached to the most finished and complete design which I am so proud of myself.

During my project process, I have collected different opinions, feedbacks and data from people around me. I benefited a lot from these comments and improved my design many times according to these. Designing a controller is very human orientated so different perspectives of people helped me a lot.

I hope Scalextric and my tutor will be pleased with my product.



# References

Company Research:

Scalextric UK. (n.d.). Scalextric UK - The Home of Model Cars, Race Tracks and Accessories. [online] Available at: <https://uk.scalextric.com/> [Accessed 28 Mar. 2022].

SLOTPIRAL REVOLUTION WIRELESS: CONTROLA- DOR ELECTRÓNICO INALÁMBRICO PARA SLOT DIGI- TAL. DISEÑO HARDWARE Y SOFTWARE DEL PRODUCTO. (WIRELESS ELECTRONIC CONTROLLER FOR DIGI- TAL SLOT CAR APPLICATIONS. HARDWARE AND SOFTWARE DESIGN OF THE PRODUCT.). (n.d.). [online] Available at: <https://core.ac.uk/download/pdf/60432484.pdf> [Accessed 28 Mar. 2022].

# Image References

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Nofrillsvideo.com. (2022). [online] Available at: <https://www.nofrillsvideo.com/jvcc.php?iid=190758546-scalextric+digital+vs+analogue&cid=26> [Accessed 28 Mar. 2022]. (mb1)

Anon. (n.d.). [online] Available at: <https://www.gsdjagkj.gq/products.aspx?cname=slot+car+track&cid=108&xi=5&xc=25>. (mb2)

Walmart.ca. (n.d.). Rdeghly Steering Wheel Accessory,Steering Wheel LED,3rd Gen LED Performance Steering Wheel Race Digital Display Shift Indicator Lights OBD2 Module Kits | Walmart Canada. [online] Available at: <https://www.walmart.ca/en/ip/Rdeghly-Steering-Wheel-Accessory-Steering-LED-3rd-Gen-LED-Performance-Race-Digital-Display-Shift-Indicator-Lights-OBD2-Module-Kits/PRD3RJG0ON3Y6T4> [Accessed 28 Mar. 2022]. (figure: shift indicator lights on a wheel accessory)

Google.com. (2022). Redirect Notice. [online] Available at: [https://www.google.com/url?sa=i&url=http%3A%2F%2Ffinchemco.vn%2Fcerro.aspx%3Fiid%3D119624817-scalextric%2Bremote%2Bcontrol%26cid%3D34&psig=AOvVaw2sDhvZnwEI-rKWhPoNMTEp&ust=1647463348188000&source=images&cd=vfe&ved=0CAAsQjRxqFwoTCJji66\\_9yPYCFQAAAAAdAAAAABAI](https://www.google.com/url?sa=i&url=http%3A%2F%2Ffinchemco.vn%2Fcerro.aspx%3Fiid%3D119624817-scalextric%2Bremote%2Bcontrol%26cid%3D34&psig=AOvVaw2sDhvZnwEI-rKWhPoNMTEp&ust=1647463348188000&source=images&cd=vfe&ved=0CAAsQjRxqFwoTCJji66_9yPYCFQAAAAAdAAAAABAI) [Accessed 28 Mar. 2022]. (mb4)

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