

07

Appendices

Personal Project Brief – IDE Master Graduation Project

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PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT

Complete all fields, keep information clear, specific and concise

Project title Next-Generation Product Development for Devoonsounds

Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

In today's connected world, sound is everywhere, and our experience is rapidly evolving. The audio market has progressed from acoustic to electronic sound, and this transformed how we interact with sound in different environments.

This project domain lies at the intersection of art, technology, and interior design—a realm where aesthetic appeal meets functional innovation. Devoonsounds, an Amsterdam-based startup, operates in this niche by creating unique sound sculptures that serve as both audio devices and artistic centerpieces. The company's choice of cement as the product material and the cone shape for the speaker were deliberate decisions to enhance both sound quality and aesthetic appeal. These products cater to a growing market of design-conscious consumers who seek to seamlessly integrate technology into their living spaces without compromising on visual appeal. It's a world where sound isn't just heard but seen as an integral part of the environment.

However, the audio landscape is crowded. With many people already owning speakers, a challenge arises: why would they replace or add to their existing setup? For Devoonsounds, this challenge presents an opportunity to explore how form and shape can optimize sound. Historically, instruments and early sound systems used shape to enhance sound quality—think of violins and old gramophones. This begs the question: why have modern speakers been confined to boxy, conventional shapes?

The key stakeholders in this project are Devoonsounds, its current and potential customers, and the communities interested in design and technology. Devoonsounds aims to broaden its product portfolio and strengthen its product-market fit. Customers are primarily interested in acquiring products that enhance their home environment both visually and acoustically. The design and technology communities are invested in pushing the boundaries of what's possible in terms of integrating art with cutting-edge audio technology. Therefore, this project will explore the relationship between shape and acoustic sound to enhance home environments both visually and acoustically.

→ space available for images / figures on next page

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Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.

(max 200 words)

In the evolving market of design-led technology, Devoonsounds aims to develop a next-generation product that enhances its artistic and technological appeal while strengthening its product-market fit.

Within 100 working days, the project will explore the relationship between speaker shape and acoustic performance, while designing a speaker that will appeal to consumers who want premium sound products that fit into a high-end interior design. This research will be conducted through desktop research and prototyping, focusing on how cabinet geometry affects factors such as material resonance, sound wave reflection and internal airflow dynamics.

The project aims to investigate how different speaker enclosure shapes can enhance sound quality and impact the acoustic experience, while making products more accessible and appealing. Thorough desktop research into shapes, combined with comprehensive market and user research, will inform the final design by providing insights into sound-enhancing shapes, consumer preferences, and emerging trends.

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for.

Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence)

As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

Design and develop a functional prototype for Devoonsounds' next-generation sound sculptures, informed by market and user research, optimizing acoustic performance through form exploration while aligning with the expectations of style-oriented users in the high-end interior design market.

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

In this graduation project, I will employ a structured approach combining research and design methodologies to generate a well-informed design direction. The project will follow the double diamond method, starting with research and analysis, narrowing the scope by defining the design direction, conceptualizing various design solutions, and finally prototyping the embodiment to validate the final result.

The project begins with a SWOT analysis to assess Devoonsounds' strengths, weaknesses, opportunities, and threats. Benchmarking against competitors and industry standards will then identify areas for design and technological improvement. This will be complemented by desktop research, interviews, and questionnaires to identify market opportunities and refine the product's alignment with consumer needs. Additionally, desktop research will explore how shape can enhance acoustic performance.

These insights will inform the concept development phase, where various design concepts will be generated and assessed. Prototypes of different shapes to enhance sound quality will be created and tested. The most promising concept will undergo further refinement through iterative prototyping. Time permitting, user testing will validate the design to ensure it addresses the identified needs. The final design will reflect the research findings, design rationale, and potential for market success.



image / figure 1 current cement speaker design



image / figure 2 Using 3D printed molds

Appendix A

Tell us about your sound experience!

Hello!

We're exploring how people use and feel about their speakers, and we'd love to hear from you! This quick survey will help us understand what works well and what could be even better. It'll take just a few minutes to share your thoughts on your current speaker setup. Thanks for helping us improve sound experiences for everyone!

By completing this survey, you give your consent to participate. All responses will be anonymous and used solely for research purposes. We value your time and feedback, and this survey should take no more than 5 minutes.

Thank you for your insights!

1. What is your age group?

Mark only one oval.

- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65 or older
- Prefer not to say

2. What is your gender?

Mark only one oval.

- Female
- Male
- Non-binary
- Prefer not to say

3. Which speaker(s) do you currently own and use?
Please specify the brand and model if you know it, or simply describe your speaker.
-

Stereo vs portable speakers

We know there are many types of speakers out there! For this survey, we're especially interested in stereo speakers used at home. However, if you mainly use portable speakers, feel free to share your experience with those instead!

4. What was the primary reason you chose your speaker?

Mark only one oval.

- Sound quality
- Design and aesthetic
- Brand reputation
- Features (e.g., Bluetooth, smart integration)
- Recommendation from friends/family
- Other: _____

5. How often do you use your speaker?

Mark only one oval.

- Daily
- A few times a week
- Weekly
- Rarely

6. Where do you primarily use your speaker?

Mark only one oval.

- Living room
- Bedroom
- Kitchen
- Office
- Outdoors
- Other: _____

7. For what activities do you most often use your speaker? (Select all that apply):

Tick all that apply.

- Background music while relaxing
- Social gatherings
- Working or studying
- Watching movies/shows
- Parties
- Other: _____

8. How would you rate your overall experience with your speaker?

Mark only one oval.

- 1 2 3 4 5
-
- Very Excellent
-

9. Which aspects of your speaker do you enjoy the most? (Select up to 2)

Tick all that apply.

- Sound quality
- Design/appearance
- Ease of use
- Size and portability
- Connectivity options
- Durability
- Sustainability
- Other: _____

10. What is one improvement you would make to the speaker?

11. Have you experienced any issues or frustrations with your speaker?

12. How important is sound quality in a speaker to you?

Mark only one oval.

1 2 3 4 5

Not Very important

13. How important is Design/Aesthetics in a speaker to you?

Mark only one oval.

1 2 3 4 5

Not Very important

14. How important is Connectivity in a speaker to you?

Mark only one oval.

1 2 3 4 5

Not Very important

15. How important are Tech Specs in a speaker to you?

Mark only one oval.

1 2 3 4 5

Not Very important

The end

Thank you for sharing your experience with us! Your feedback is invaluable as we continue to improve and design better listening experiences.

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Google Forms

Appendix B

User Validation and Insight Gathering Workshop

Welcome



Introduction

Target group: Modern Nostalgists

Your role: To help me better understand and improve your music listening experience.



Introduction

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Your role: To help me better understand and improve your music listening experience.

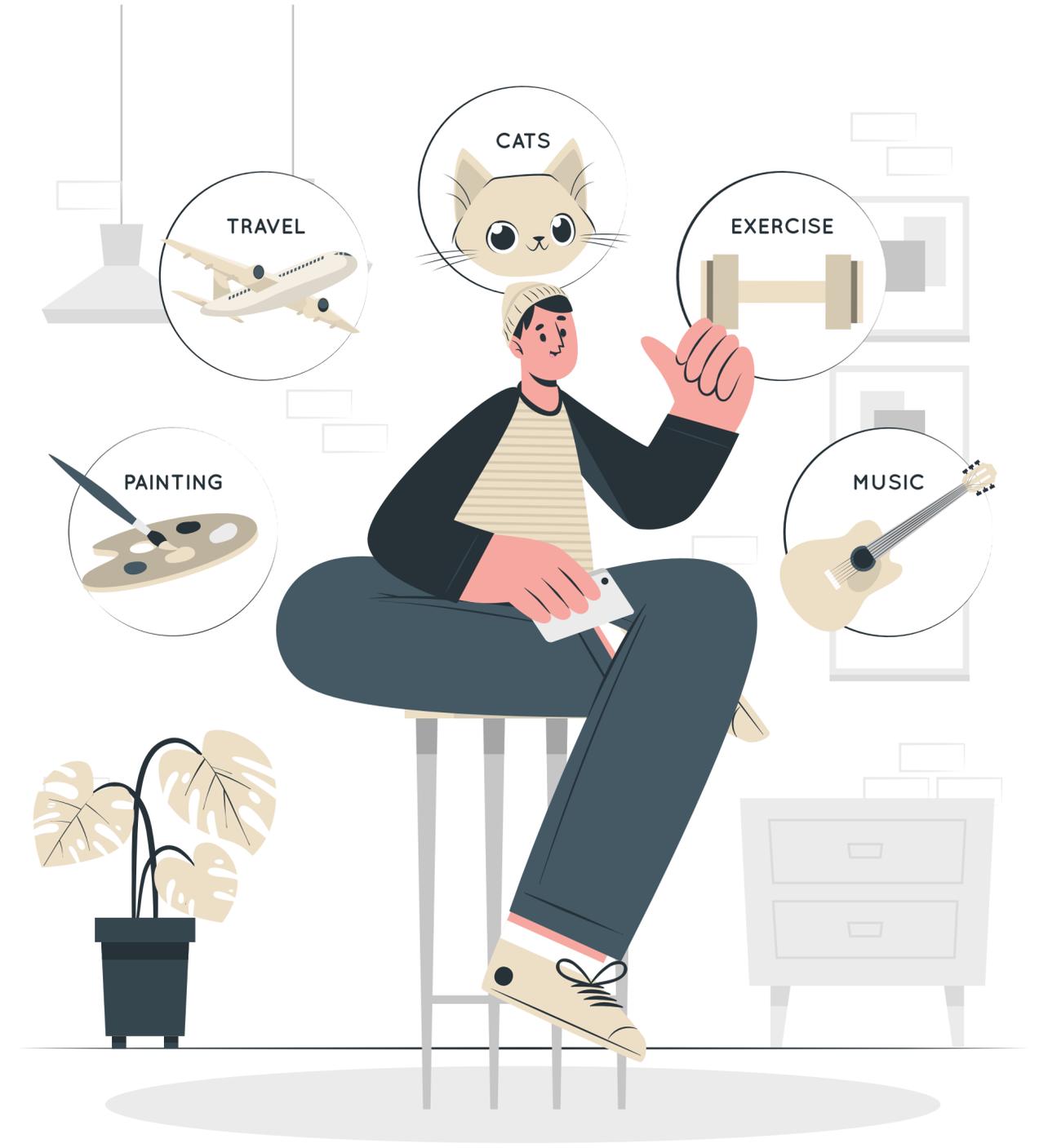


What's your favorite
music-related memory,
and why?

Journey and Interaction Map

Goal: To understand when, where, and how you interact with music, devices, and have rituals.

Pinpoint the different times of the day when you listen to music on the journey map.



Journey and Interaction Map

Goal: To understand when, where, and how you interact with music, devices, and have rituals.

Pinpoint the different times of the day when you listen to music on the journey map.

- *What do you do before you start listening to music?*
- *While listening, what do you interact with? How does it make you feel?*
- *What happens when you stop listening?*



Journey and Interaction Map

Goal: To understand when, where, and how you interact with music, devices, and have rituals.

Pinpoint the different times of the day when you listen to music on the journey map.

- *What do you do before you start listening to music?*
- *While listening, what do you interact with? How does it make you feel?*
- *What happens when you stop listening?*



Cluster the sticky notes
of everybody

*What feels most meaningful about this process?
What would you like to change about any phase of this ritual?*

Beginning of the day

I get up at 7:30 and my roommate sleep so I use headphones



Right when I set up while I make and have breakfast I listen to News podcasts

Dance music to get me to brush my teeth and tidy my room

My favorite songs at the moment to sing along while I take to the station

First task reading papers for them so instrumental class year

From my Country, it makes me feel connected to my place of origin which I am far from



Mid-day

Singing time in the shower. Songs I know lyrics

Making dinner with roommate with speaker of vinyl player

Dance again to get back home!!!

Discovers weekly. Songs I don't know do stay concentrated

but still enjoys at after lunch I do more visual/design tasks

Make prep for next day and class

the day



(normally pop)



Beginning of the day

Radio
Jazzy vibes

train:
podcasts
(headphones)
mostly when home

going into
focus with music
on headphones
(mostly radio)

going out of
focus when
headphones
are off

grey/brown
noise
(headphones)

when agitated

Mid-day

lunch: put off
music to
rest a bit
and mainly
talk with people

also bits here

day

Radio
while going
to bed

if feeling silente
in the living-
room

Dinner: often
put dish-related
music on.
So Pasta →
Italian
music

train
podcasts
(headphones)
mostly when home

nearing the
'End' of the
working day,
I often put
music on out
loud (when pers.)

Beginning of the day

Listening to podcast on earpods while eating ~~the~~ breakfast

Most of the time watching the video

recording as well

listening to known music or discovering something new on my monitors =>

~~Sitting~~ Sitting in a triangle with monitors



Gym: earpods with more aggressive ~~aggressive~~ music

Mid-day

Lunch: also listening to podcast and watching the ~~room~~ recording in front of me. On earpods

End of the day

~~Cooking~~ Cooking: listening to music on songs in kitchen. Taking a lot of time to find right music

Going for a car ride. ~~Want~~ I take a lot of time searching for the perfect car music at that moment

Beginning of the day

morning ritual
getting ready with some soul / r&b vibe (chill)



(SOMETIMES) TRAIN
jazzy chill happy

STUDY/WORK TIME
energy usually more slow tech / house not too many vocals

Mid-day



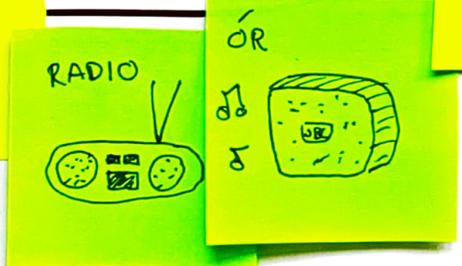
WORKOUT
high energy (150-160 bpm)

End of the day

SLEEP
podcasts



DINNER TIME
mixed (depending on group and/or dish)



Sensory mapping

When you listen to music, what do you want to feel? Describe this in an analogy.

- *What emotions does this ritual evoke?*
- *What physical interactions do you imagine?*
- *How does this metaphor align with your music habits?*



MY MUSIC LISTENING EXPERIENCE AS AN ANALOGY

IT SMOOTHLY TAKES YOU TO DIFFERENT PLACES
LIKE A FLOWING RIVER

(fits / adapts to the moment)
CLAY

FITS ALL THE SPOTS WHERE I LISTEN TO MUSIC

It's the feeling of choosing the right recipe / ingredients / seasoning

Car: feel like an immersive sound experience with more bass => so full spectrum sound

I want the ~~best~~ music to perfectly match my mood

Portable speaker: nice to hear music and still be surroundings (while cooking for example)

Listening podcast: "to the home", to imagine what is happening out there when I'm leaving at the landscape

Turning on radio by clicking buttons
↓
Feels like starting a new day by listening to music

going into another world while driving
↓
is like making your phone

Dance music helps up to feel attracted and happy while doing something I don't enjoy
Hike One

Upbeat music to listen to feel energized while travelling for long

Playing songs I know the lyrics to do things along while slaving
Hike One

In my ~~band~~ PRIVATE
Hike One

Listening on a vinyl player makes me feel serious and fancy

Speaker do sit up a space

Sensory mapping

What are your current frustrations with the way you interact with music?

- *What emotions do you feel when you encounter this frustration?*
- *What specific actions or physical interactions are most frustrating for you?*
- *How do these frustrations affect your overall enjoyment of music?*



FRUSTRATIONS I EXPERIENCE WHEN LISTENING TO MUSIC

RADIO
SOMETIMES
TOO MANY
ADS (I LIKE
MIXED MUSIC BUT
SOMETIMES I AM
USED TO OWN)

I HAVE TO
CHARGE MY
USB AND I
FORGET

PAIN IN MY
EYES FROM
WEARINGS/
RECHARGE/
GPS

SOUND
& QUALITY
IS NOT THAT
GOOD

A lot of speakers lose
sound quality when
its turned louder

I DON'T
HAVE THE
LIGHT CABLE
FROM MY LAPTOP

Some portable speaker
designs do not facilitate
easy positioning

Devices slowly
wear connecting

Sometimes I want
to tune the bass
a little bit lower

Its annoying to
hear speakers by
other speakers
while its only possible
with headphones/
and then you're
listening to different
things

Turning on
Radio is not
convenient for
interaction

charging music
is hard for
me. So I'm not
listening the time
so I gotta be
less..

When running
out of battery
and nothing to
find a charger

When my speaker
connects to also
my laptop and
lags

When discovery
weekly doesn't
match my mood

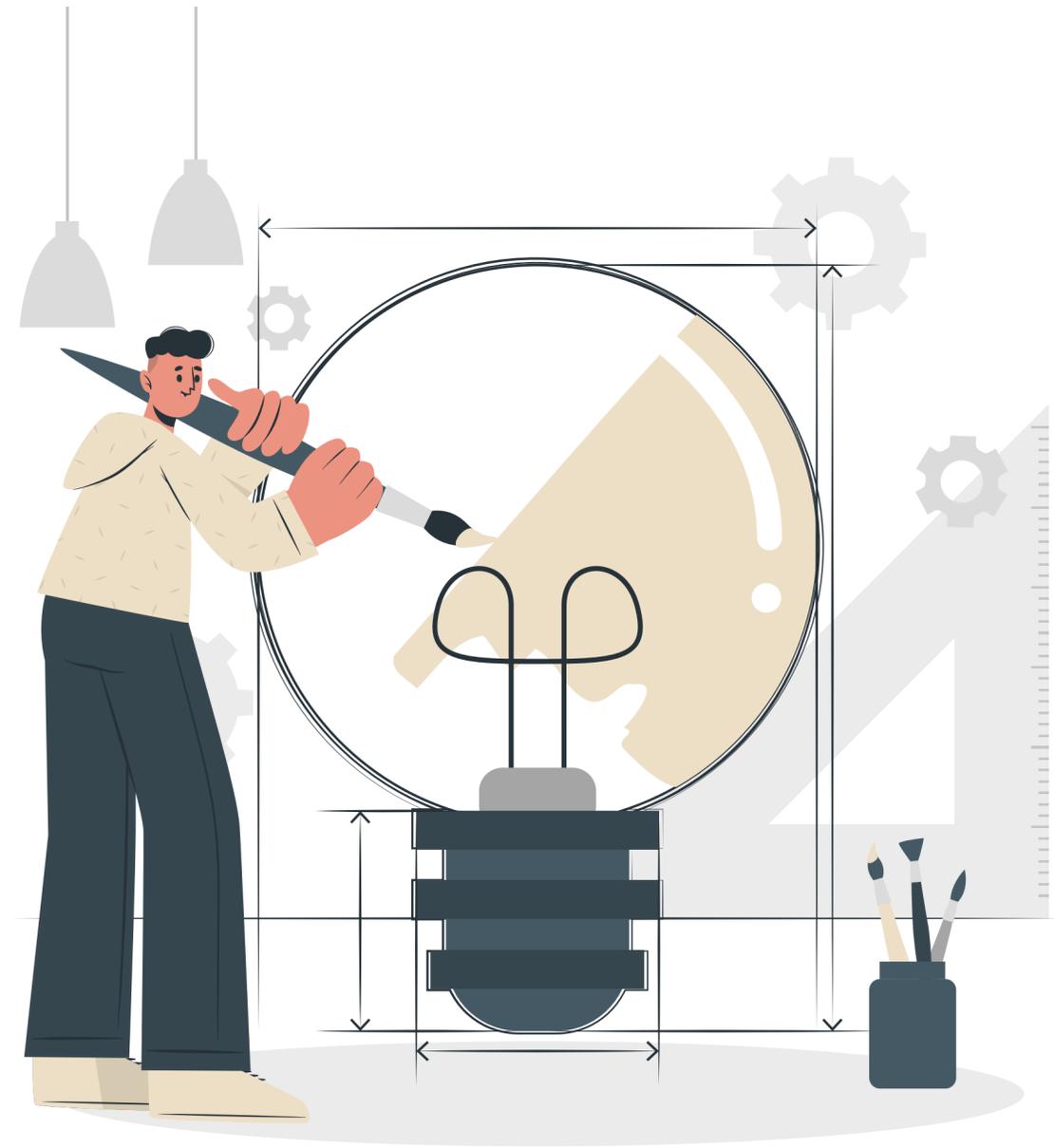
When the volume
was high and
I connect my
headphones
Hike One
original product design

Bluetooth is
sometimes noisy
and gets
feedback/feedback
ward

Sensory mapping

If you could change anything about your music listening experience, what would it be?

- *Imagine your ideal music-listening moment with this speaker.*
- *What does it look like, feel like, and sound like?*



Sensory mapping

If you could change anything about your music listening experience, what would it be?

- *Imagine your ideal music-listening moment with this speaker.*
- *What does it look like, feel like, and sound like?*



Cluster the sticky notes
of everybody

Reflection

Is there anything we missed that you feel is important to your music-listening experience?

Are there any questions for me?

Appendix C

Interior Design Exploration

This research explores how materiality, aesthetics and functionality can be integrated into product design by analysing the work of leading interior designers. By analysing their approaches, the aim is to gain insight into creating a speaker that serves as both a functional sound device and a design object. This step is to help align the product with high-end interior styles and ensure it appeals to design-conscious consumers and interior design professionals.

Key insights from analysing interior designers

Material innovation:

- Designers such as Tom Dixon, Neri & Hu and David Adjaye emphasise raw materials such as concrete, wood and metal. These materials are celebrated for their inherent textures and natural imperfections, which aligns well with DevoonSounds' use of cement and branding of earthy materials.
- Relevance: Cement can be elevated through craftsmanship and thoughtful design. Balancing its rawness with refined finishes, it appeals to both design enthusiasts and sustainability-conscious consumers.

Combining art and functionality:

- Patricia Urquiola and Michael Anastassiades demonstrate how functional objects can double as sculptural art. Their ability to merge organic forms with technological functionality provides inspiration for designing sound sculptures that are both visually captivating and practical.
- Relevance: DevoonSounds can position its speakers as functional works of art, appealing to users who value products that enhance their interiors.

Creating emotional spaces:

- Ilse Crawford focuses on human-centred design, creating soothing, tactile and inviting spaces. Her approach is to ensure that every design element contributes to the user's wellbeing.
- Relevance: This is in line with the trends for emotional fixtures, suggesting that the speaker should evoke warmth and serenity and enhance the ambience of its surroundings.

A balance between minimalism and boldness:

- Designers like Pierre Yovanovitch and Kelly Wearstler balance bold, statement pieces with cohesive designs. Wearstler's maximalism and Yovanovitch's minimalist luxury show how contrasting styles can still create harmony.
- Relevance: Interesting to explore how cement's industrial aesthetic can act as either a subtle backdrop or a bold focal point, depending on the target user.

Attention to craftsmanship:

- Sebastian Herkner and Yabu Pushelberg emphasise craftsmanship and thoughtful use of materials. Herkner blends traditional and modern techniques, while Yabu Pushelberg creates immersive, luxurious designs.
- Relevance: Leverage Cement's craft potential could be of interest in emphasising the handcrafted, unique qualities of its speakers to appeal to high-end markets.

Alignment with market and trend research:

- The emphasis on materiality, as seen in designers such as Tom Dixon, relates to the growing market trend for sustainability and environmentally friendly materials.
- The concept of speakers as design objects reflects the trend for aesthetic innovation, where products integrate seamlessly into the home decor and add value beyond functionality.

Target group relevance:

- Design enthusiasts, interior designers and modern nostalgics - key personas identified in previous research - are likely to resonate with products inspired by the work of these interior designers as they are at the top of their field.
- The emotional and artistic qualities emphasised by designers such as Ilse Crawford and Patricia Urquiola match the preferences of users seeking warmth, calm and connection in their living spaces.

Market differentiation:

- Designers such as Kelly Wearstler and Neri & Hu are creating bold yet timeless pieces that occupy a niche between artistic innovation and functional technology.
- Combining bold sculptural elements with minimalist finishes offers a distinctive positioning that bridges modern and nostalgic design trends.

Design Features

Use of material:

- Emphasise the texture and durability of cement, inspired by Tom Dixon and David Adjaye. Explore the addition of complementary materials (wood or metal) to enhance the visual appeal.
- Recycled cement as a premium, sustainable material, in line with consumer trends identified earlier.

Aesthetic approach:

- Develop two design approaches:
 - Subtle minimalism: Inspired by Michael Anastassiades and Pierre Yovanovitch, targeting users looking for understated, elegant designs.
 - Bold statements: Inspired by Kelly Wearstler and Patricia Urquiola, for users who want bold sculptural objects.

User-Centered Design:

- Prioritise the creation of calming, inviting designs that enhance user wellbeing, as seen in the work of Ilse Crawford.
- Integrate seamless connectivity to ensure a stress-free user experience, linking with the findings of the Connectivity vs. Simplicity value map.

Craftsmanship Focus:

- Highlight handcrafted elements in the marketing narrative, inspired by Sebastian Herkner and Yabu Pushelberg, to appeal to luxury markets and create a sense of exclusivity.

This exploration of interior design provides inspiration for designing a speaker that balances functionality and aesthetics. Insights into the use of materials, craftsmanship and sculptural forms inform how the product can stand out in the marketplace. This step ensures that the speaker is in line with contemporary design trends and user preferences, and offers both artistic and functional value to design enthusiasts and interior designers. The results also reinforce the project's focus on creating a product that integrates seamlessly into modern interiors, while differentiating itself through bold yet user-centred design.



Raw, industrial aesthetic with high-end finishes.



Balance bold, statement pieces with cohesive designs.

Appendix D

Material Testing

After looking at materials mainly from a visual perspective in the form analysis, this section shifts focus to how different materials affect the listening experience. A material test was set up to explore how speaker cone materials influence the perceived sound quality. Four materials were tested: cardboard, felt, wood, felt combined with cardboard and plastic were tested together with a baseline measurement where the speaker had no cone. Participants (N=6, F=3, M=3) rated each material based on bass performance, midrange clarity, high-frequency clarity and soundstage using four different song samples. The purpose of this testing was to identify how and if the materials influence the sound profile of a speaker.

After doing a test run the following things were adapted/found:

- Blindfolding the person helps them focus on the sound.
- Instead of listening to whole song use small sections for easier comparison between materials.
- Randomly include the first material again without the participant knowing since the first material gets a score without reference to other materials. Varying the order in order to get a blind test with the materials.
- Speaker as is without a cone is randomly included in the test as a baseline.
- When people are in doubt they can request to go back.
- Making people sit in the same place and asking them not to move too much, not leaning forward/backward different for each sound sample.
- Not indicating in advance that the speaker will be heard even without a cone, people got the feeling from this that they could give a wrong answer.
- Talking during switching cone to mask sound, asking their opinion on sound track.

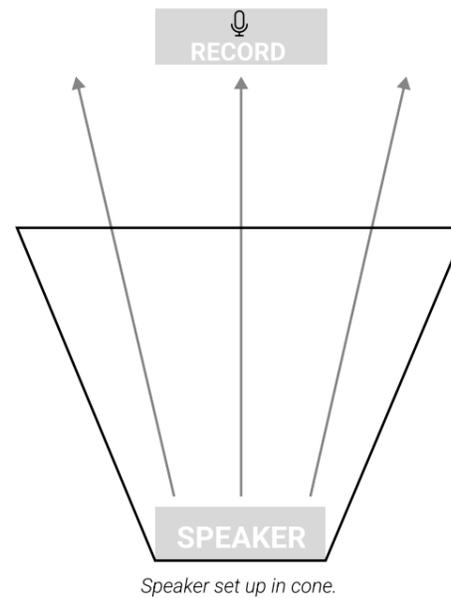
Participants were asked for consent and informed they will be blind folded for a listening test.

It was explained to them that there will in total be four different sound samples played. For each sound sample every cone will be tested. Since the first cone they do not have a reference yet, this cone will be randomly tested again without the participant being aware when this cone will be repeated.

Four sound samples were chosen to test different sound characteristics. They were informed what the sound sample focusses on to make the participant more prepared and guidance.

When the cones are switched they are asked to think out loud about what their opinion was on the sample with cone they just heard. This was to gain more insights in their listening experience, but also to hide the sound the cone possibly would make when being replaced.

Test results were written down by hand. To minimise extra noise from typing for example.



Materials were selected based on availability and on different density and surface structure. Different densities have different abilities to absorb frequencies.

Felt is known for its sound absorbing properties due to surface texture, while a very slick material like plastic reflects more sound instead of absorbing it.

Wood is used in music instruments and was therefore also selected. To make the cone from wood different slits needed to be made in the material, which also influences the acoustic ability of the material.

Combining different materials in layers was done out of curiosity.

Appendix E

Results material test cones

The scores of the different participants in an excel overview.
First per participants, and finally scores all together

Tester A					
Materials	Bass	Midrange	High Frequency	Soundstage	Overall score
Wood	5	3	4	3	3,75
Plastic	3	2	4	3	3
Felt	4	3	3	3	3,25
Cartboard	4	5	3	4	4
Felt + Cartboard	4	3	3	4	3,5
Baseline measurement	2	3	4	2	2,75
Tester B					
Materials	Bass	Midrange	High Frequency	Soundstage	Overall score
Wood	3,5	4	3,5	5	4
Plastic	5	4,5	3	4,5	4,25
Felt	4	4,5	3,2	4,5	4,05
Cartboard	5	5	3,5	3,7	4,3
Felt + Cartboard	5,5	5	5	5	5,125
Baseline measurement	5	5	3,2	5	4,55
Tester C					
Materials	Bass	Midrange	High Frequency	Soundstage	Overall score
Wood	4	4	4	5	4,25
Plastic	4	4	5	4	4,25
Felt	5	5	4	4	4,5
Cartboard	3	4	4	4	3,75
Felt + Cartboard	2	5	3	5	3,75
Baseline measurement	5	3	5	5	4,5
Tester D					
Materials	Bass	Midrange	High Frequency	Soundstage	Overall score
Wood	2	4	2	3	2,75
Plastic	2	2	4	4	3
Felt	3	5	5	5	4,5
Cartboard	4	5	4	4	4,25
Felt + Cartboard	3	4	4	4	3,75
Baseline measurement	5	3	4	4	4
Tester E					
Materials	Bass	Midrange	High Frequency	Soundstage	Overall score
Wood	3	4,5	3	3,5	3,5
Plastic	3,5	4,5	3	5	4
Felt	4,5	3,5	2,5	4	3,625
Cartboard	3	4	2,5	3,5	3,25
Felt + Cartboard	3,5	3,5	3,5	3	3,375
Baseline measurement	4,5	3,5	3,5	4,5	4
Tester F					
Materials	Bass	Midrange	High Frequency	Soundstage	Overall score
Wood	3	5	3	3,5	3,625
Plastic	4	4	2	2	3
Felt	3,5	2	2,5	3,5	2,875
Cartboard	3,5	5	3	4	3,875
Felt + Cartboard	4	3,5	4	3,5	3,75
Baseline measurement	3	4,5	4	4	3,875
Summative score					
Materials	Bass	Midrange	High Frequency	Soundstage	Overall score
Wood	3,416667	4,083333	3,25	3,833333	3,645833
Plastic	3,583333	3,5	3,5	3,75	3,583333
Felt	4	3,833333	3,366667	4	3,8
Cartboard	3,75	4,666667	3,333333	3,866667	3,904167
Felt + Cartboard	3,666667	4	3,75	4,083333	3,875
Baseline measurement	4,083333	3,666667	3,95	4,083333	3,945833

Appendix F

Prototyping the shell or body

Here the prototyping process is displayed. The power button is placed on the side for a more intuitive interaction, and the power outlet is at the bottom.



Tracing the driver in order to cut the opening in the bowl.

Cut the circle out of the cardboard.



Use the circle to trace on the bowl the driver size.

Size of driver is now transferred onto the bowl.



Sand the top off.

Clamp bowl and drill holes for power button and usb-c power outlet.



The power switch of the speaker.



Cutting the USB-C port.



File the holes together.



Holes from driver overlay and trace on bowl.



Material is too thin to fix the driver on.



File the holes by hand in the thin material.



Make supportive ring to clamp the driver on.



Ring is placed on the inside.

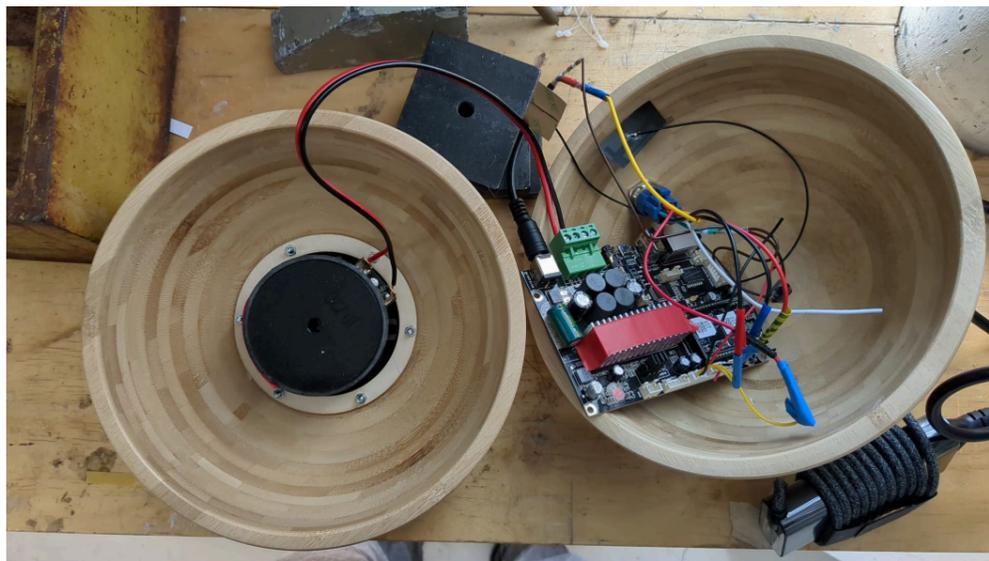
Prototyping the shell or body



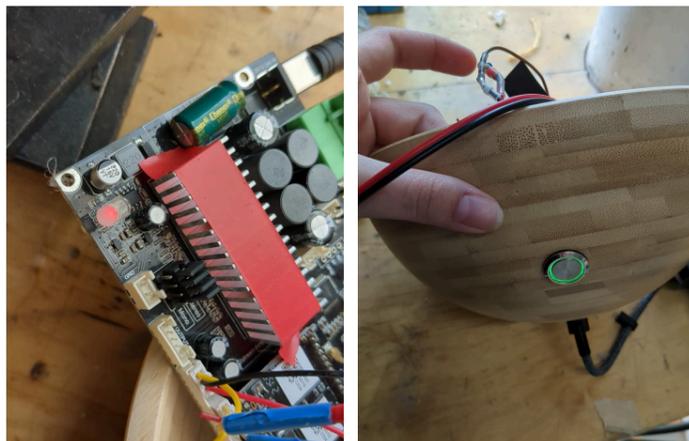
Place the nuts and bolts in pattern to avoid slanted mounting with tension.

Nuts and bolts clamping the driver in place.

Solder circuit to driver

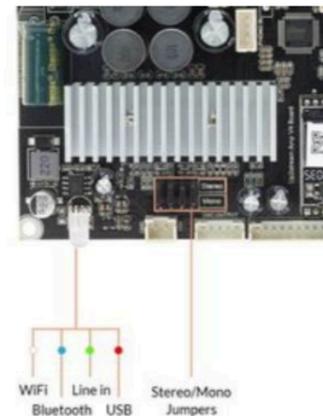


Trying to connect the speaker to my phone with the 4stream application before closing the speaker.



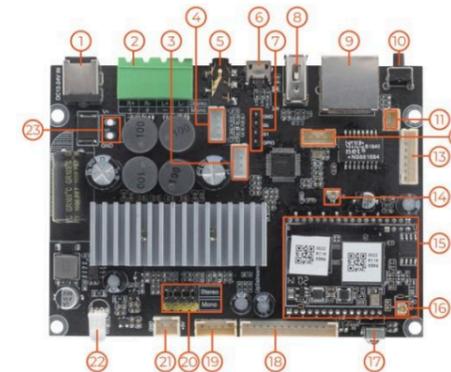
Does not connect, LED is red.

Button should blink to connect, but stays still...



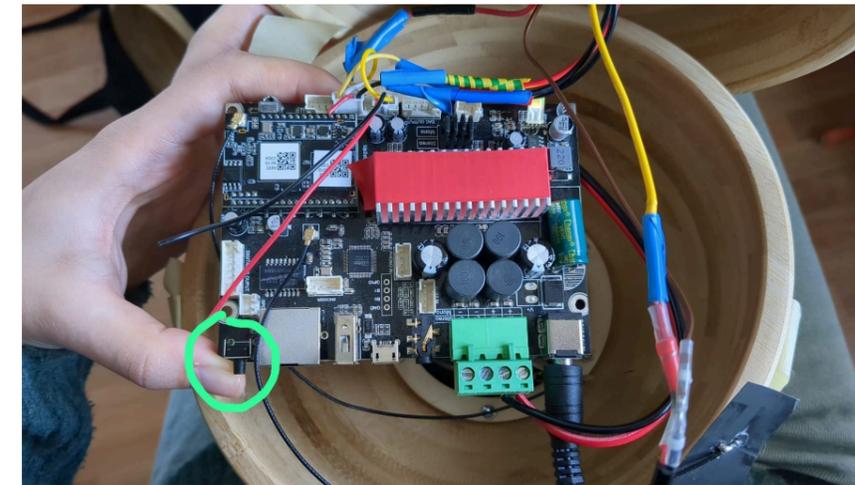
Deep dive into the Amplifier Board and found the different LED color meanings. Desired setting would be wifi or Bluetooth, but is now on Line in or USB.

3. Interface



- 1 DC-IN
- 2 Speaker OUT (Stereo: R+,R-,L+,L-) (Mono: +,+,--)
- 3 GND, MIC2, MIC1, GND
- 4 Line IN (R_IN, GND, GND, L_IN)
- 5 Line IN
- 6 Mirco USB
- 7 GND, B0, B1, GPIO
- 8 USB
- 9 Ethernet RJ45
- 10 Power Button
- 11 GND, SPDIF
- 12 GPIO2, GPIO1, GND, VCC3V3
- 13 SPDIF, MCLK, IIS_DATA, BCLK, LRCK, GND, VCC_3V3
- 14 Bluetooth Antenna
- 15 WiFi Module
- 16 WiFi Antenna
- 17 IR
- 18 IIC, IR, ADC_KEY, LED, RESET, TX, RX, GND, VCC3V3
- 19 XOUT, DGND, LOUT, AGND, ROUT (Stereo: LOUT, ROUT) (Mono: XOUT)
- 20 Stereo/Mono Jumpers
- 21 +5V, GND
- 22 LED
- 23 V+,GND (12-24V DC in)

Found the specifics of the Amplifier Board and found the option of a power button (10).



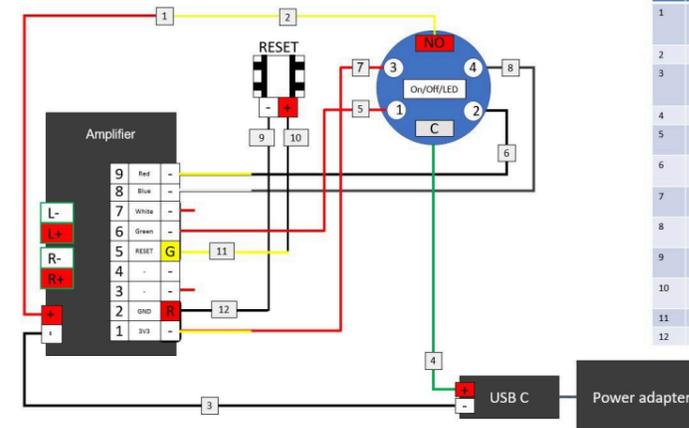
Pushing the button to move to a different setting, but it doesn't work.

Trouble Shooting

- Trying different things suggested in the manual of the Amplifier Board:
- Hold the POWER button then plug in the power cable.
 - If you change to another router, or the password of the connected router has been changed, please long press POWER button for 5 secs in WiFi mode to reset the connection.
 - Hold POWER button then plug in the power can force the device to enter WiFi mode. If you have setup router connection before, the device will auto connect to that router.
 - Short press to power off and on; When in WiFi mode, long press (press and hold for 5 secs) to reset WiFi settings and enter pairing mode; When in Bluetooth mode, long press to terminate current connection. *Hold Power button first then plug in the power cable can force the device to enter WiFi mode. If you have setup router connection before, the device will automatically connect to that router.

- There is another way to setup Wifi if the above method has faild:
1. Hold the POWER button then plug in the power cable.
 2. The LED light will start flashing, release the button and wait till the LED flash slowly.
 3. Goto your mobile WiFi settings and search for SoundSystem_xxxx WiFi and connect. *If you cannot find SoundSystem connection, long press the POWER button for 5 secs and then refresh your mobile's WiFi listing

Nieuw circuit



Checking the circuit on faulty connections.

Stand

For the prototype, an IKEA plant pot stand was repurposed as a temporary support structure. Two holes were drilled—without fully penetrating the material—to integrate wooden pins seamlessly into the stand. The pins were then trimmed to the desired length and sanded for a refined finish. These pins provide structural support for the speaker caps.

This stand serves as a placeholder while the focus remains on prototyping the cap, which is the more unique feature of the design. Since various speaker stands already exist, extensive ideation on this component was deprioritized in favor of refining the product's distinctive elements.



Clamping

To secure the caps, they were clamped onto the pins using friction. Initially, laser-cut layered circles were used as pin caps, but they did not provide sufficient friction and the caps slipped. Rubber bands were introduced as an alternative, effectively stabilising lightweight paper caps. However, this method proved insufficient for heavier materials, leading to structural instability. A more robust clamping solution, such as a nut and bolt mechanism, is required to ensure secure positioning and long-term reliability.



Caps

Initial shape exploration for the caps was carried out using lightweight paper, which was gradually cut and adjusted until the desired shape and movement between layers was achieved. Once the shape was defined, heavier paper was used to improve rigidity. To further test material functionality, cork (2mm thick) and felt (3mm thick) were considered as potential cap materials. The cork, although flexible, cracked when folded, compromising its durability. The felt was more resilient but lacked stiffness. A thicker felt or an additional layer would be required to retain its shape and provide better support.

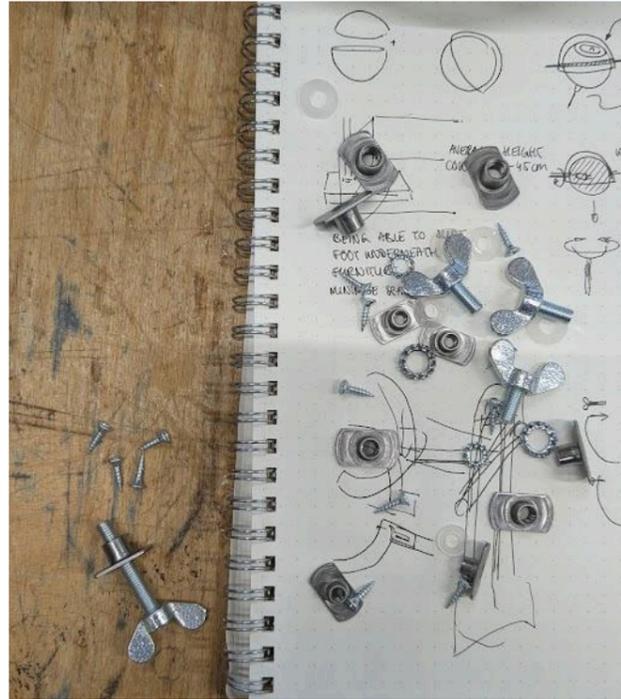


Appendix G

Prototyping speaker stand/interaction



Findings the middle of the bowl to indicate where the holes for the inserts would go.



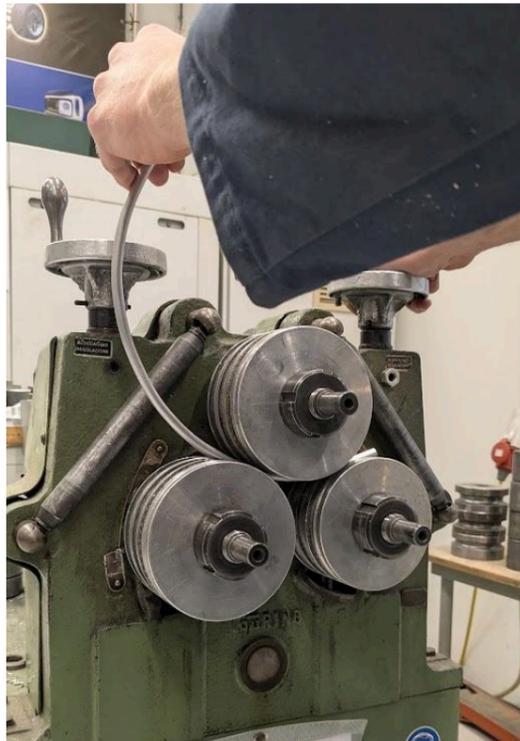
Exploring different inserts and methods to get the speaker attached to the stand with keeping vertical rotation.



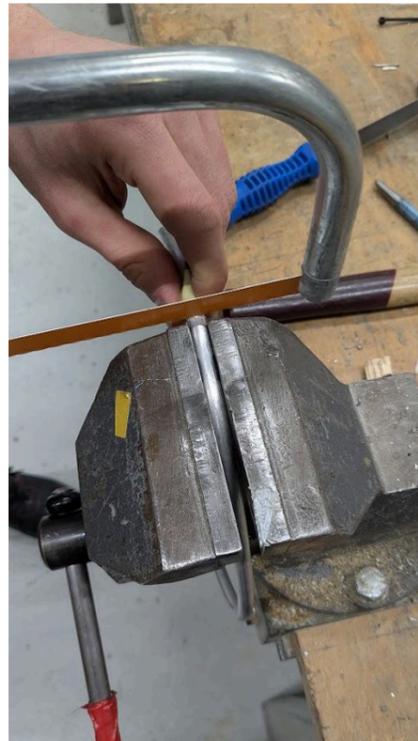
Voorboren van gat, kijken of het zou werken op de naad.



Insert met schroefdraad invoegen nadat ingezonken gaten gemaakt waren in insert.



Walzen van aluminium staaf (8mm).



Extra materiaal wat rechte stukken afzagen.



Gaten boren om schroefdraad doorheen te steken.



Het samenvoegen van stand frame en speaker met schroefdraad.



Siliconen inserts toevoegen om meer frictie tussen frame en speaker te krijgen.

Prototyping speaker stand/interaction



Analysing how the lamp system works to figure out how to add the speaker.



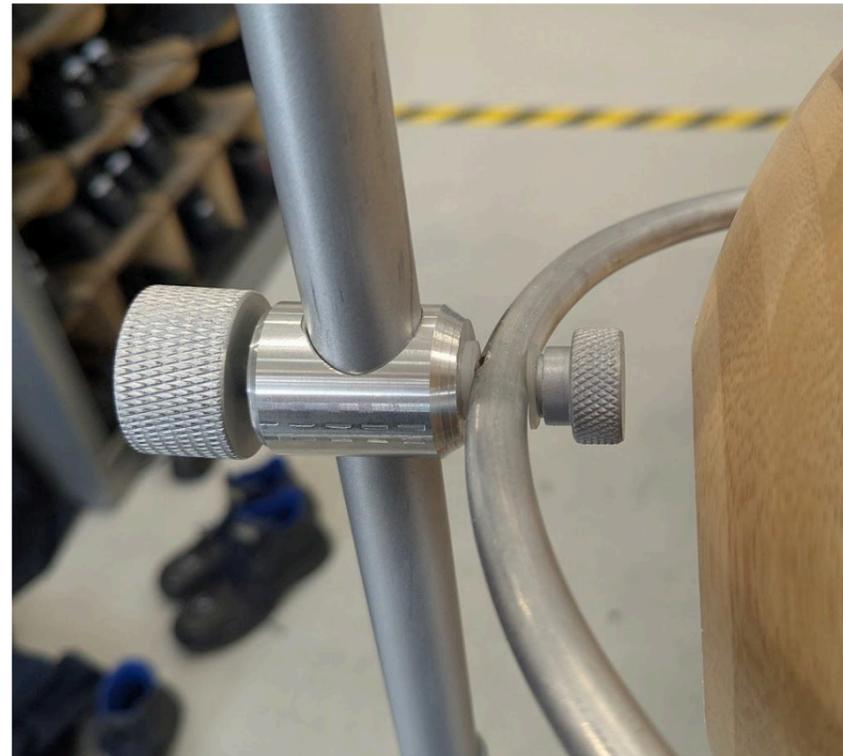
Attach the speaker frame to the clamping system of the repurposed lamp stand.



Since the component is from plastic it was bending under the speakers weight.



The plastic clamping component was replaced with an aluminium replica. (with help of the pmb people)



The aluminium component held the speakers weight solving the problem of the speaker bending down.



The speaker on the stand.

Appendix H

Eco Speaker

- A modular (cement) speaker that functions as a piece of art, using sustainable materials like recycled fibers and bio-based damping.
- Sculptural and bold in design, with custom finishes for personal expression.

Tactile Nostalgia Meets Modern

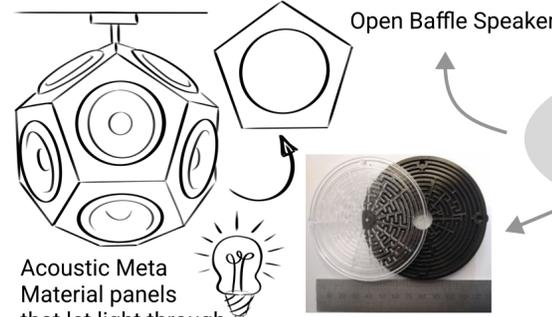
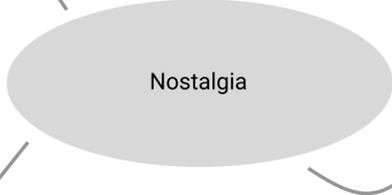
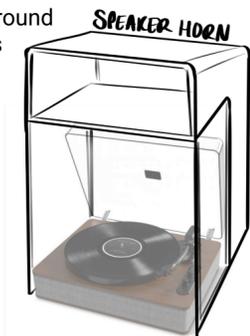
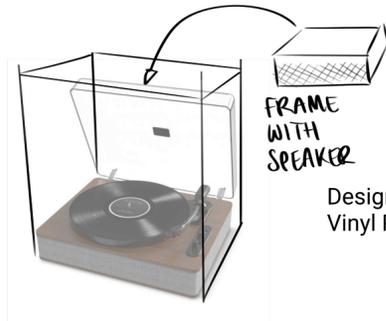
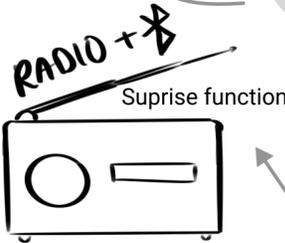
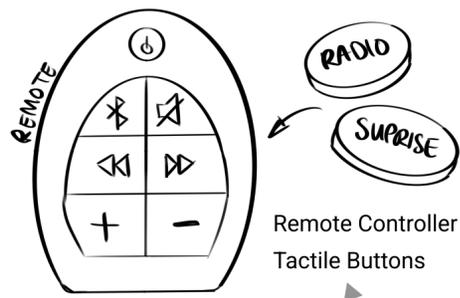
- Retro-inspired tactile controls combined with seamless app integration.
- Offers features like random "radio" mode playlists and Bluetooth reconnecting for ease of use.

Interior Focused

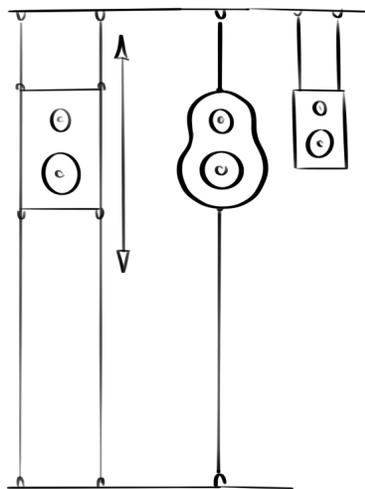
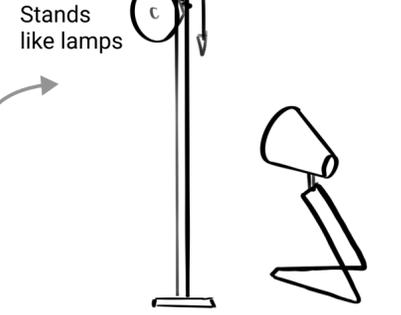
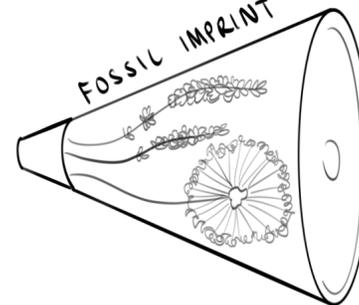
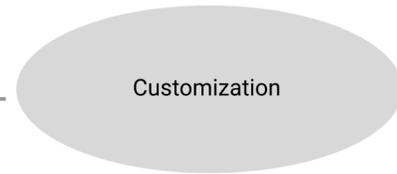
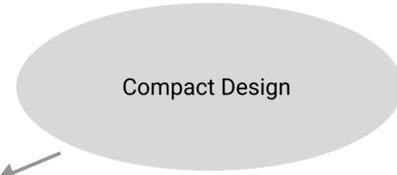
- Speakers designed for interior designers, with customizable panels, versatile placement options, and hidden wiring systems.
- Compact, sleek options for minimalist spaces and larger, statement pieces for feature walls.



Modularity
Repairability

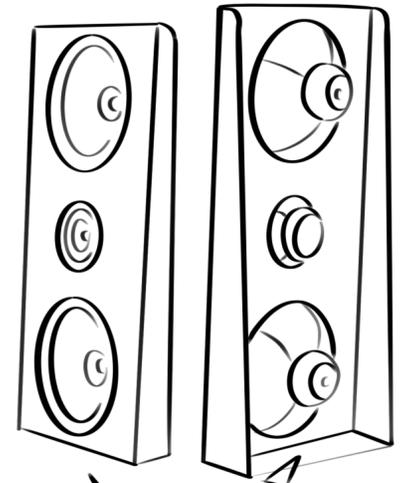


Different Materials,
Finishes, Colors

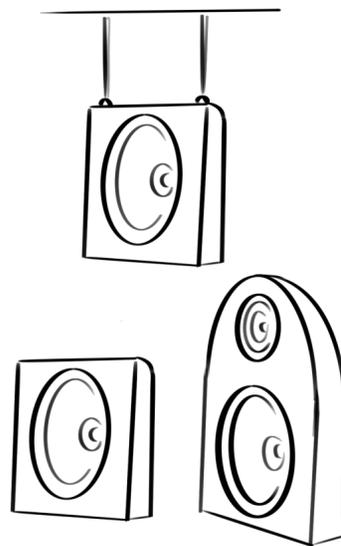


Modular Design

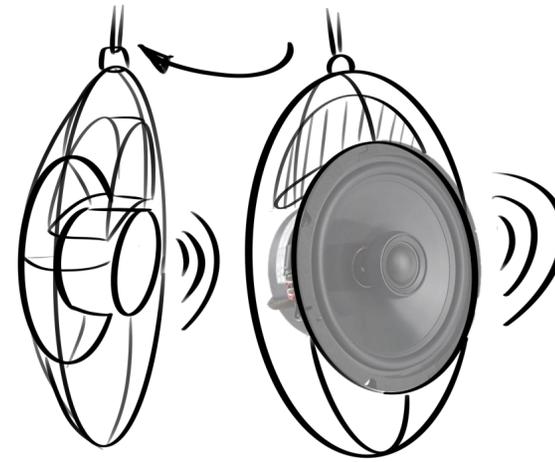
OPEN BAFFLE SPEAKER



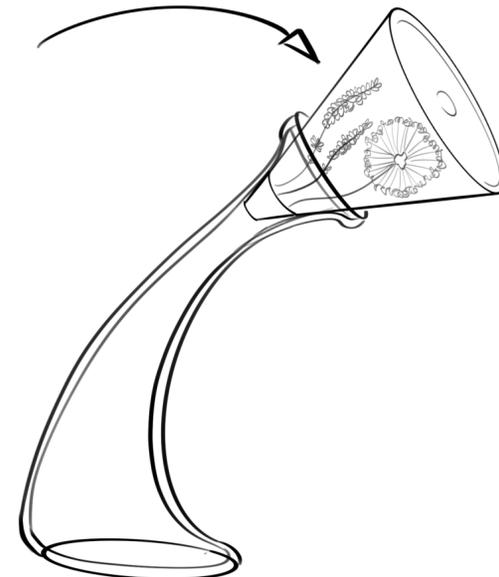
Create a frame on which front panels can be personalised/switched

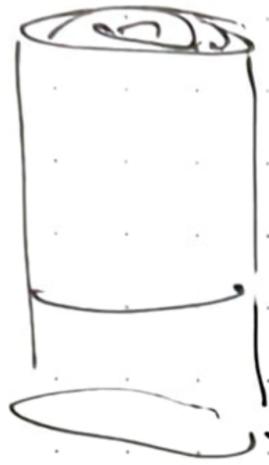


Compact Design

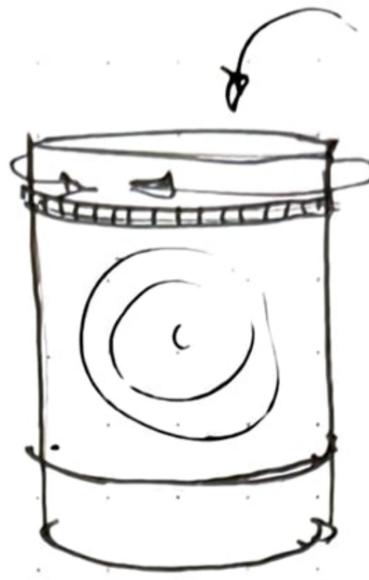
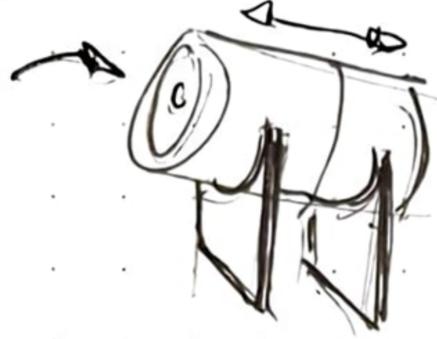


2-Way Directivity
Unique sound experience

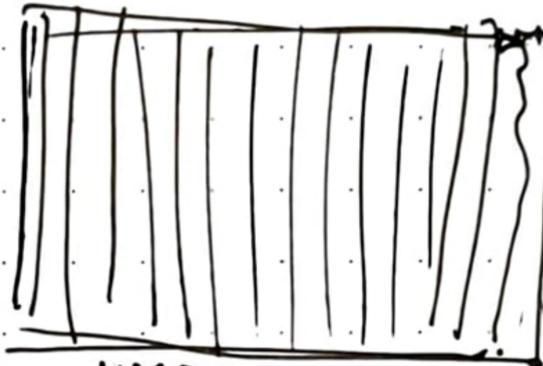
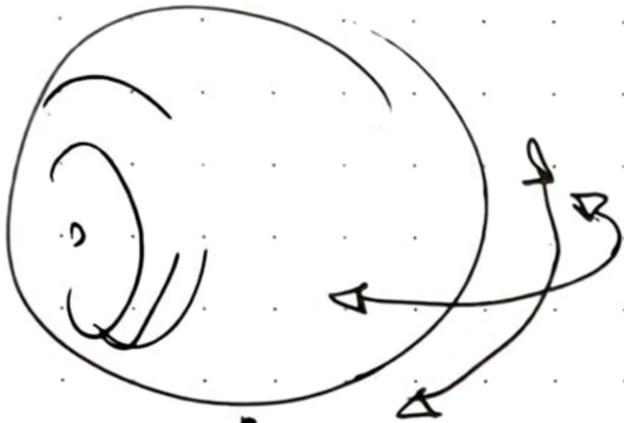
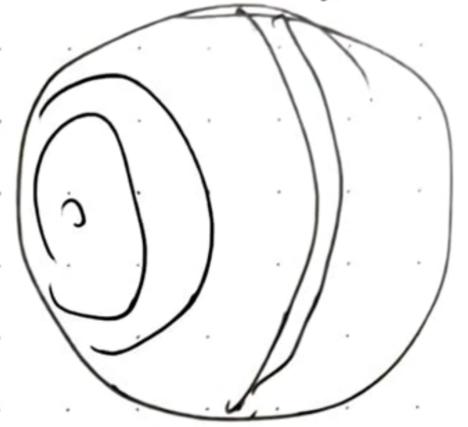




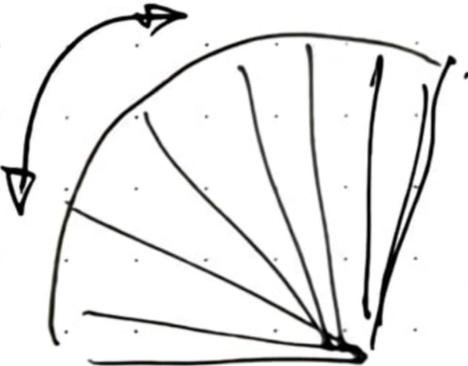
OMHOOG
OMLAAG
VSSCHUIVEN



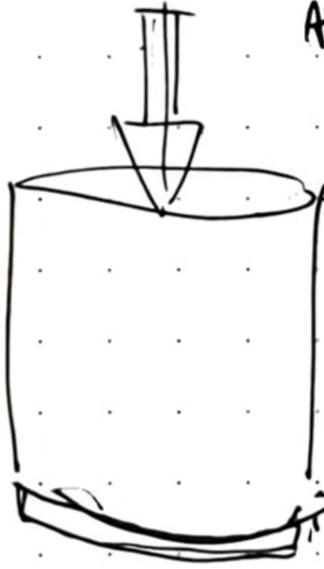
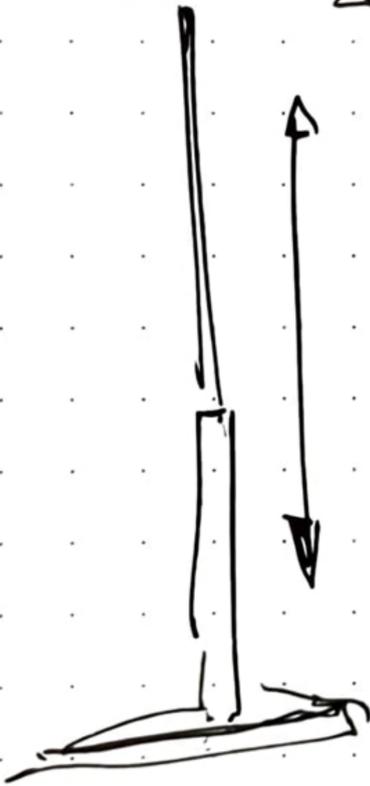
DRAAIENDE
LAAG
IPV
DRAAIKNOP



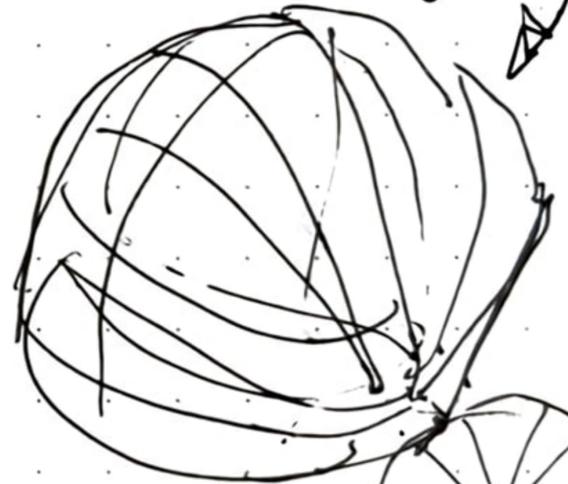
UNFOLD SPEAKER
ACCORDION



OPEN OR CLOSE



CLICK
TO
TURN
ON/OFF



WASHER

OPEN OR CLOSE
DIFFERENT
PANELS

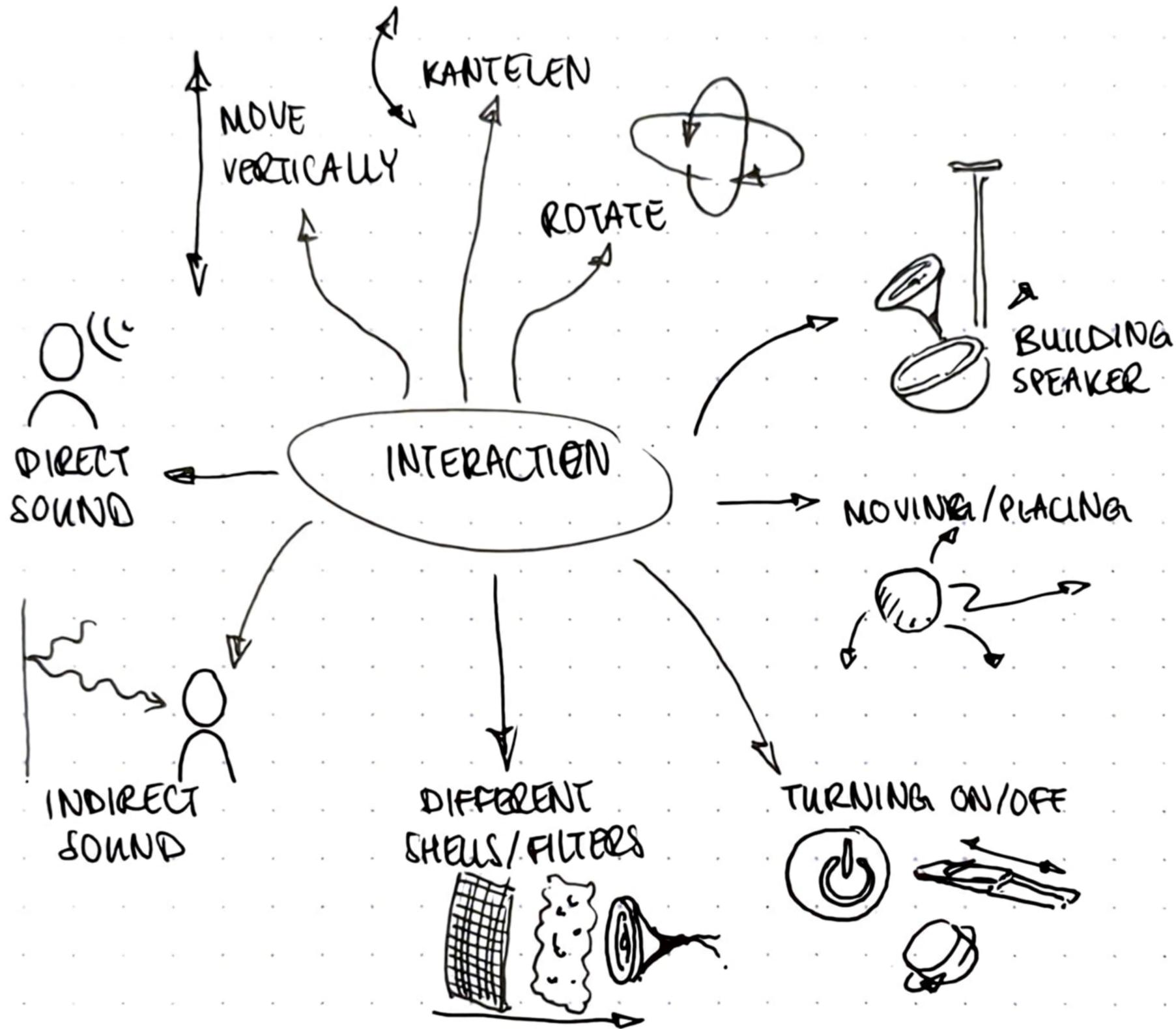


MAXIMUM
OPENING



SPEAKERS
STAPELEN OM TE VERSTERKEN





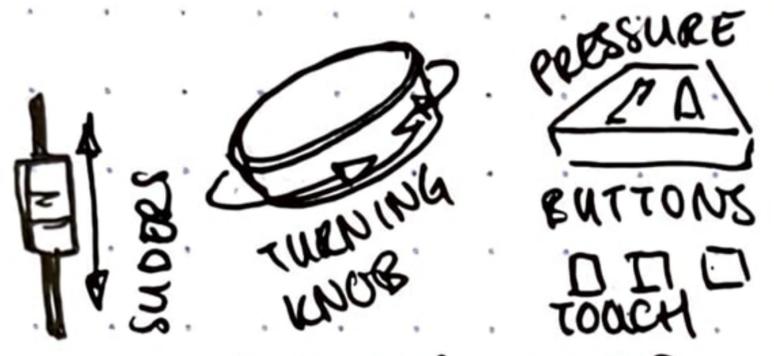
GEbruiker
 context
 waarden
 onderscheid

- ↳ KEY INSIGHTS
- ↳ USER NEEDS
- ↳ TRENDS / PATTERNS
- ↳ CHALLENGES / PROBLEMS
- ↳ OPPORTUNITIES

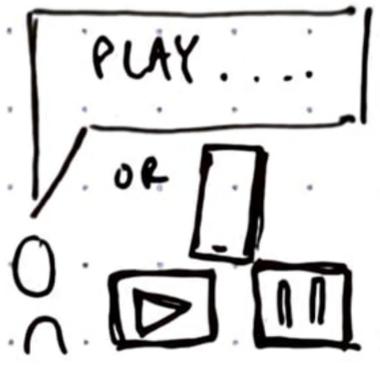
TURN ON

FEEDBACK FROM SPEAKER → LIGHT, SOUND

CONNECTING TO SPEAKER. BLUETOOTH OR WIFI

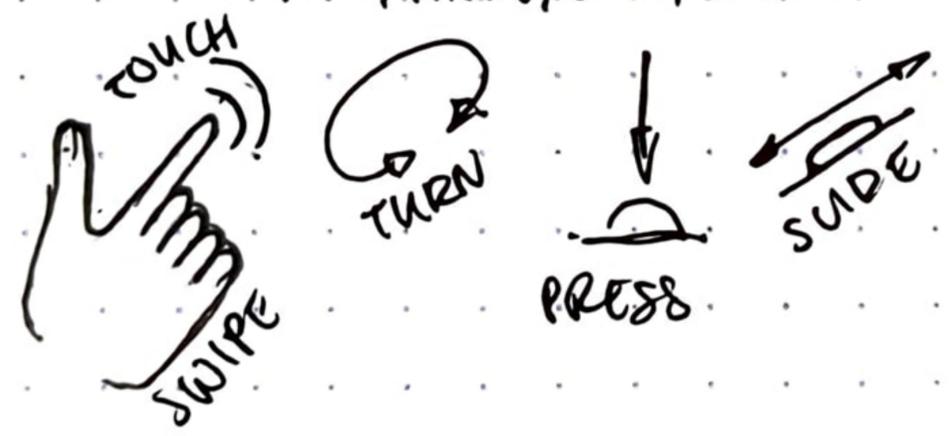


CUSTOMISE SOUND
"VOLUME, BASS, TREBLE, BALANCE"



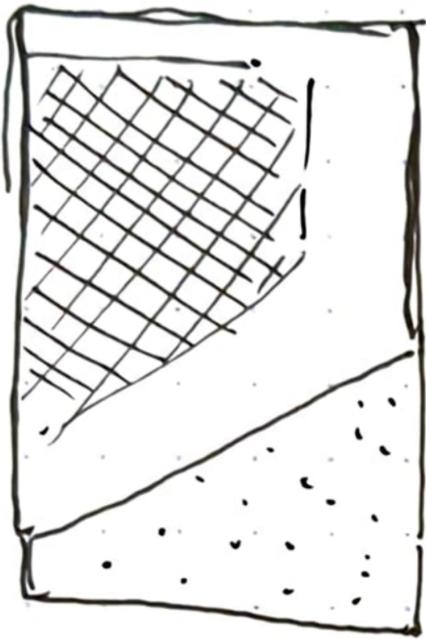
SELECTING MUSIC TO PLAY

PLAYBACK FUNCTION
"PLAY, PAUSE, SKIP, REWIND"



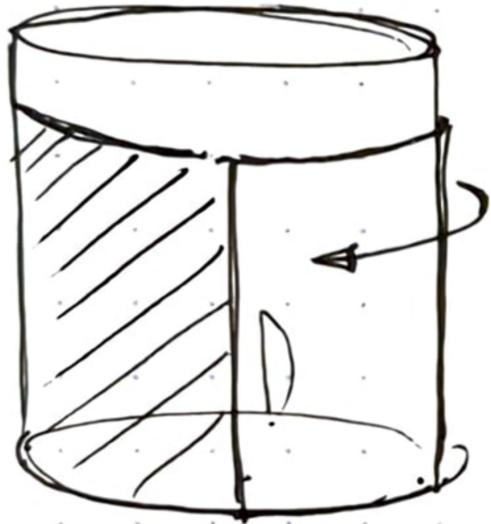
DISCONNECT





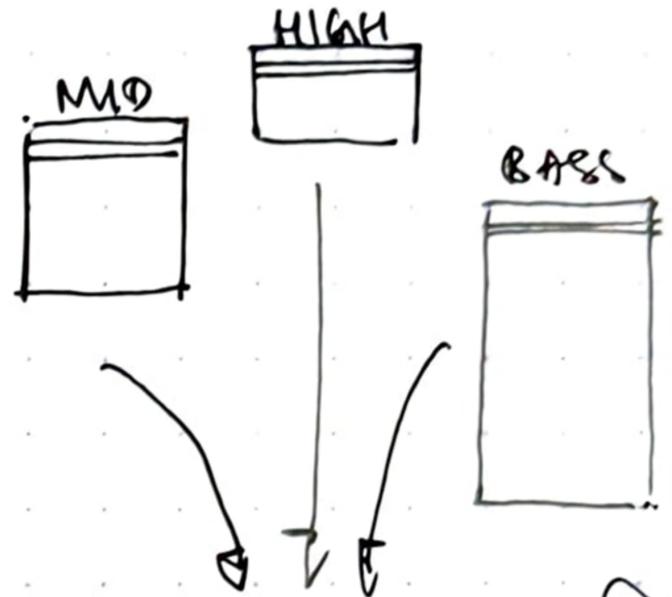
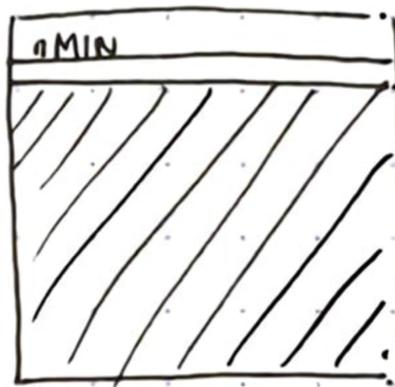
TO CONTROL VOLUME MOVE / TURN UP/DOWN

PLASTER OR CEMENT / STONE

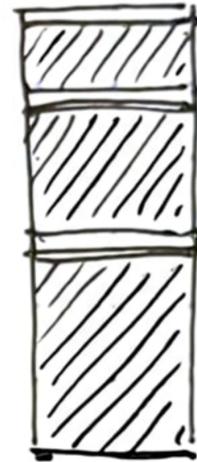


SLIDING SPEAKER OPEN / CLOSED

ADJUST LEVEL VOLUME PER SECTION

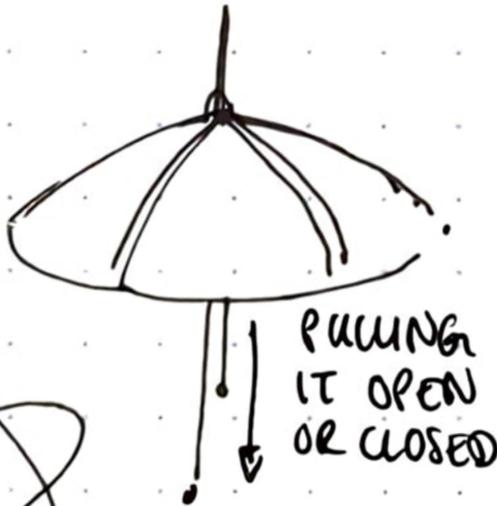


SEPERATE ORTION



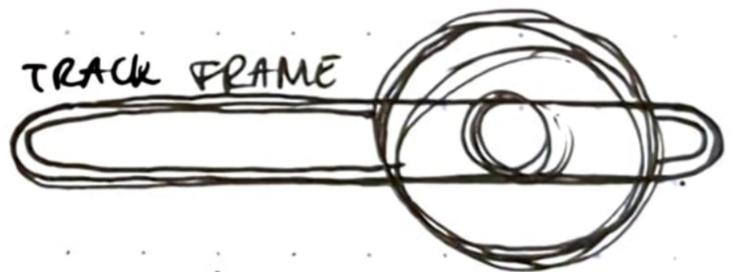
INTEGRATED

PLACE TOGETHER OR SEPERATE BUILDING BLOCKS



PULLING IT OPEN OR CLOSED

DIRECT IN DESIRED DIRECTION

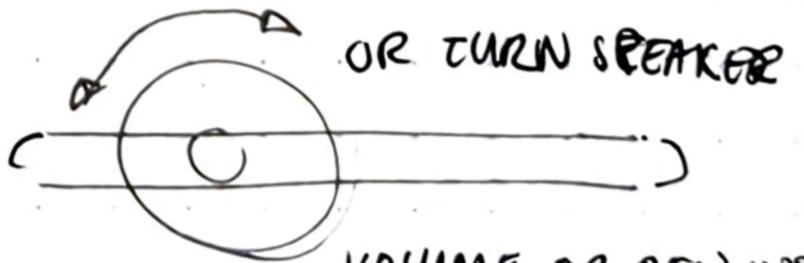


TRACK FRAME

SLIDE SPEAKER FOR CHANGING VOLUME

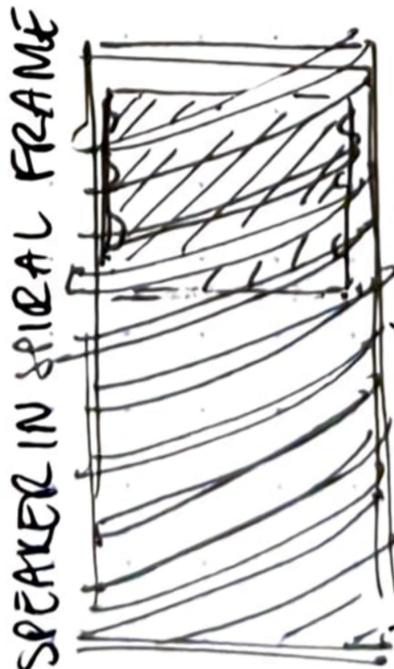
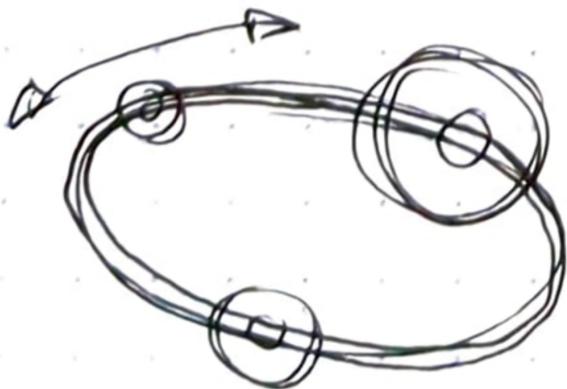


VOLUME TURN DISK

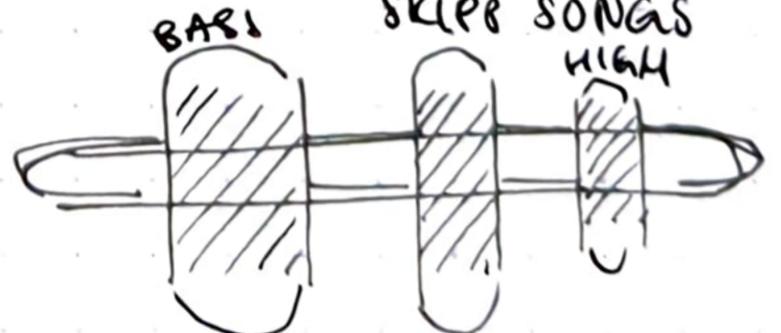


OR TURN SPEAKER

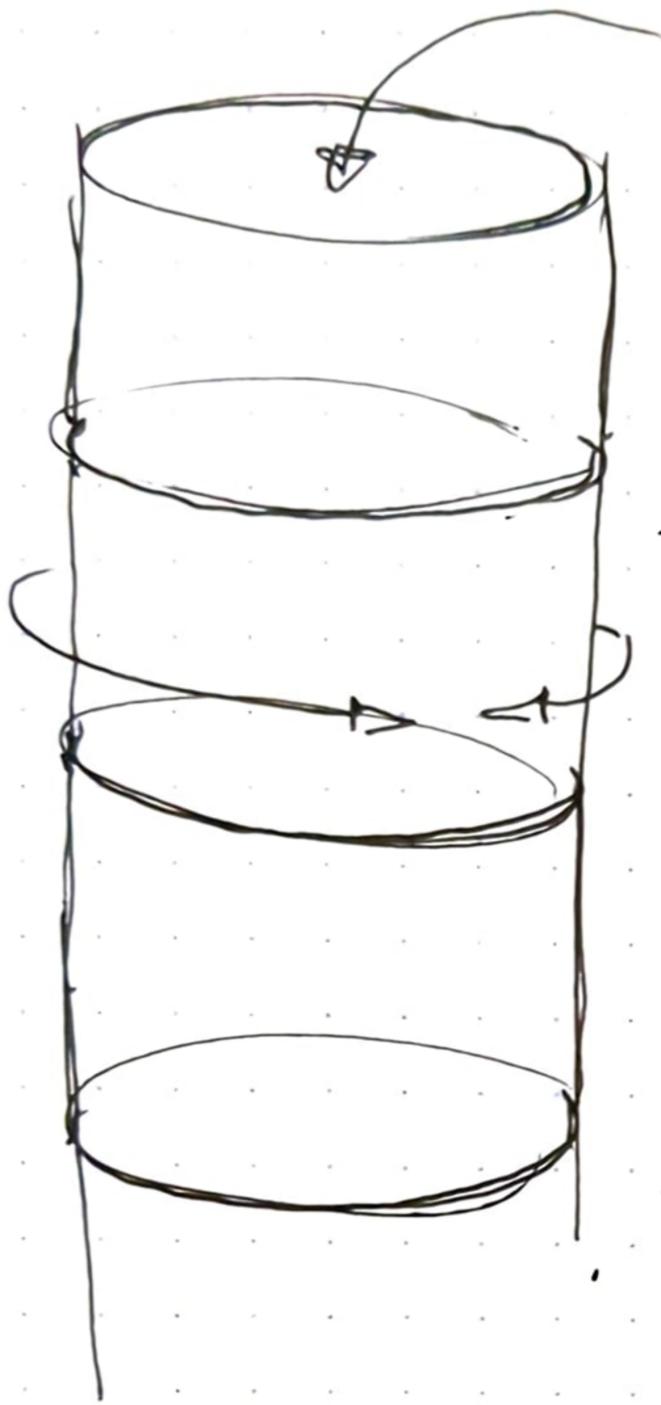
VOLUME OR REWIND / SKIP SONGS



SPEAKER IN SPIRAL FRAME



DIFFERENT LEVELS ON FRAME

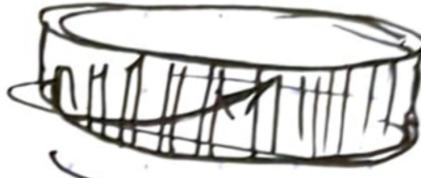


TAP TO TURN ON/OFF

TURN FOR VOLUME



TEXTURE RING



SHOW VOLUME IN LIGHTS.



SKIP OR GO BACK

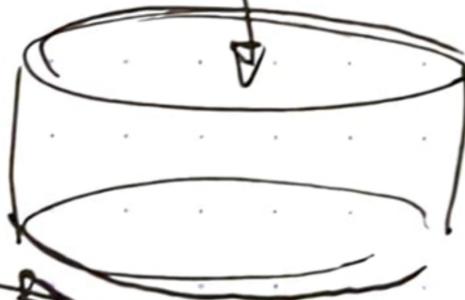


PAUSE TOUCH.

TWEETER

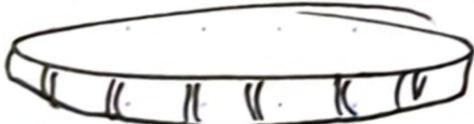


DIFFERENT PARTS

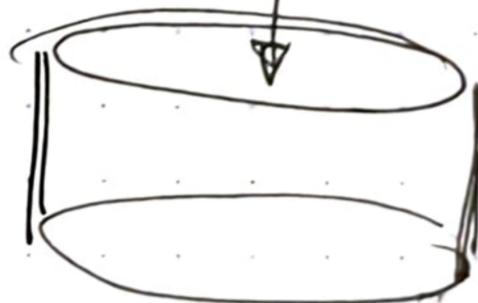


MID RANGE

ADD VOLUME RING



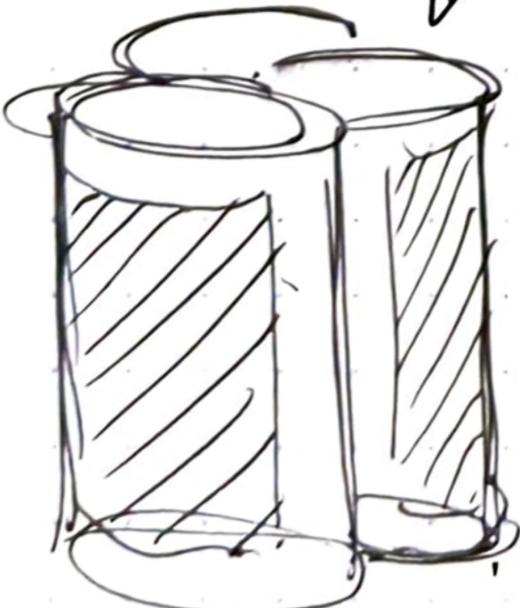
PER PART

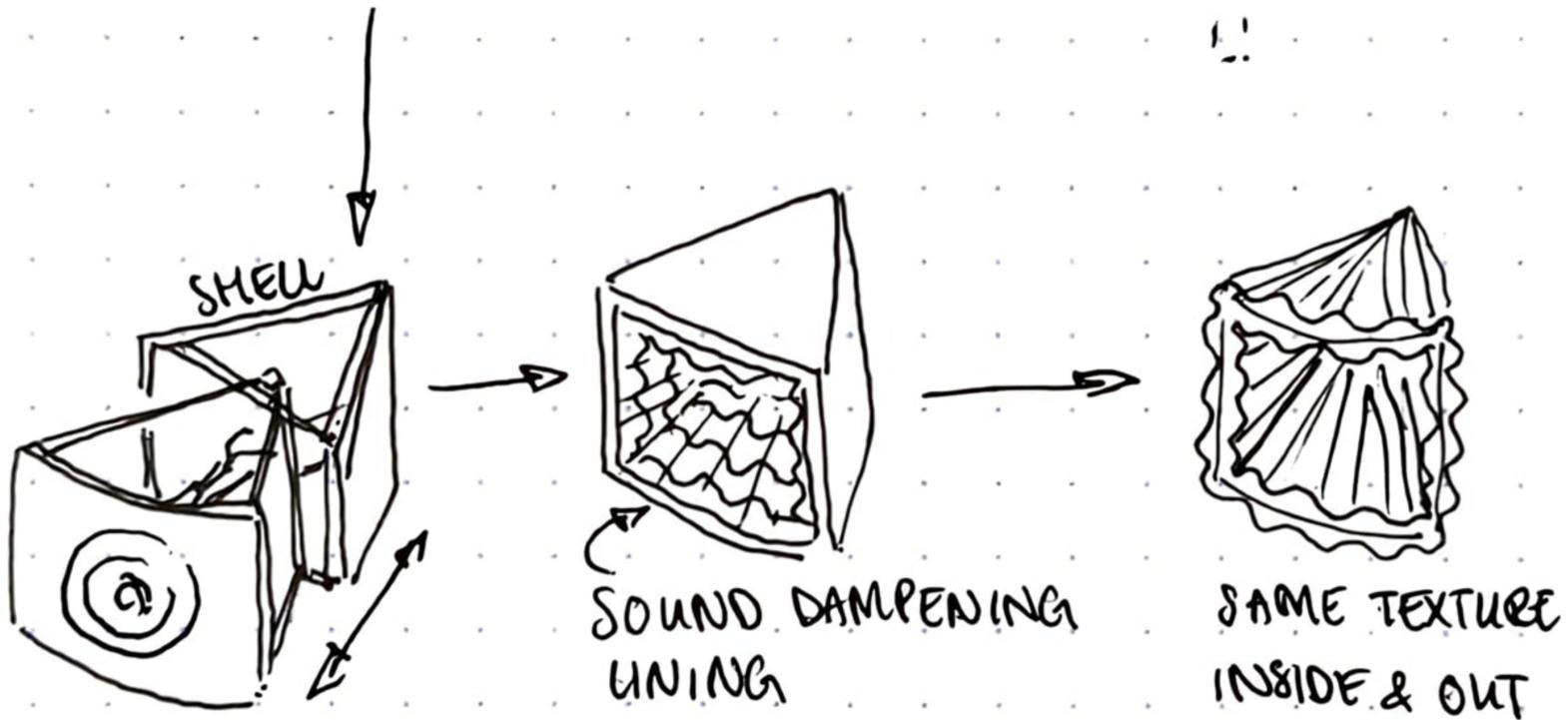
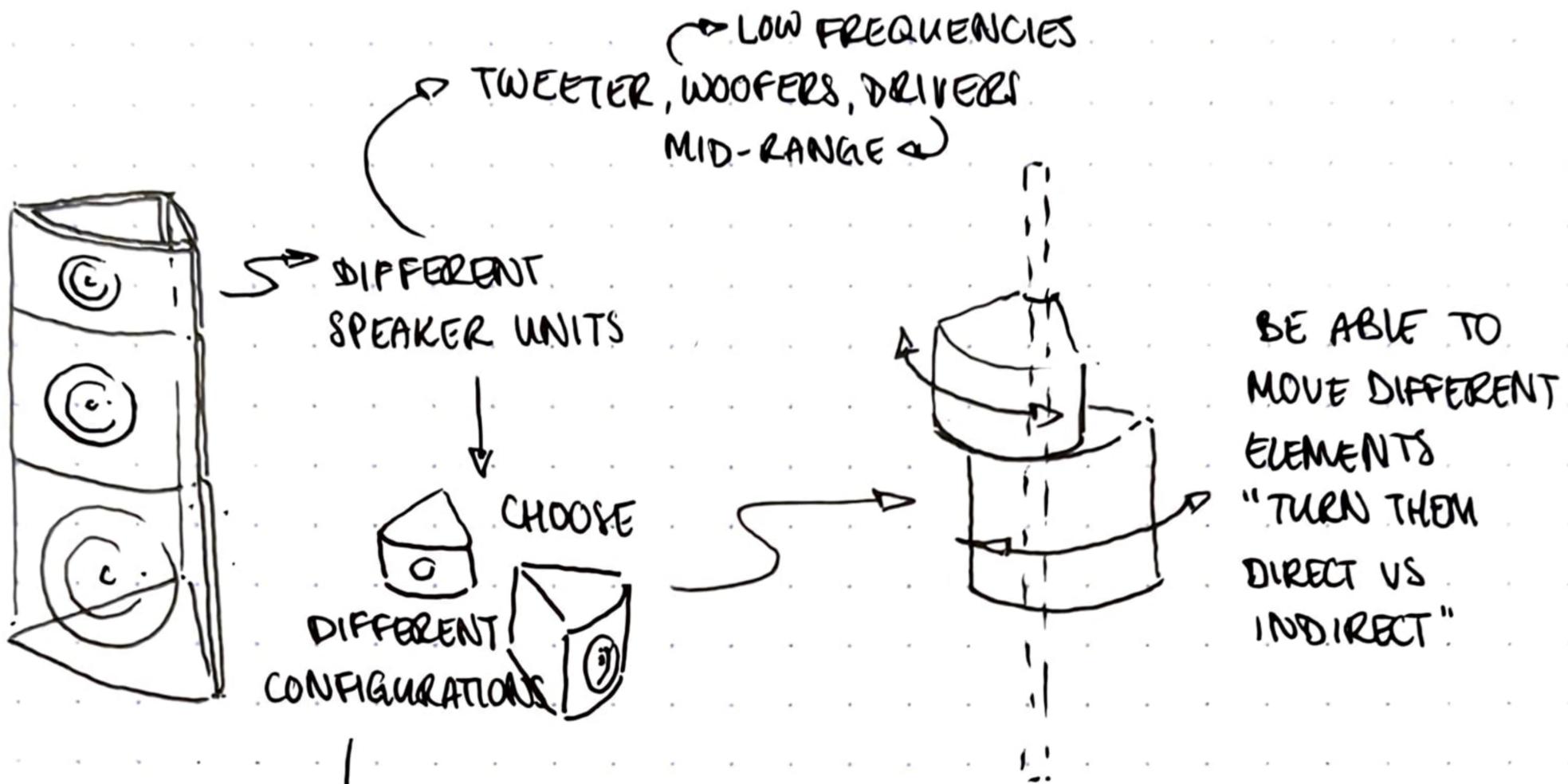


WOOFER

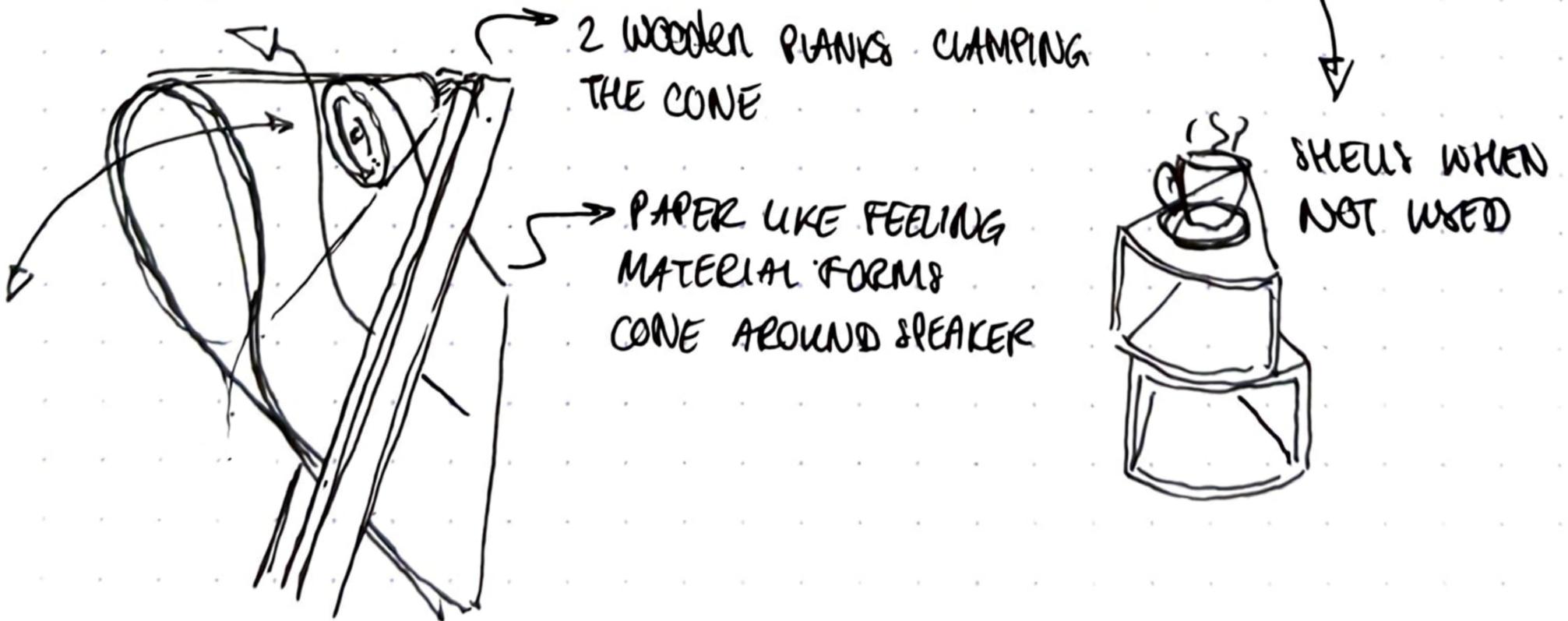


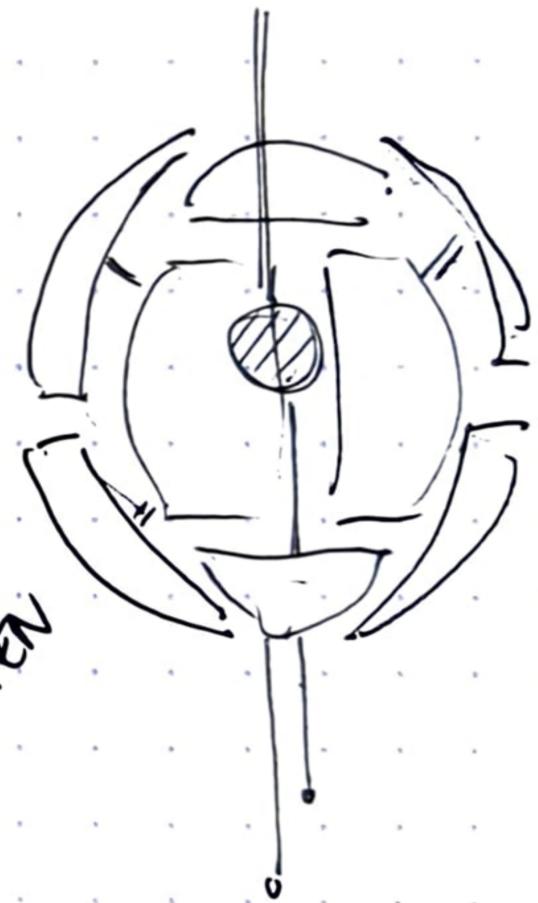
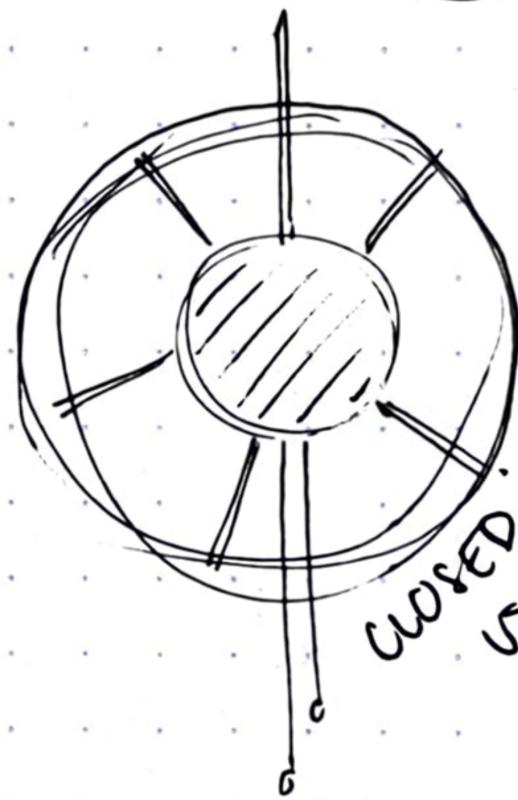
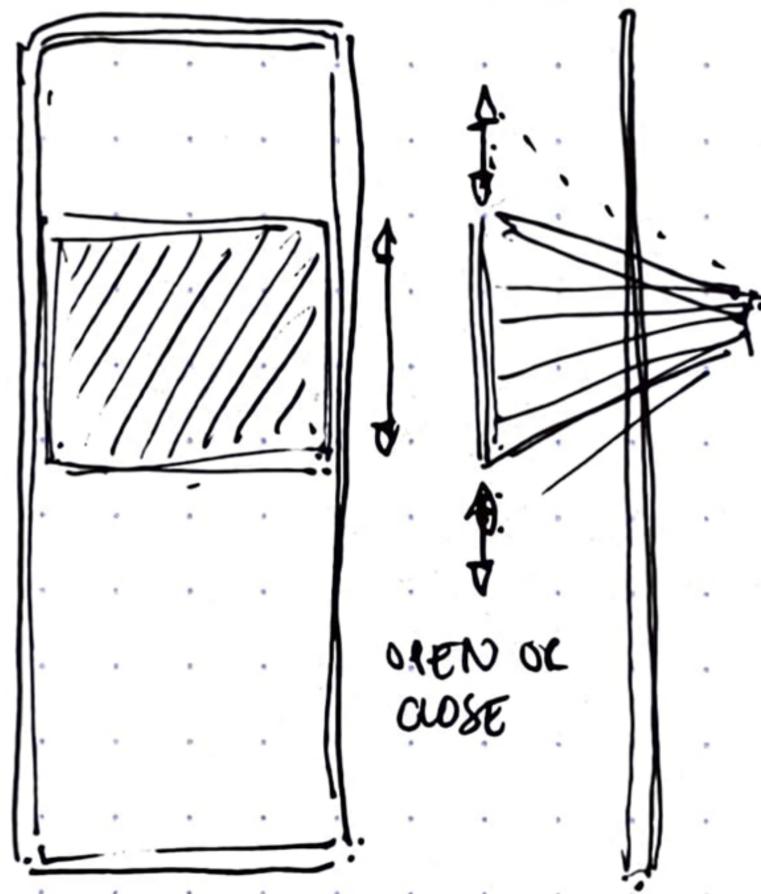
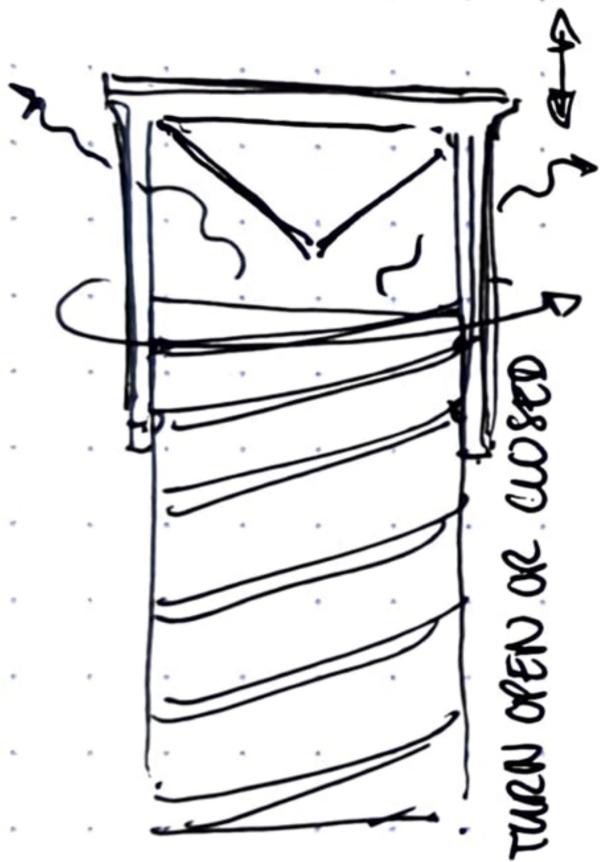
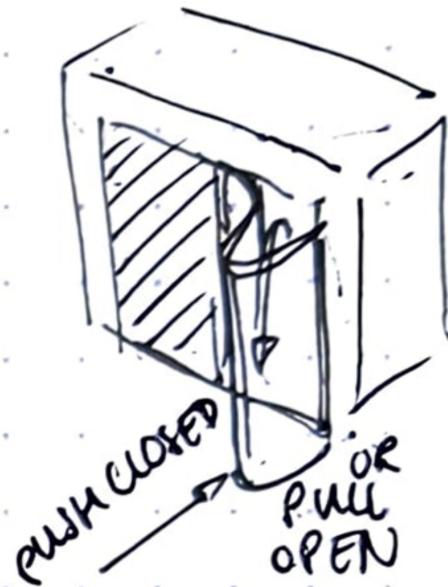
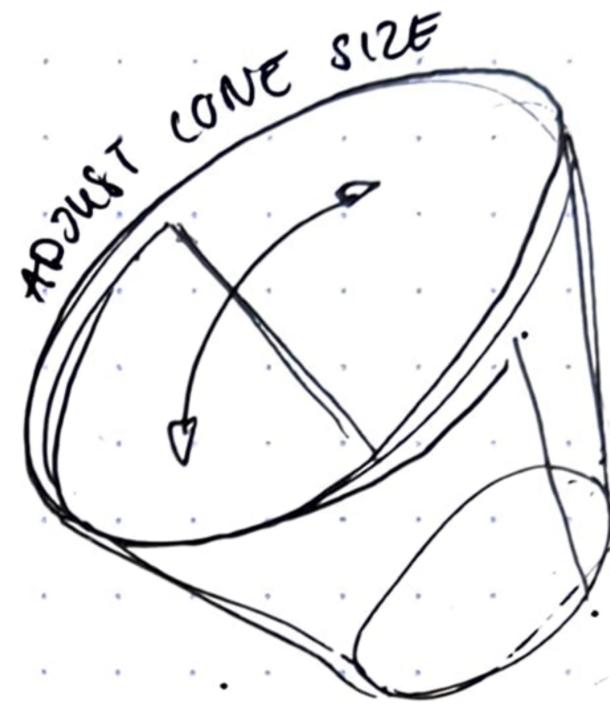
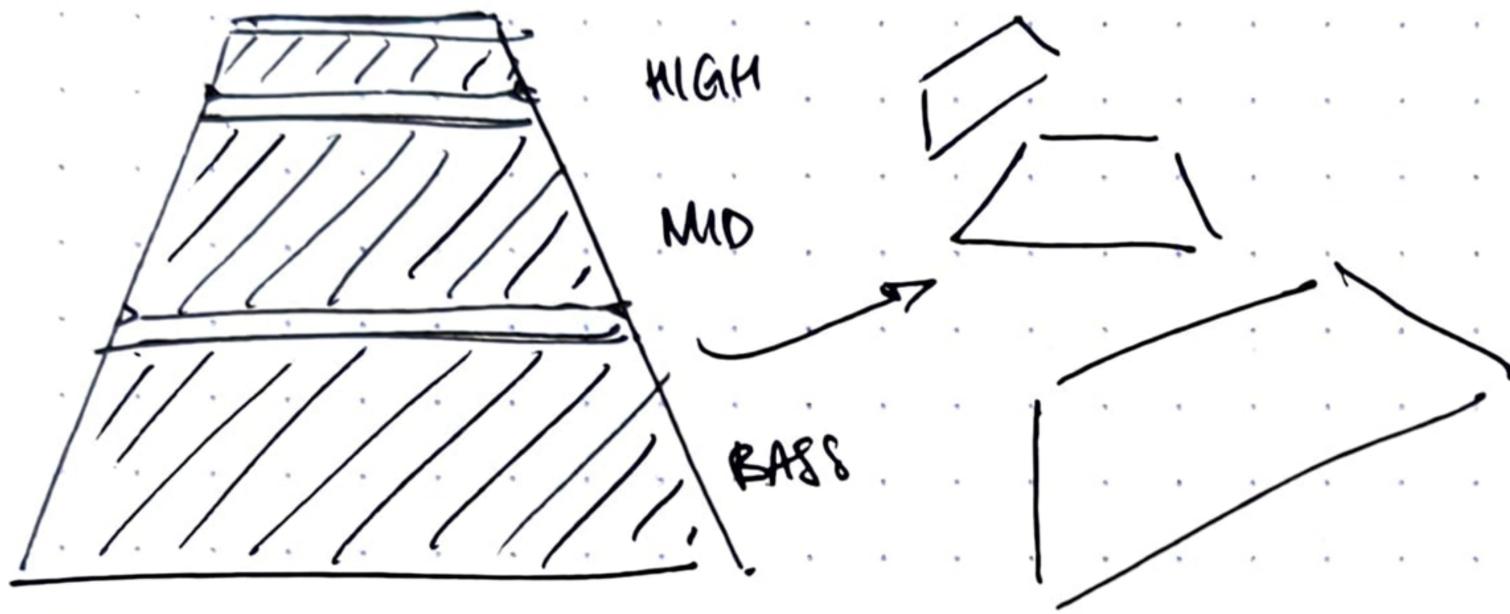
FRAME THAT FITS THE SPEAKER





ADJUST CONE

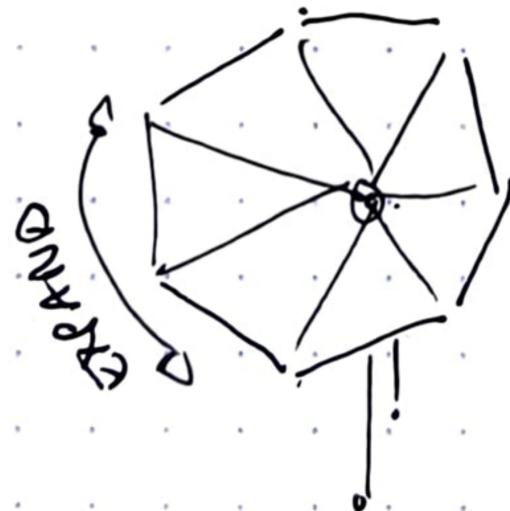


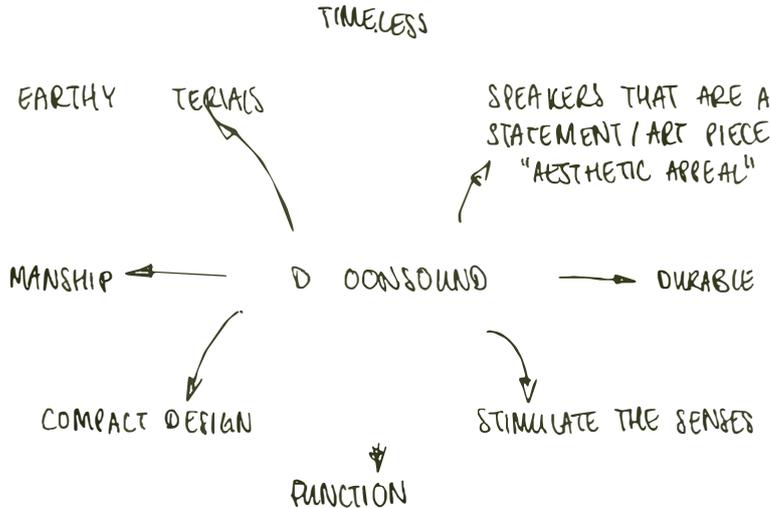


CLOSED VS OPEN



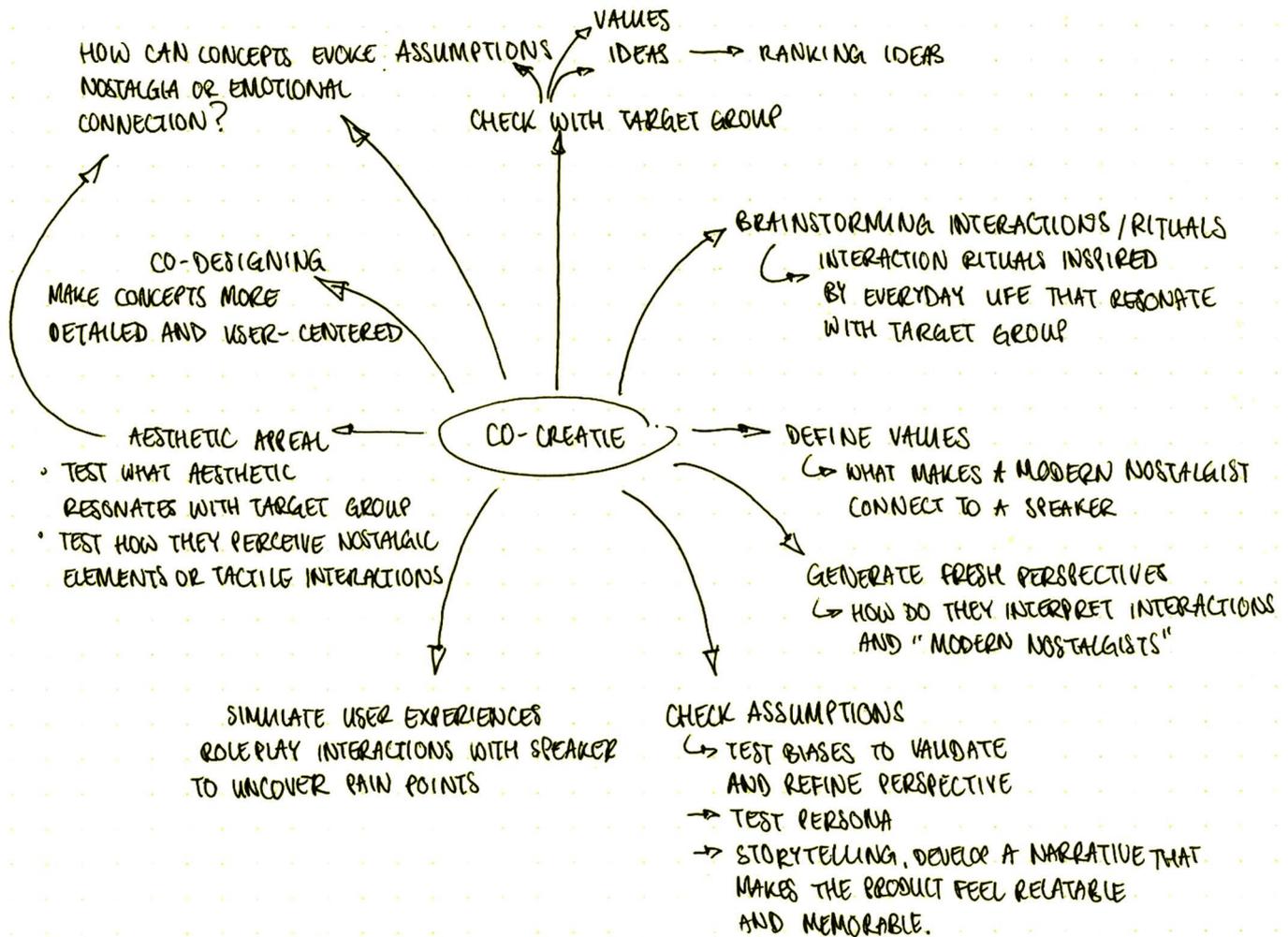
OPEN OR CLOSED
LOOPS TO LET
SOUND
THROUGH
OR NET

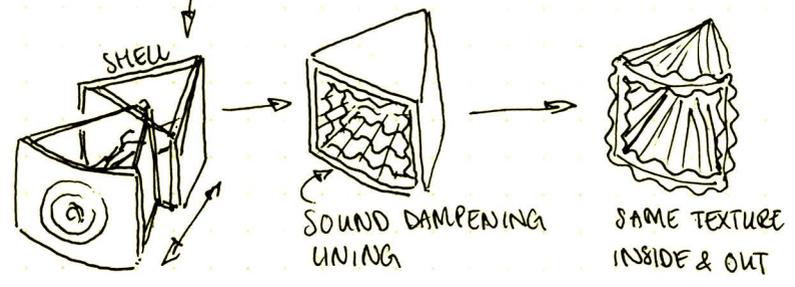
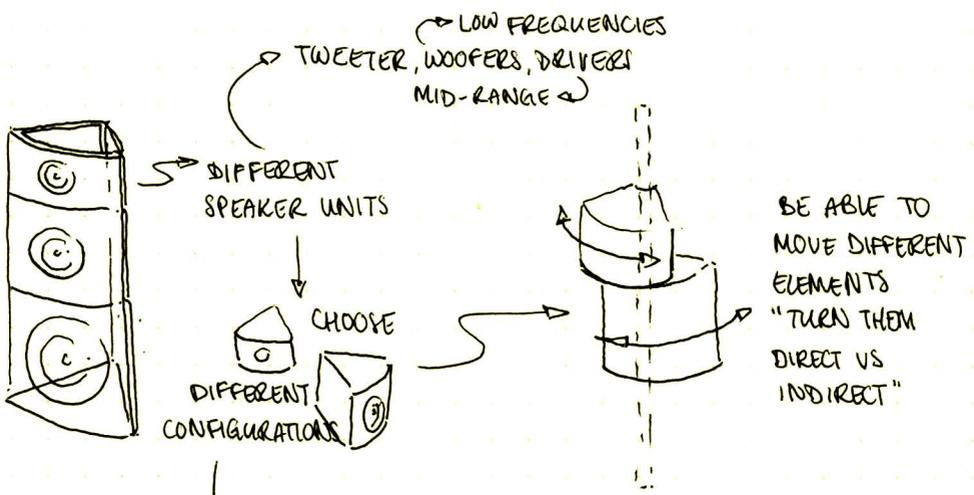




MODERN NOSTALGIA!

- timeless design
- earthy materials
- invest in quality (craftmanship)
- disconnect through listening to music

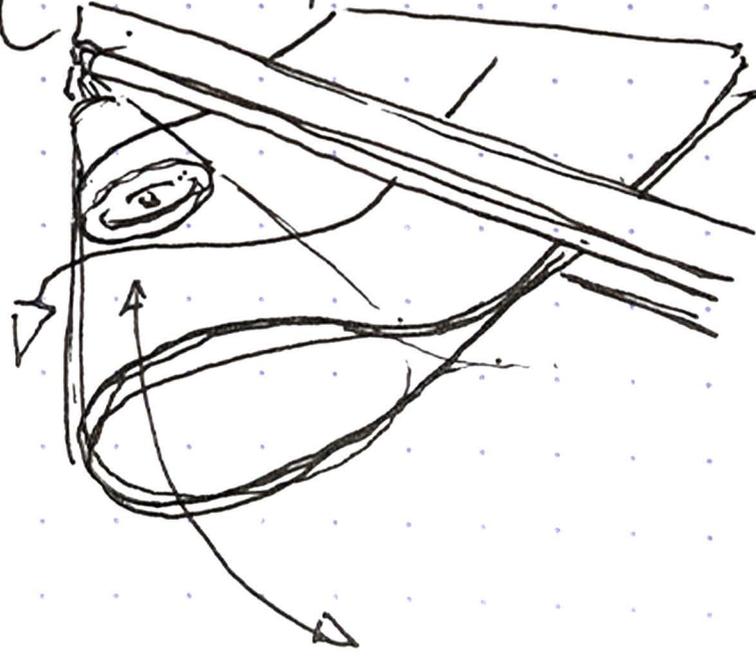


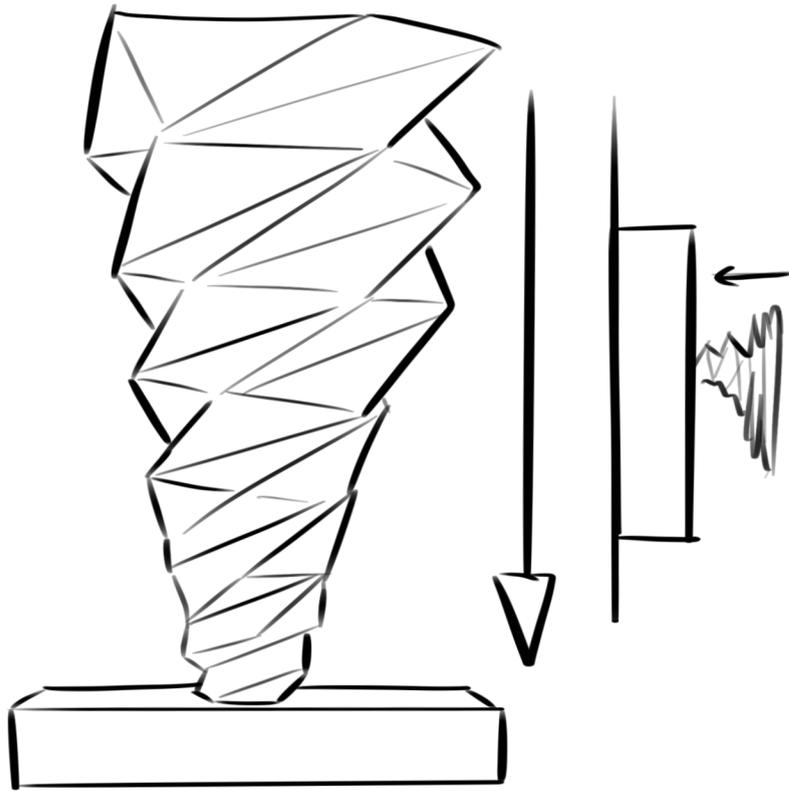


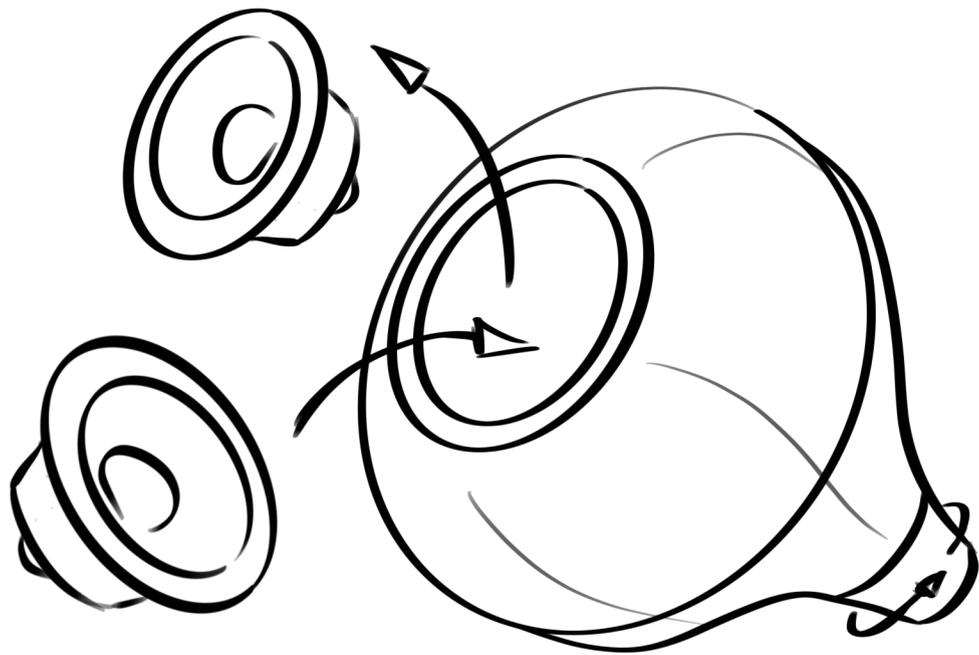
ADJUST CONE

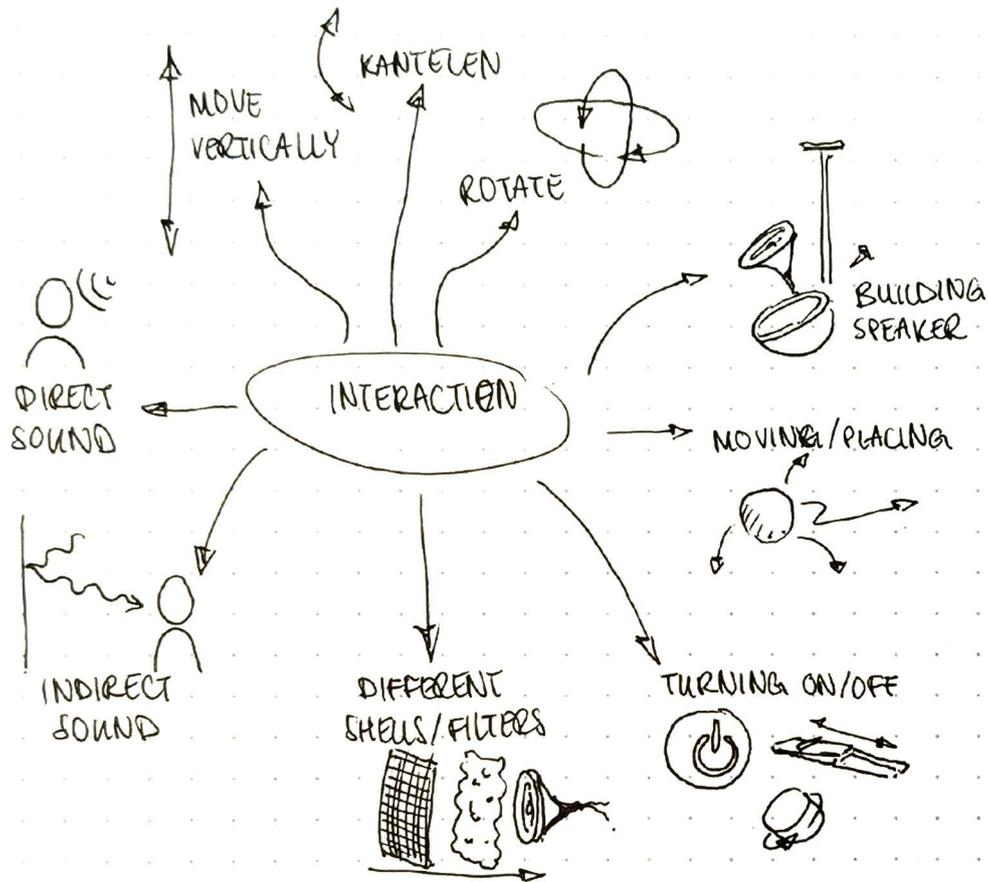
→ 2 WOODEN PLANKS CLAMPING
THE CONE

→ PAPER LIKE FEELING
MATERIAL FORMS
CONE AROUND SPEAKER



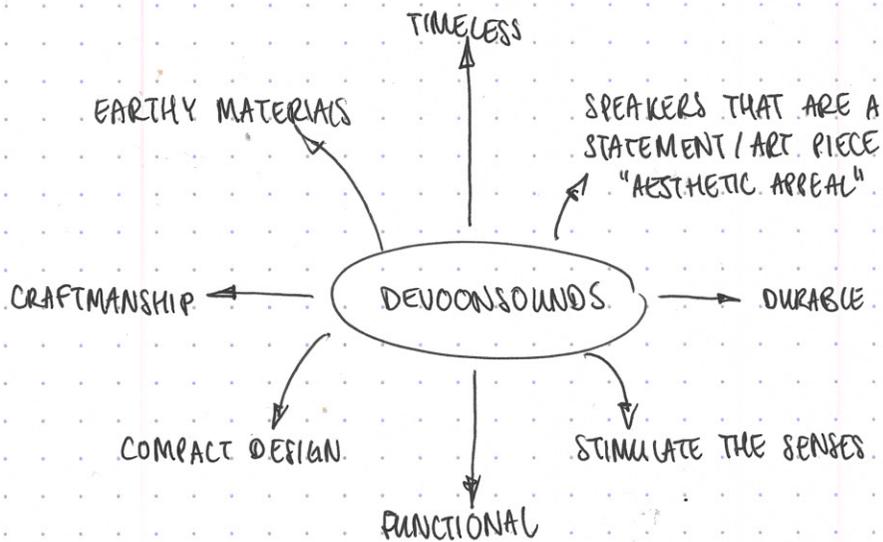






GEbruiker
CONTEXT
WAARDEN
ONDSCHIED

- ↳ KEY INSIGHTS
- ↳ USER NEEDS
- ↳ TRENDS/PATTERNS
- ↳ CHALLENGES/PROBLEMS
- ↳ OPPORTUNITIES



MODERN NOSTALGIST!

- timeless design
- earthy materials
- invest in quality (craftmanship)
- disconnect through listening to music

I WANT TO CREATE A SPEAKER THAT...

CREATING ADDED VALUE THROUGH INTERACTION AND EXPERIENCE



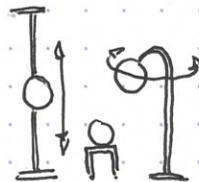
INTERACTS

ENGAGE IN INTENTIONAL ACTIONS AROUND THE ACT OF LISTENING TO MUSIC



STATEMENT PIECE

ENCOURAGE CONNECTION WITH SOUND AND OTHERS THROUGH ENGAGING DESIGN

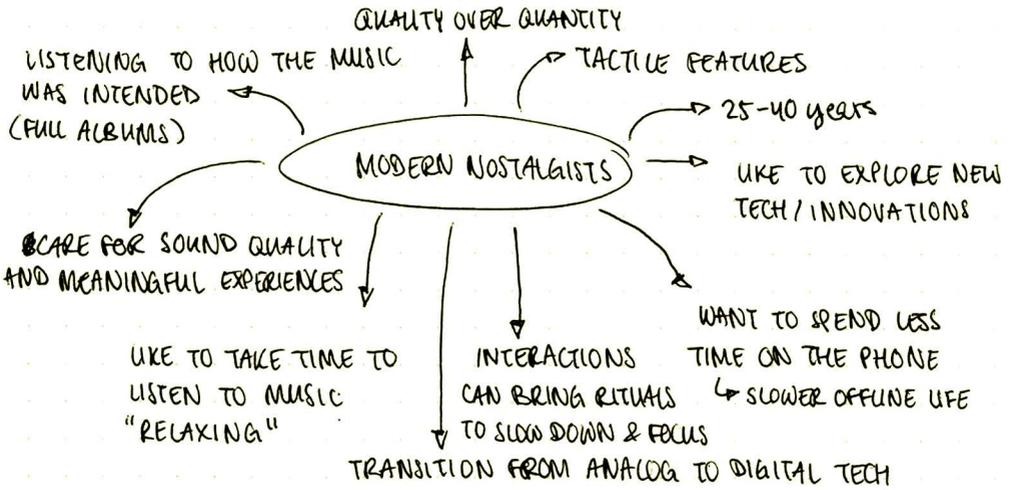


ADJUSTABLE IN SPACES

BEING IN THE MOMENT WITH WHAT YOU ARE DOING WHICH CREATES DISCONNECTION FROM OTHER ACTIVITIES AND CREATES AN ESCAPE OR RITUAL.

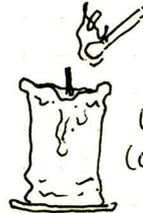
CREATING A SPEAKER THAT PEOPLE LOVE TO DISPLAY INTO THEIR INTERIOR AND ADDS/INSPIRES TO THEIR STYLE.

GIVE PEOPLE OPPORTUNITIES TO EXPRESS THEMSELVES AND MAKE IT FIT INTO THEIR INTERIORS.

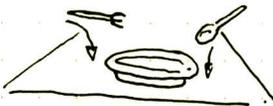


ANALOGUES

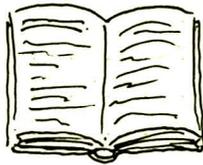
(RITUAL + ATMOSPHERE)
TEA CEREMONY
A BEAUTIFUL MOMENT



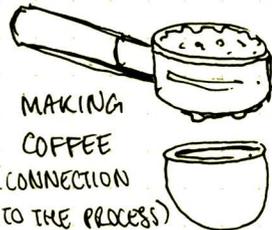
LIGHTING A CANDLE
(CREATE A CALM AMBIANCE)



SETTING THE TABLE
"RITUAL"



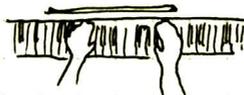
OPENING/READING A BOOK
(IMMERSIVE EXP.)



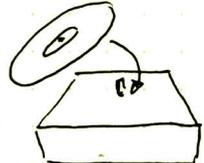
MAKING COFFEE
(CONNECTION TO THE PROCESS)



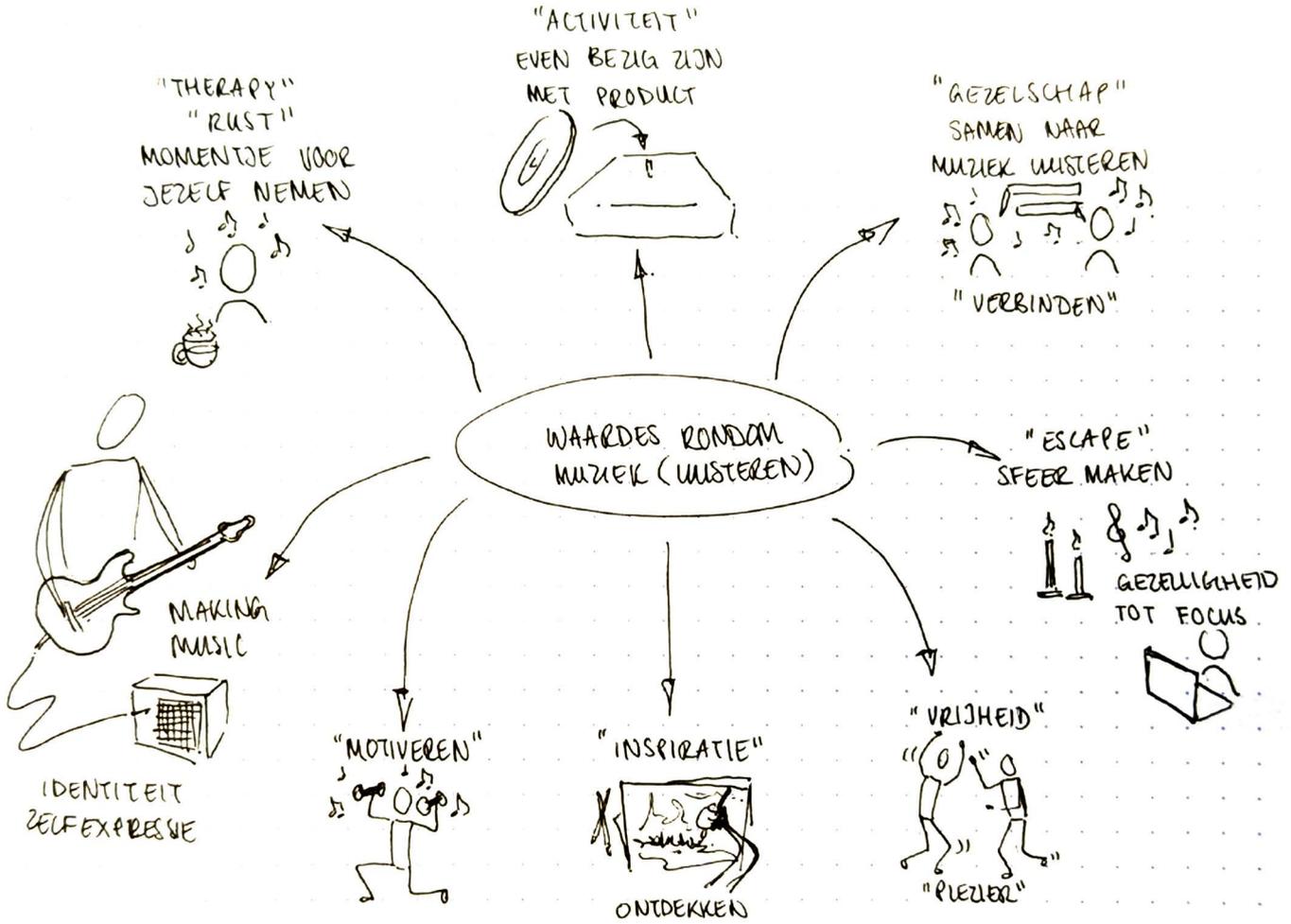
FOCUSING THE CAMERA
"FINE TUNING"
(PERSPECTIVE SHIFT)

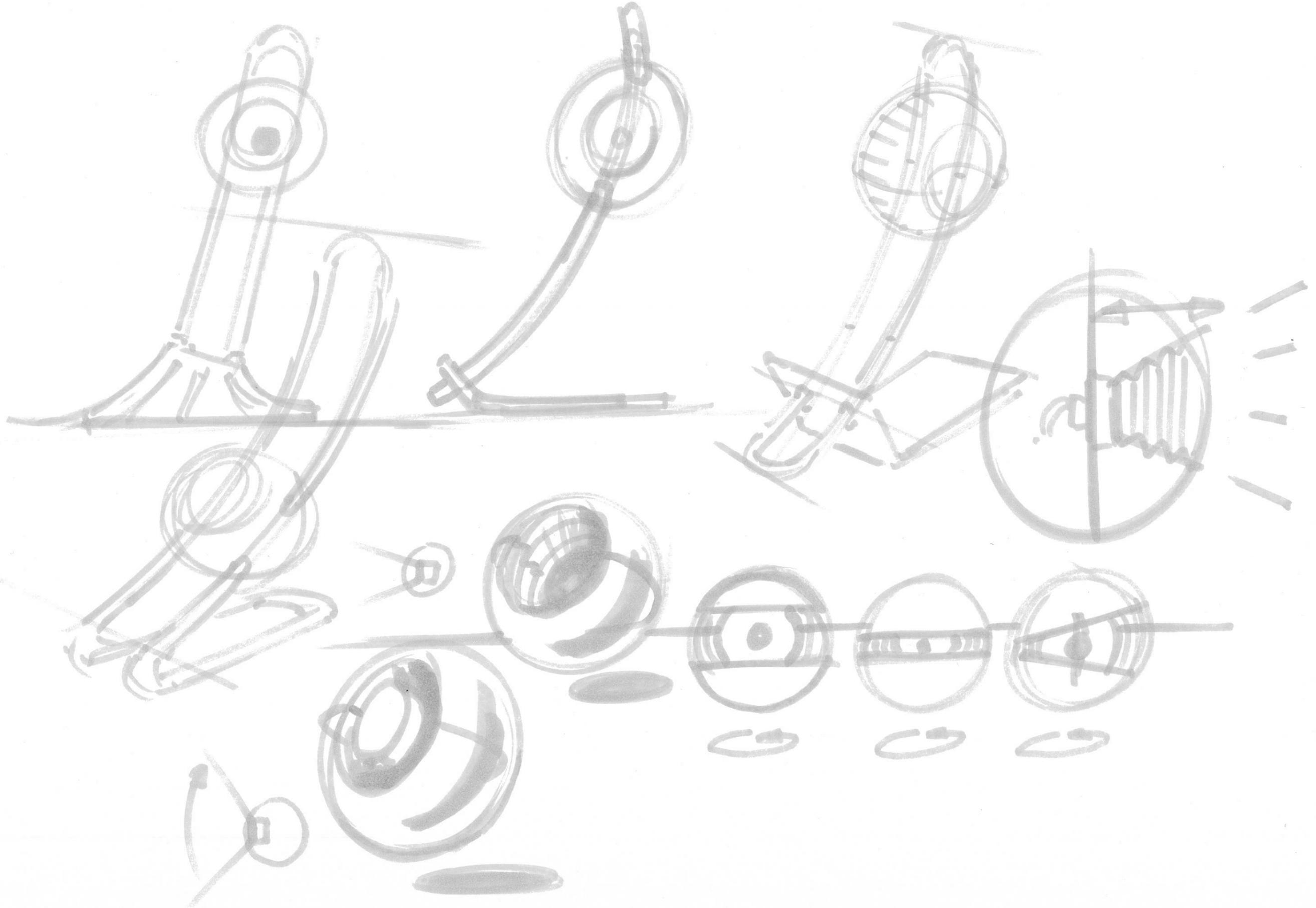


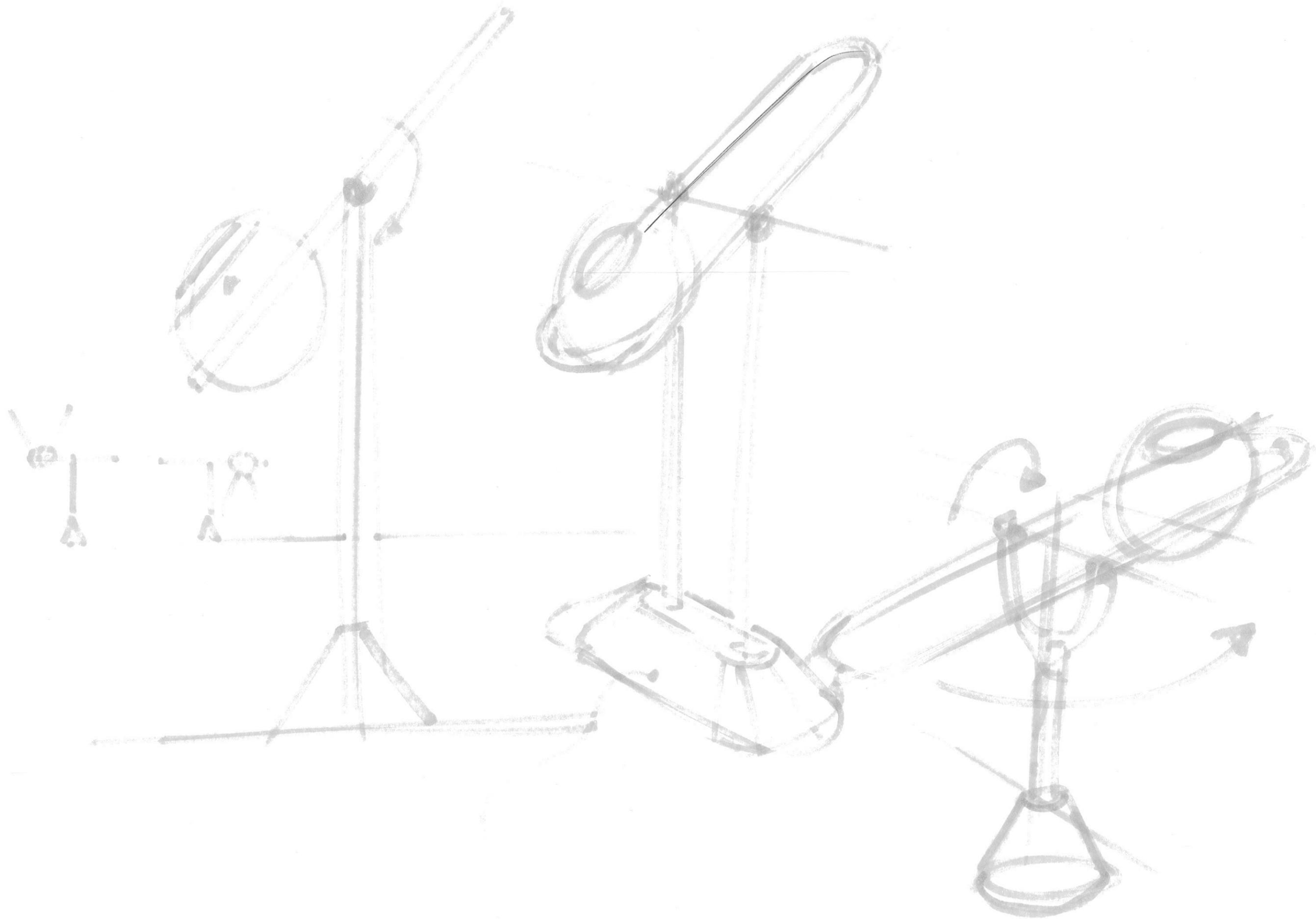
PLAYING AN INSTRUMENT
(HANDS-ON CONNECTION)

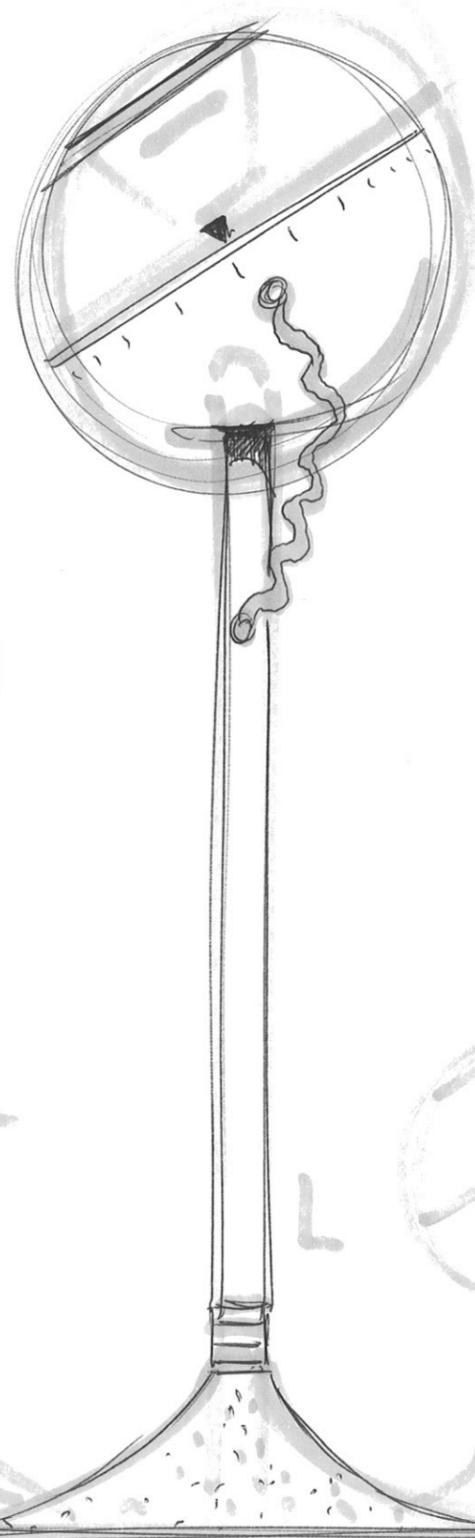


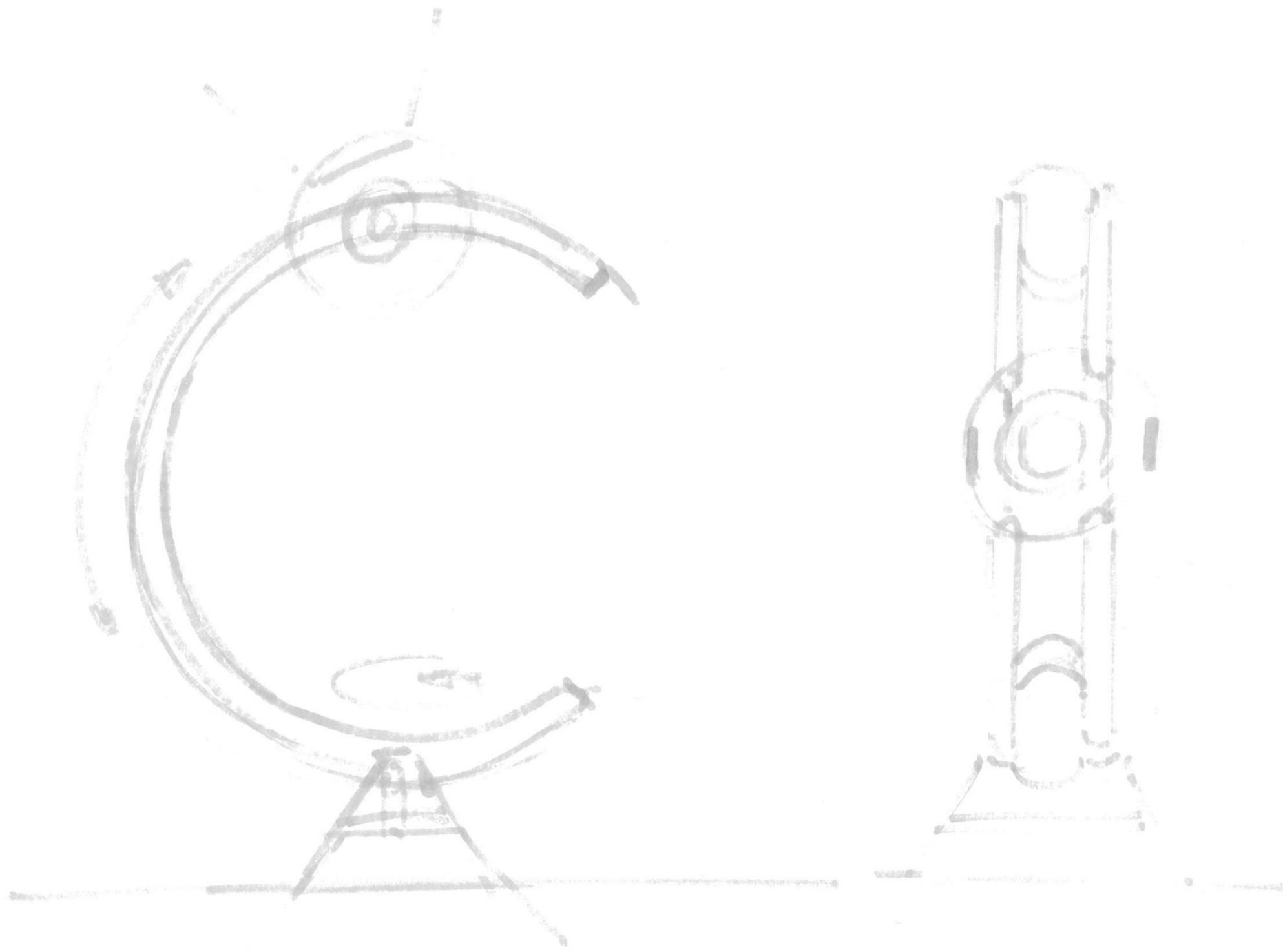
PLAYING A VINYL RECORD + FLIPPING IT
(PHYSICAL INTERACTION TO CONNECT TO SOUND)





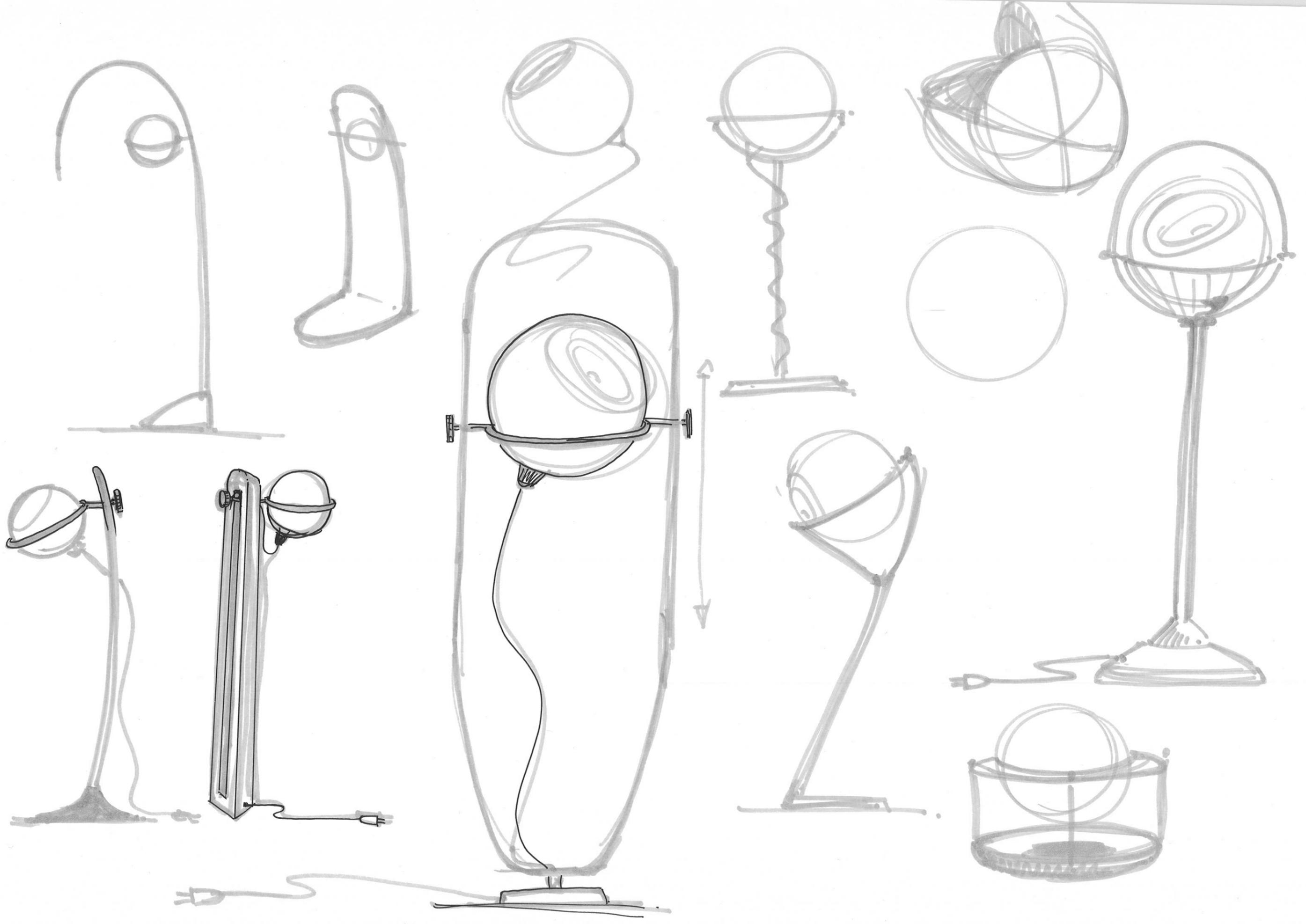




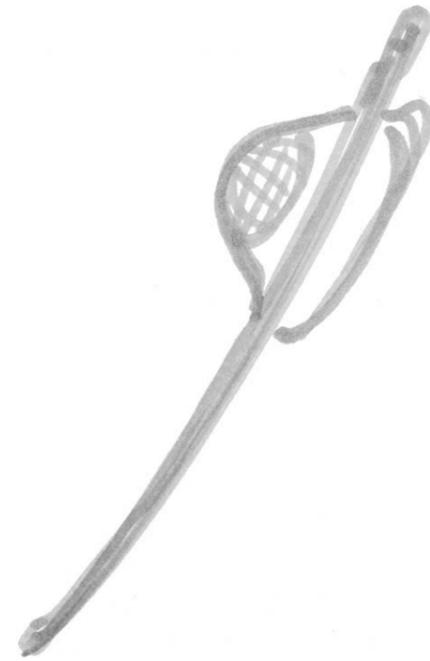
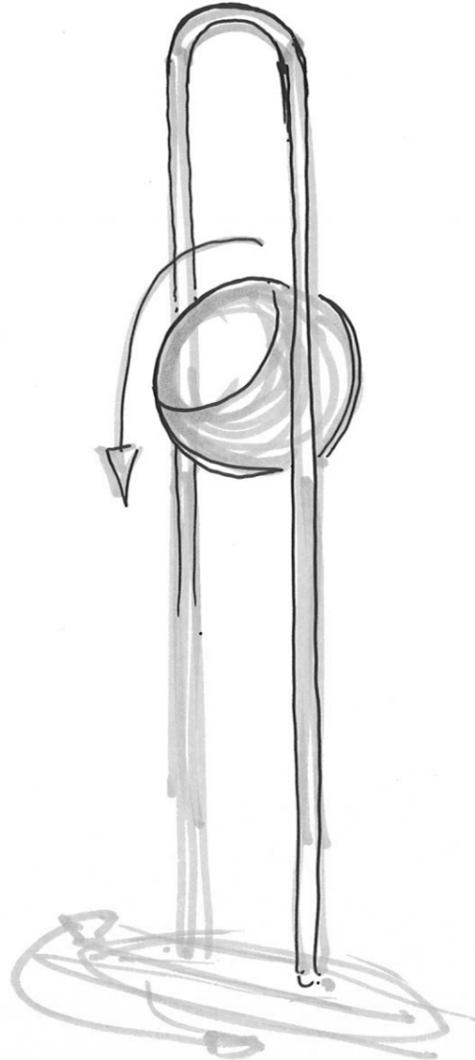
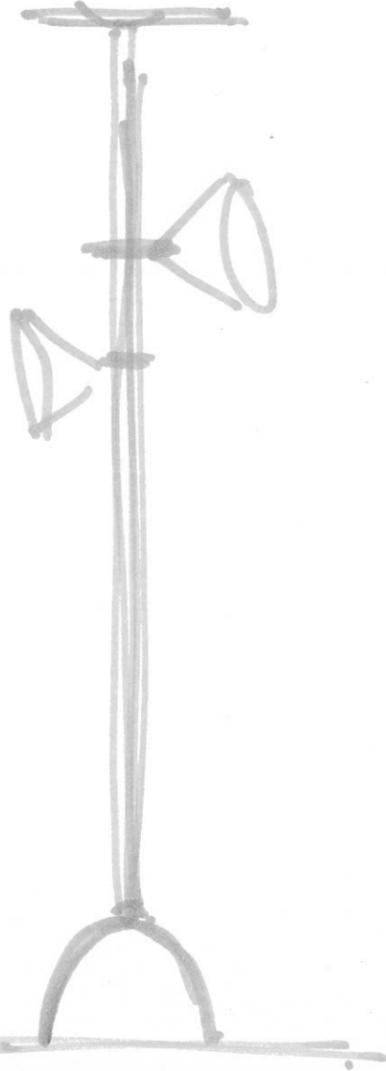
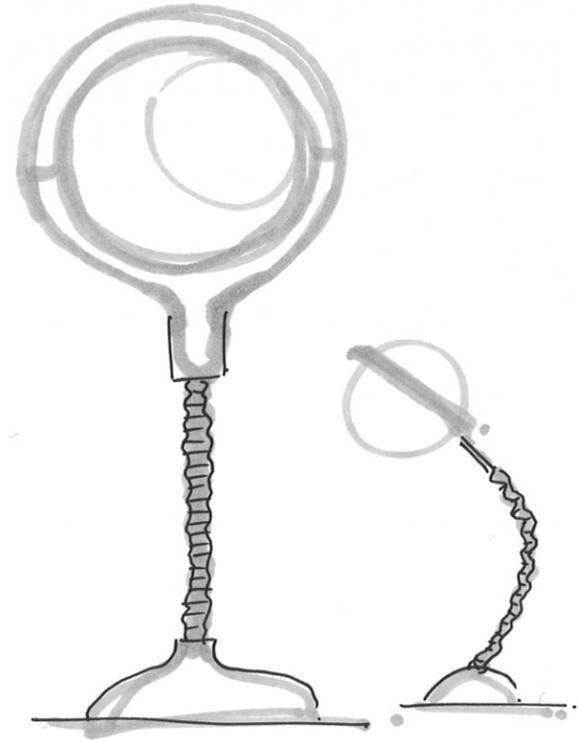
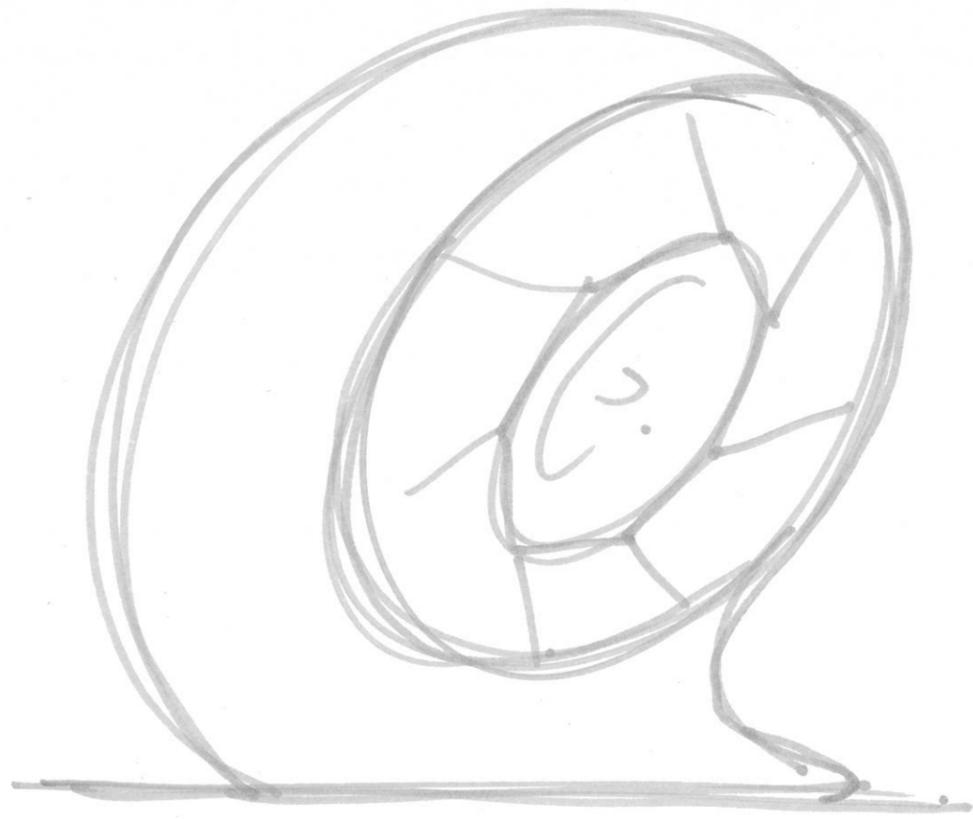


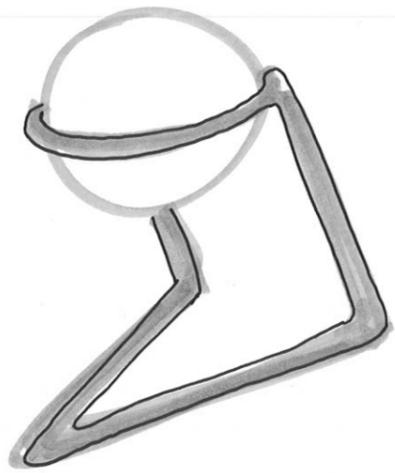
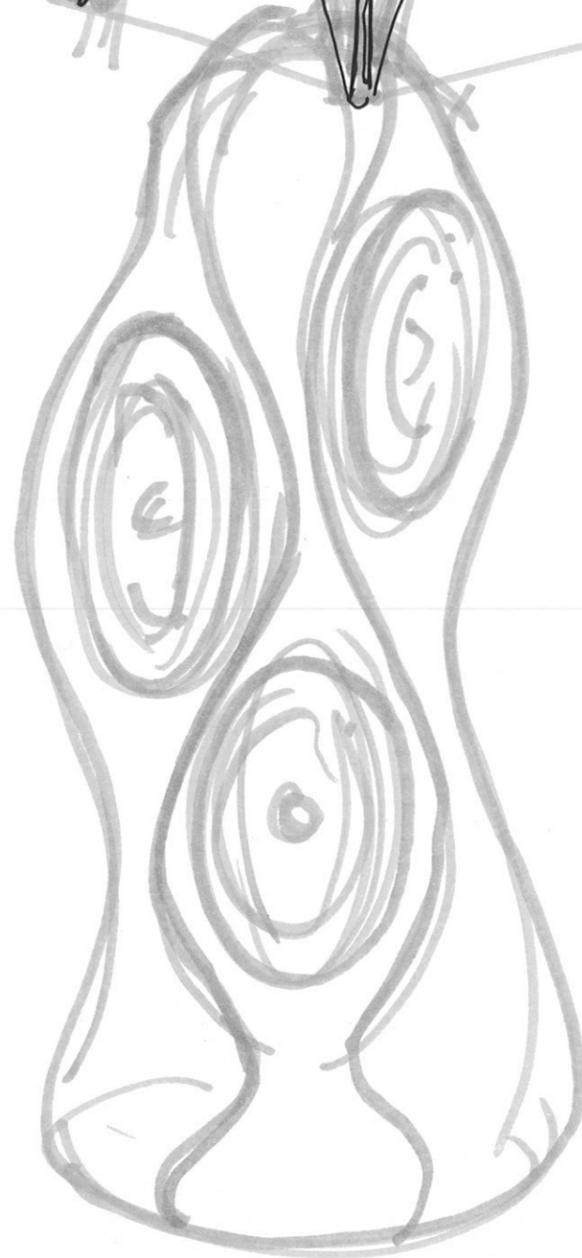
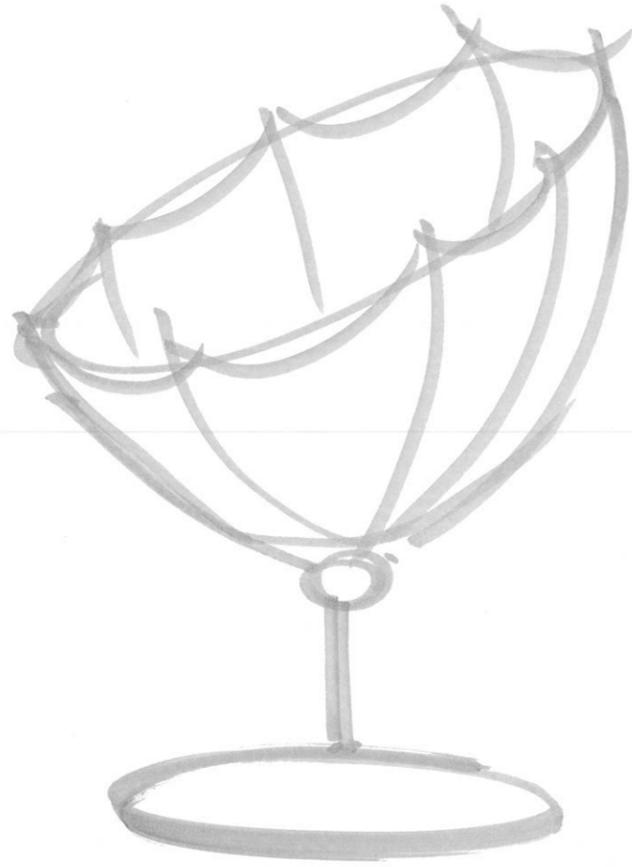
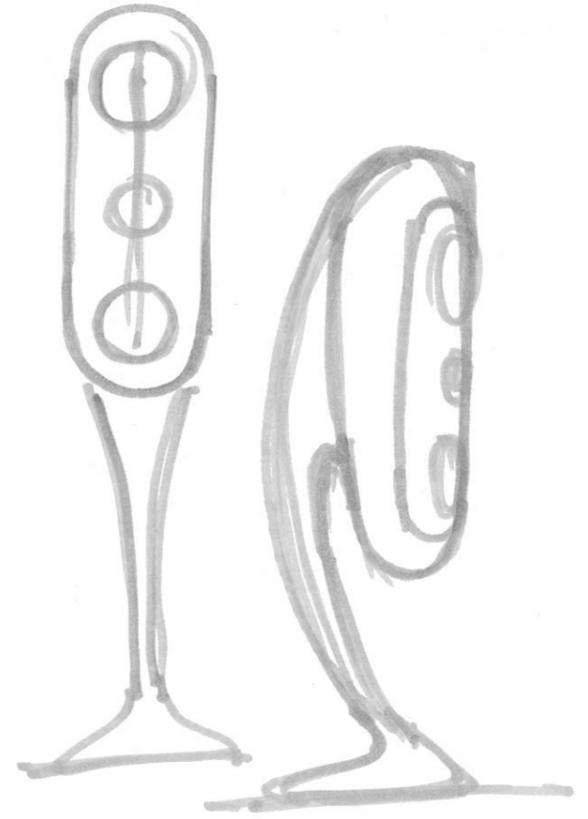


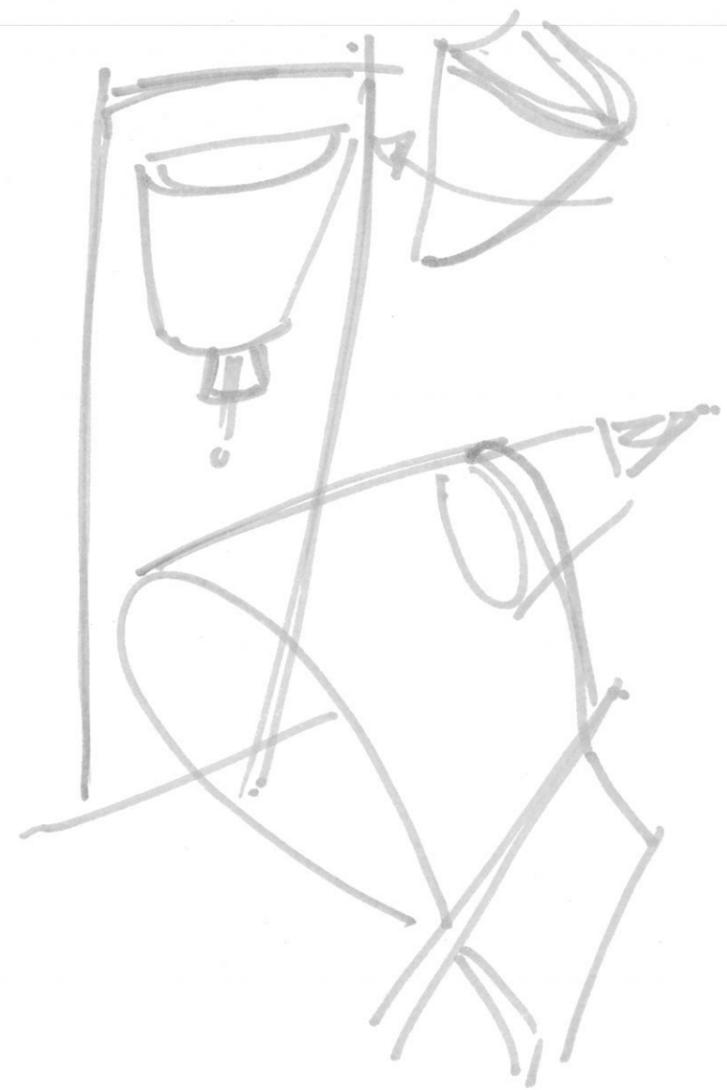
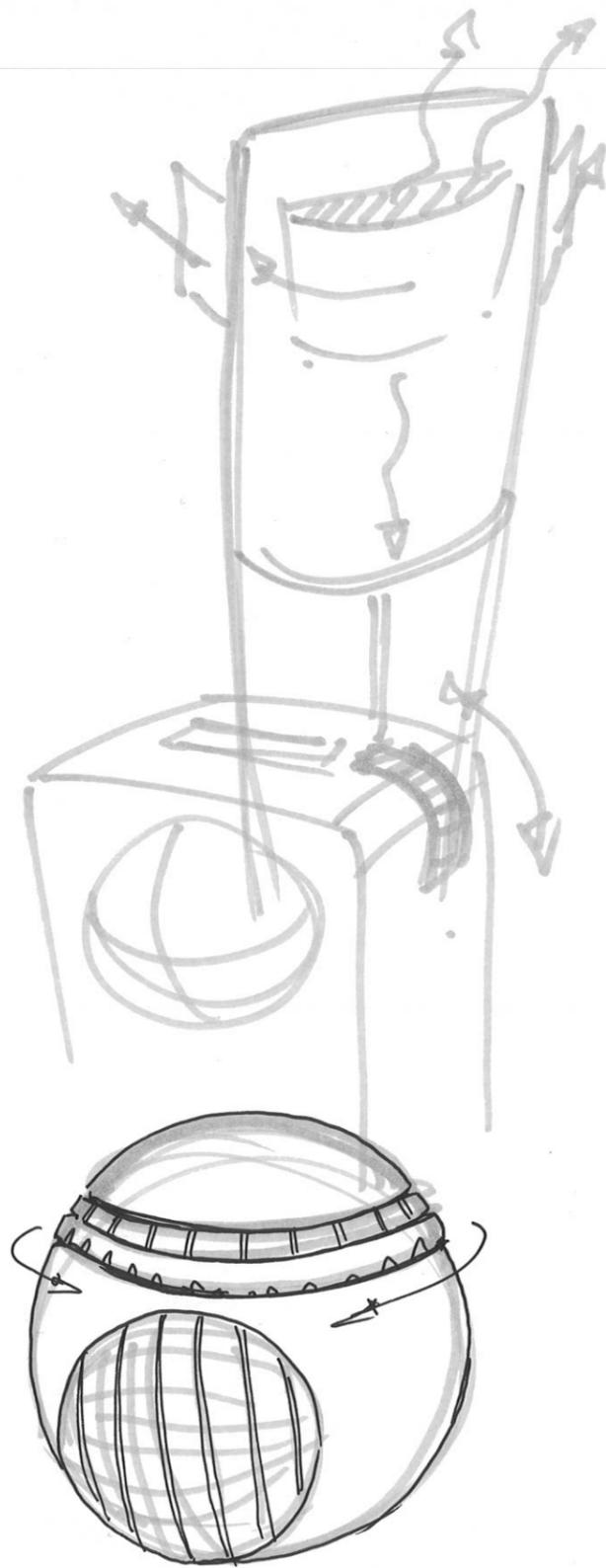
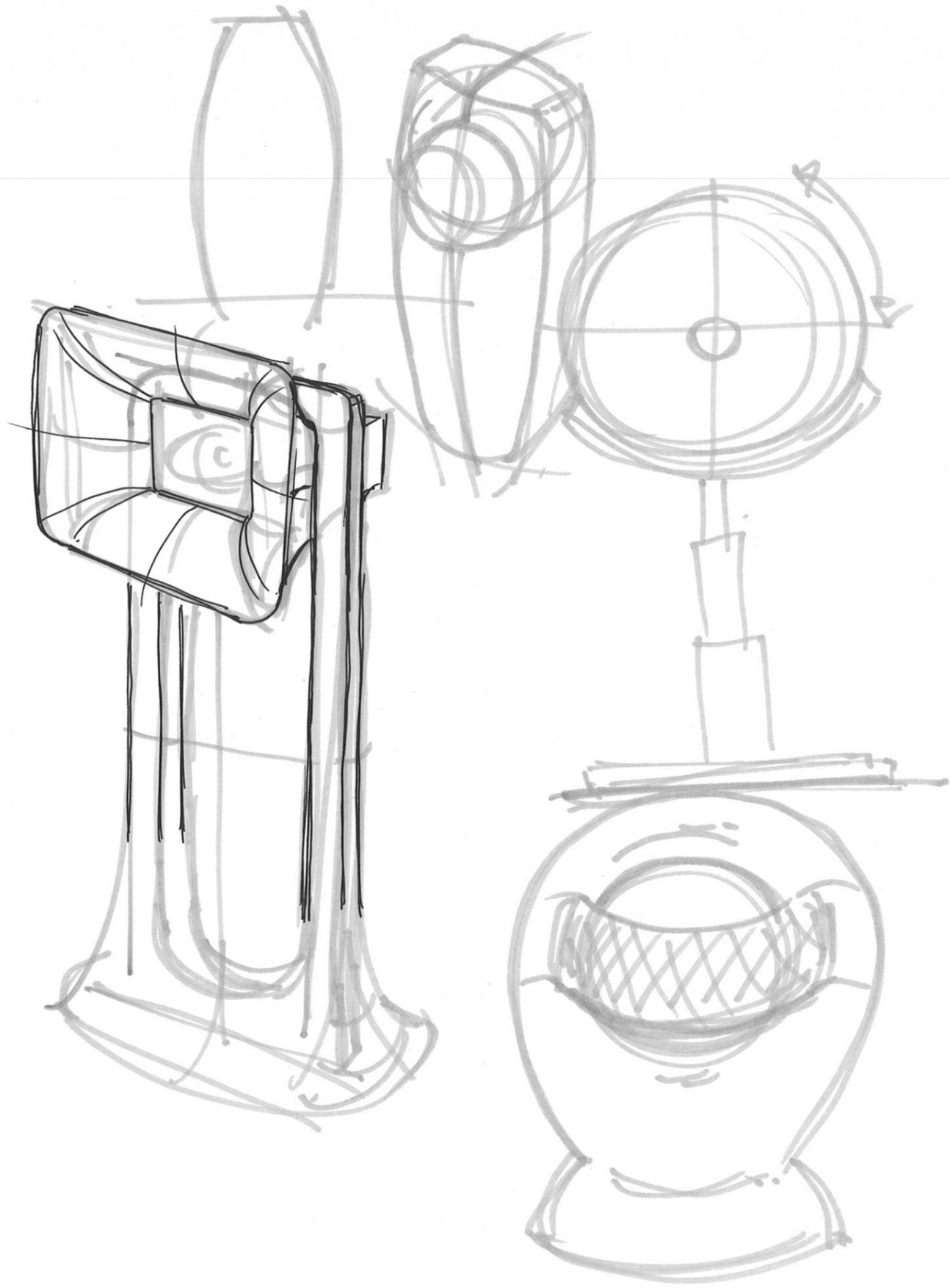
NS-BEWEGUNGS CAMER A

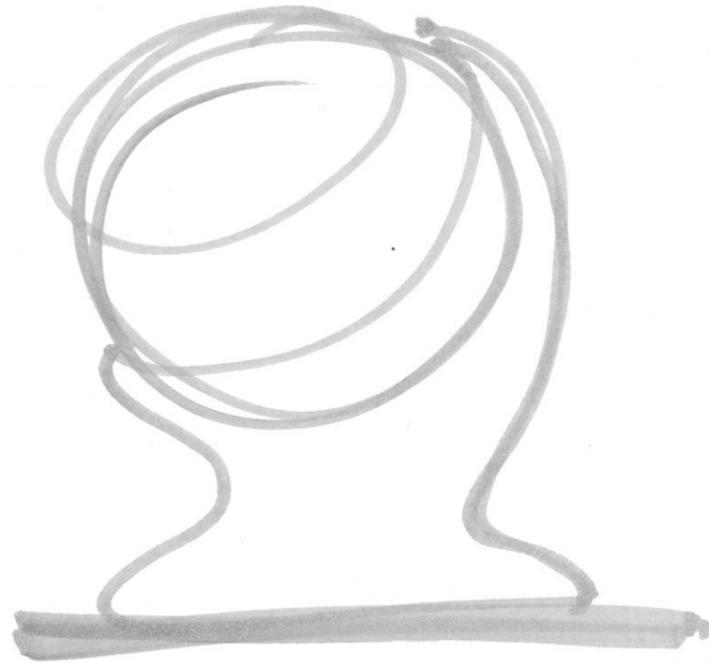
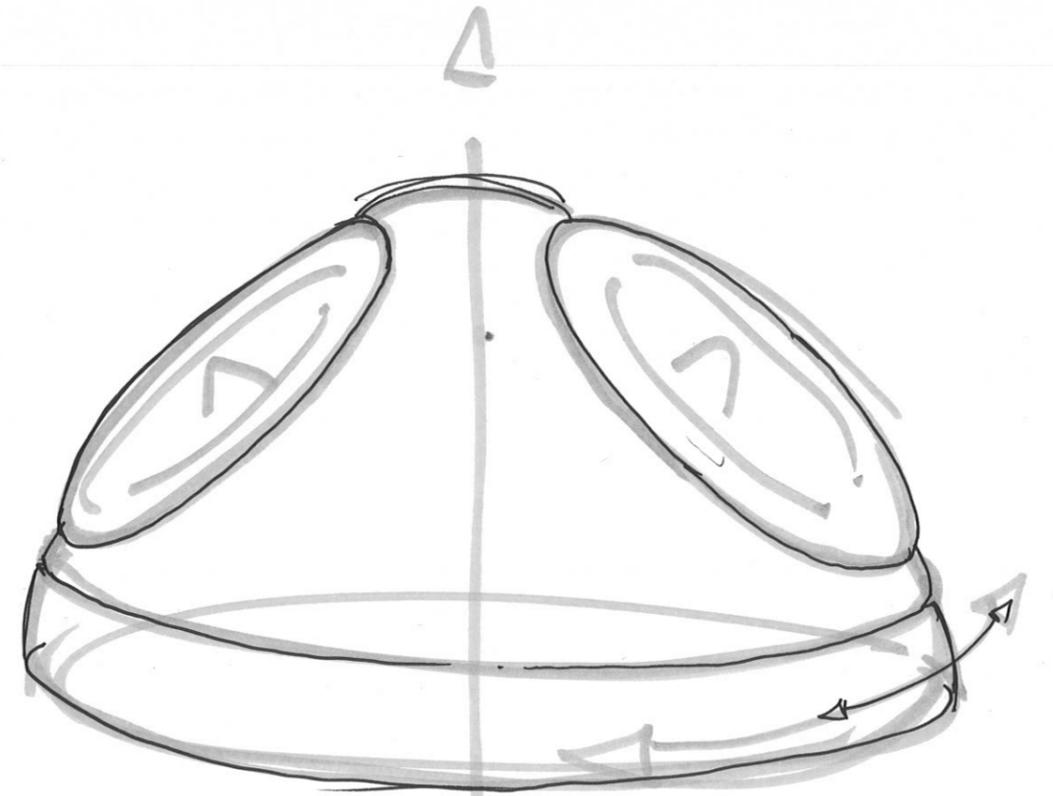


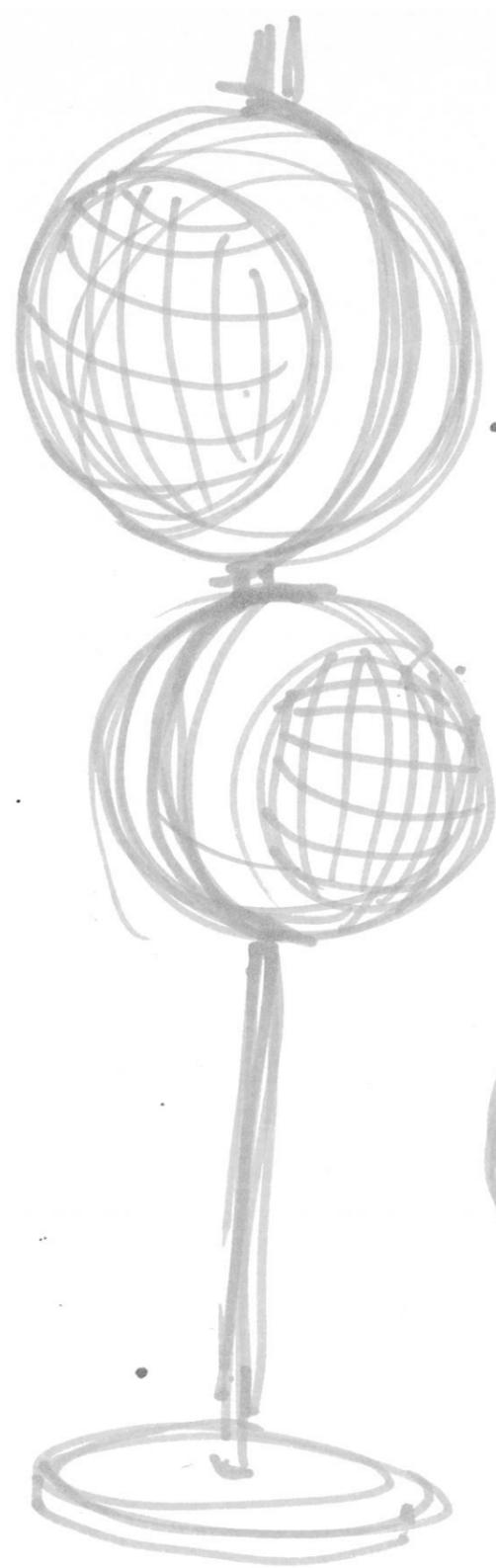
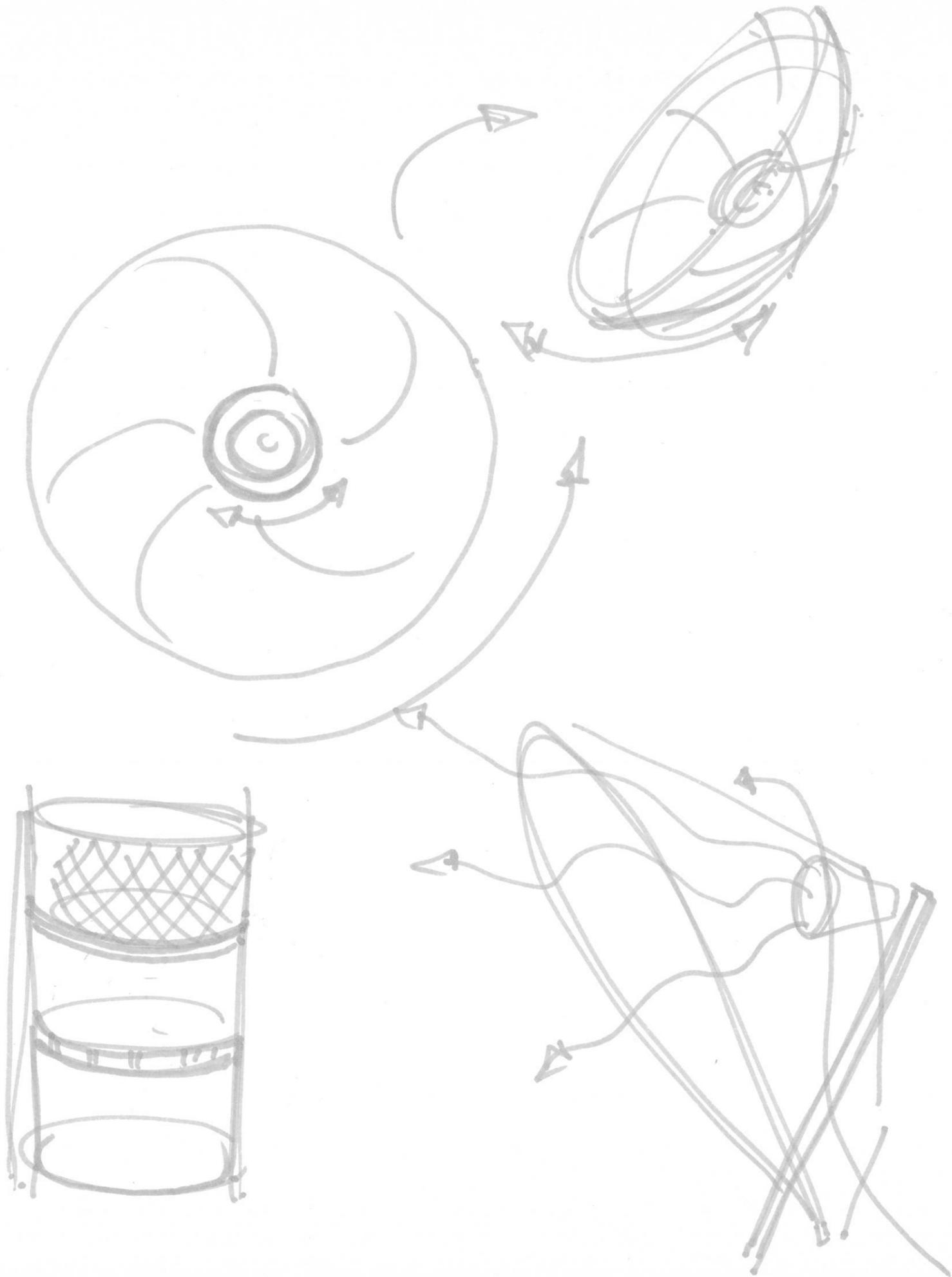
M











HOE KUN DE INTERACTIE?

