

the project was created as a part of bachelor's thesis at
Magdalena Abakanowicz's University of Fine Arts in Poznań

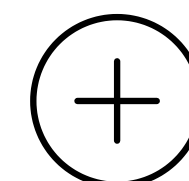


Uniwersytet Artystyczny
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w Poznaniu

Lena Balcerak

PAPER+

**Paper as a medium between human and electronics – the
potential of paper in the designing electronic objects.**



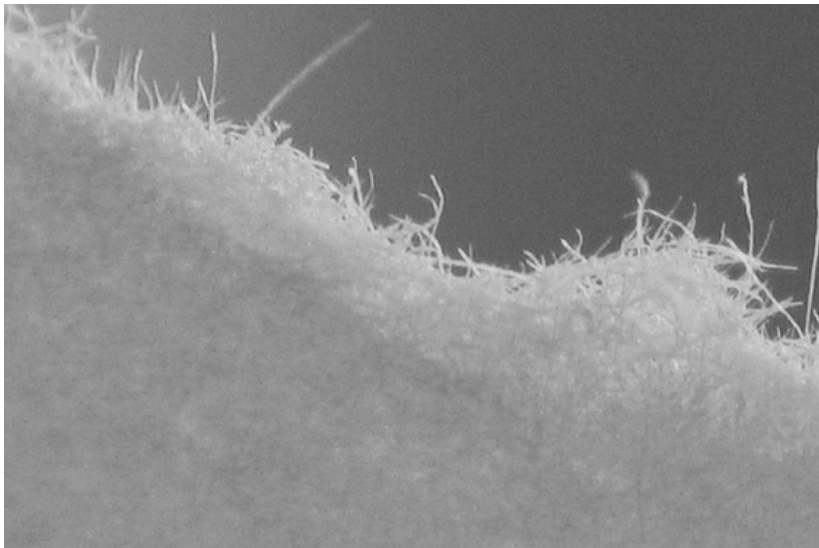


Paper is a material woven into everyday life, so much so that we stop to notice it. We take it for granted, and its ubiquity in everyday life, in my opinion, is making it adaptable. The project aims to explore the potential of using paper in device design. The work is oriented toward an experiment based on following the nature of paper and examining how they can enrich electronic objects. I locate my project in material research that result in sustainable solution.

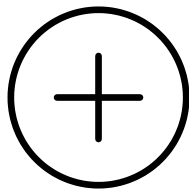
In this document I wanted to share the story, inspirations and logic of my work, as well as the process of designing and final details of objects.

Paper – characteristics of the material

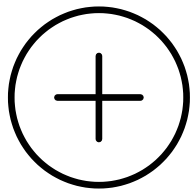
Paper revolutionized the way knowledge is gathered and transmitted, becoming a foundation for the development of civilization from writing, through printing, to culture and art. The evolution of this material progressed through papyrus, parchment, and ultimately paper.



Paper is light, flexible, and durable. It holds creases permanently, and can be folded, cut, torn, printed on, painted, and glued, while its porous structure allows for soaking and coating – making it a material exceptionally amenable to processing and modification.

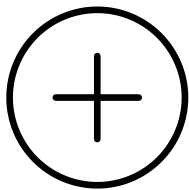


history

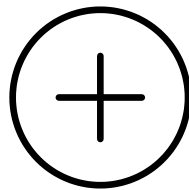


structure

Paper is built from long, thin cellulose fibers, which, when bonded together, form a structure that is both strong and flexible. The way these fibers are arranged within a sheet determines the paper's properties – its strength, flexibility, and response to moisture.



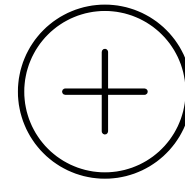
properties



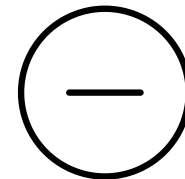
meaning

Paper is a material deeply rooted in human life. It is a carrier of memory, a tool of art, and the basis of everyday products. It combines physical and symbolic properties that have made people trust it for thousands of years.

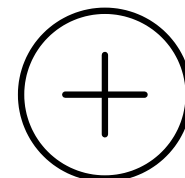
We live in times when we are described as an information society – one shaped by revolutionary inventions in electronics and computer science. Electronic devices have become tools we use every day, and their presence is impossible to ignore.



electronic objects in everyday life



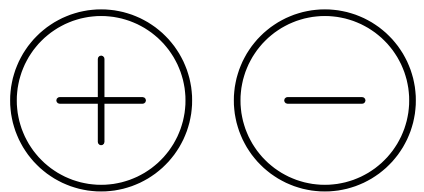
designing electronics



technology for people

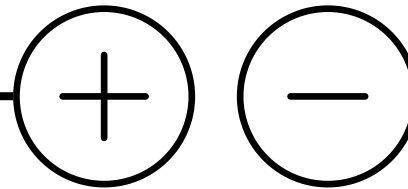
Electronics – electronic objects in everyday life

Electronic devices now dominate daily life, offering convenience, communication, knowledge, entertainment, and health support. Electronics have even become embedded in private life, with wearable sensors in watches, glasses, and clothing enabling real-time health monitoring, with future potential as biodegradable medical implants.

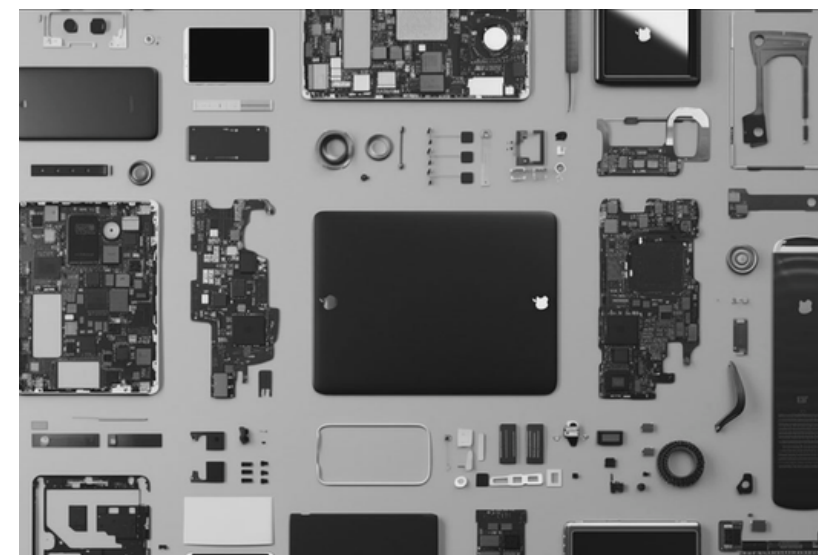
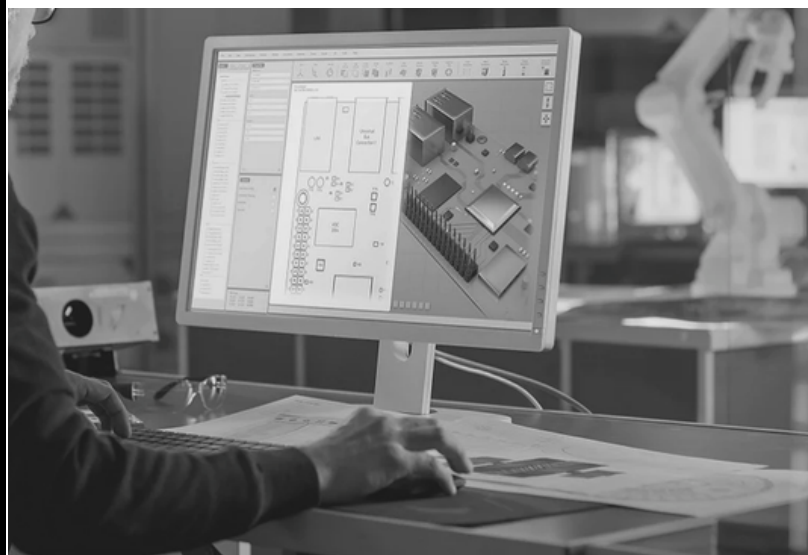


While electronics have simplified everyday life, many people in the 21st century now experience fatigue and overstimulation from their constant presence. Awareness of how to use electronics responsibly is fading, raising concerns about preserving human autonomy and natural development in an age of rapid technological growth.



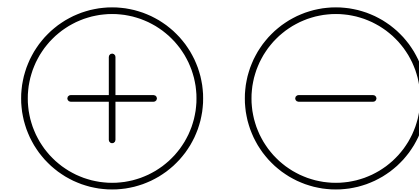


In *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design*, Anthony Dunne argues that the real challenge for designers no longer lies in technical functionality, which has already reached an optimal level, but in the poetry and aesthetics of products.

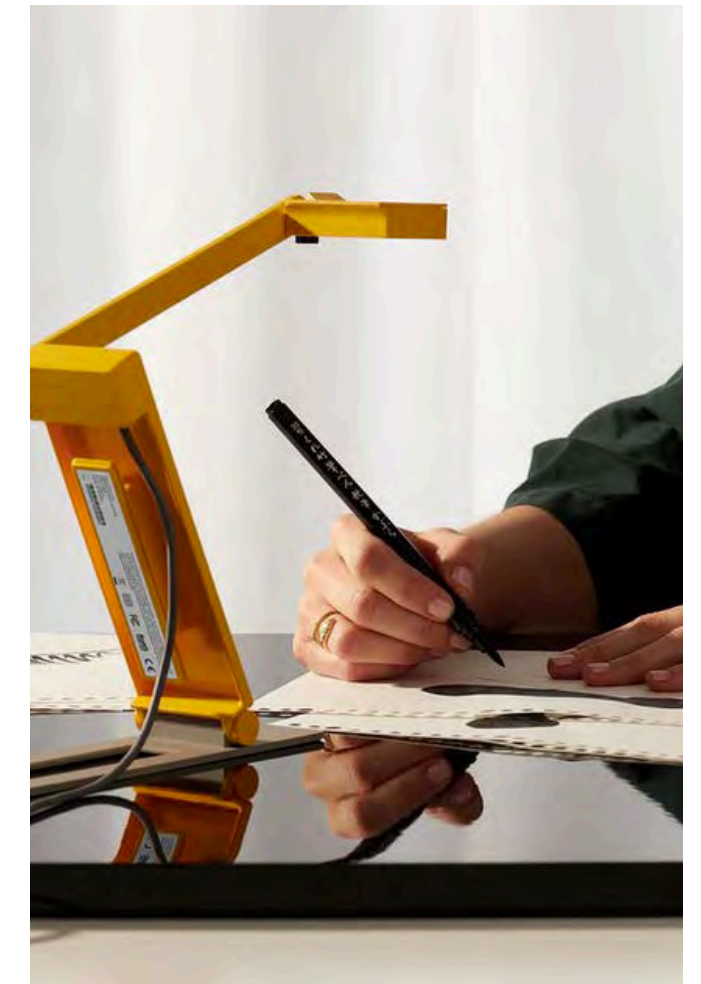
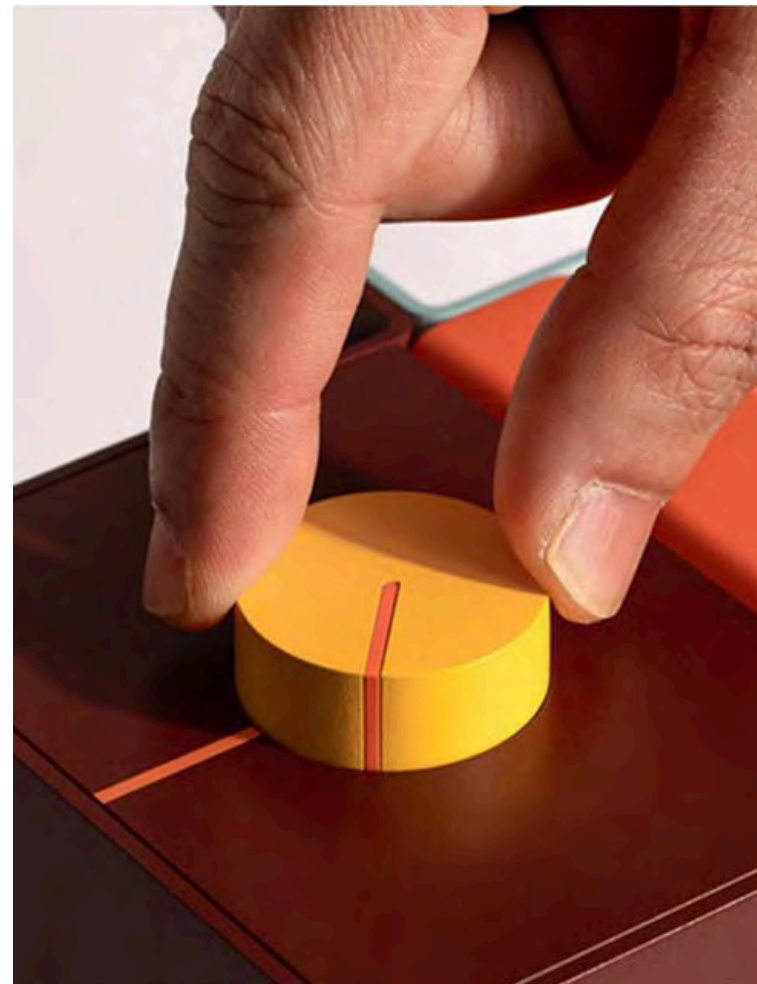


Since electronics design is tied closely to its market and everyday presence, designers must consider how it can enrich human life. Dunne notes that many designers have instead settled for creating functional enclosures around technologies that remain poorly understood.

Electronics – technology for people



Contemporary design aims to ensure that neither people nor the objects around them get lost in the world of modern technology. Products should be designed with responsibility for their entire life cycle, creating objects that connect, stimulate emotion, and evoke surprise or comfort – achievable through choices like material selection or an interesting form.



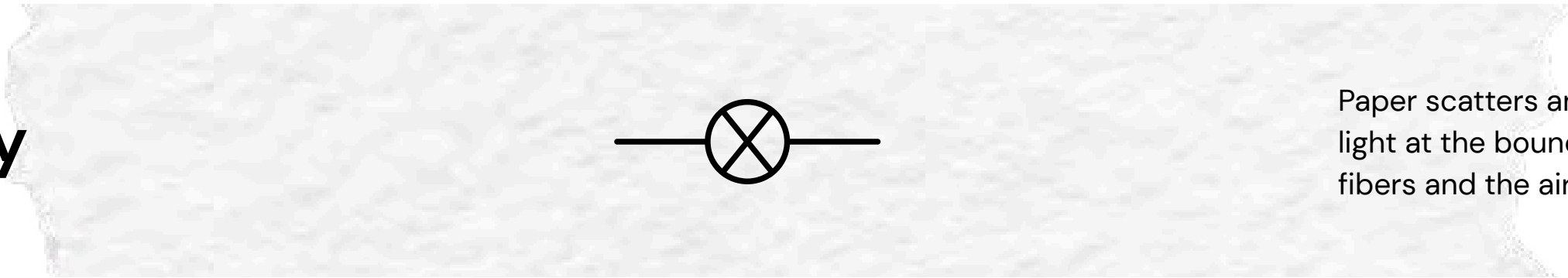
Paper is perceived as a disposable, ephemeral material.
Pairing it with electronics – a field associated with precision
and technological advancement – creates a cognitive tension
that is itself a valuable design quality.

acoustics



Paper has the ability to behave like a
membrane– it can absorb, dampen, or
transmit vibrations, making it an
acoustically active material.

translucency

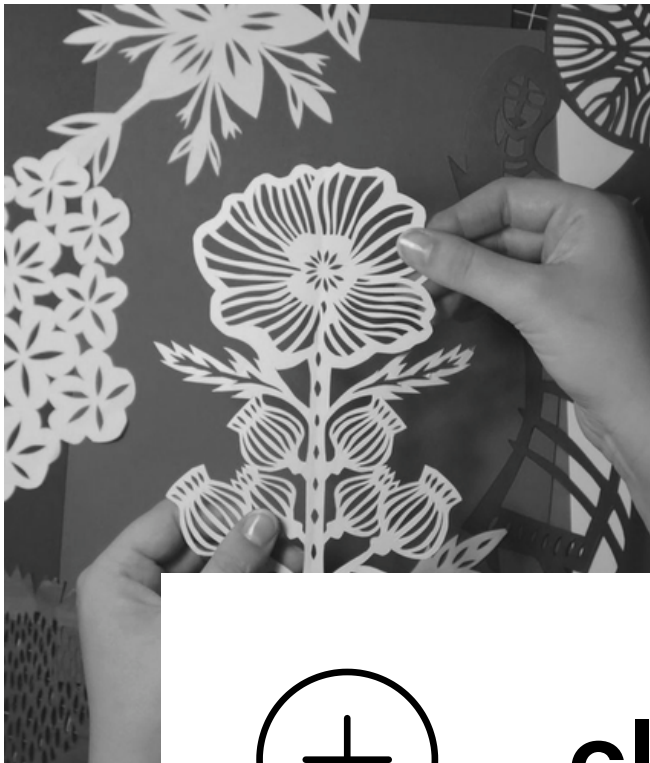


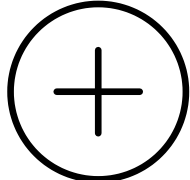
Paper scatters and refracts incoming
light at the boundary between its
fibers and the air, creating a soft glow.

isolation



Paper is a natural electrical insulator.
It can serve as a structural material
for electronic device enclosures,
protecting both the internal
components and the user.



 **closeness to human**

Paper carries potential not only as a technical substrate for electronics, but also as a material that gives it new quality.

In human perception, paper is a common material, often overlooked and unnoticed. It is deeply rooted in everyday life and culture. This familiarity makes it exceptionally promising for integrating electronics into people's everyday surroundings. Paper, being culturally rooted and close to people, can serve as a tool for humanizing electronics – giving it a material, sensory, and even emotional dimension.

The three planes on which electronics permeate human everyday life. These are the points of contact between technology and daily life, where paper can find its application.



SOUND



LIGHT



IMAGE

lamp

clock

speaker



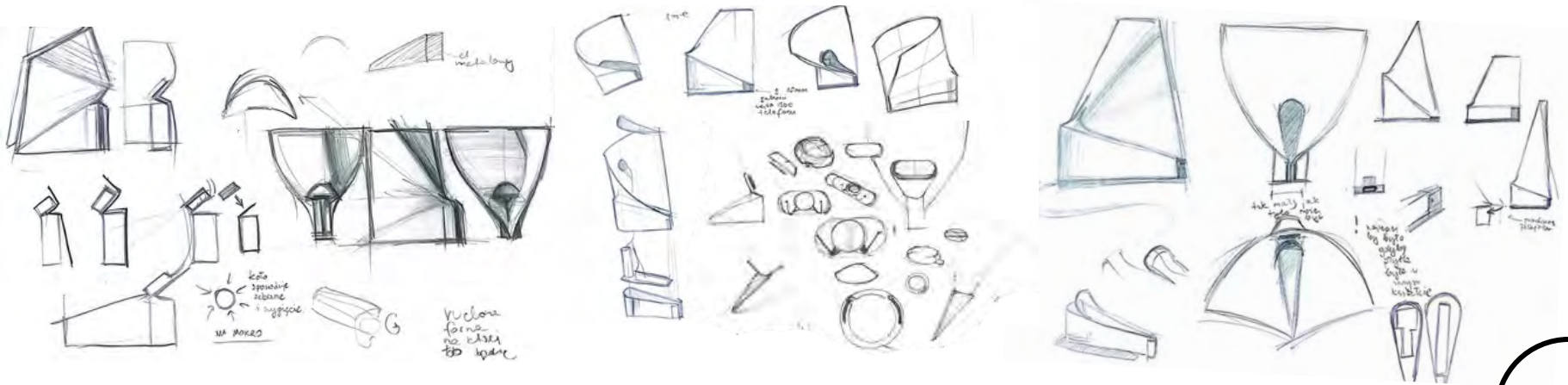
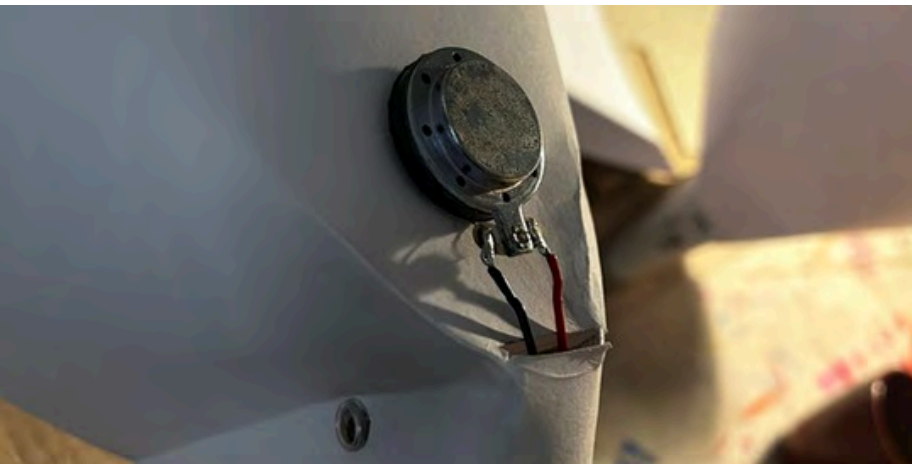
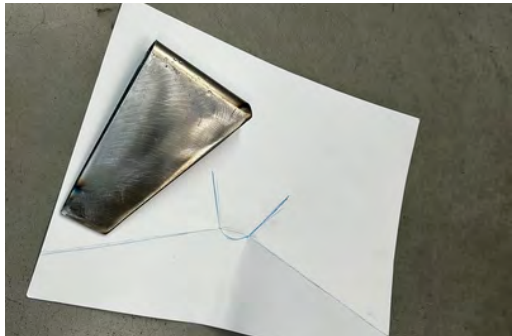
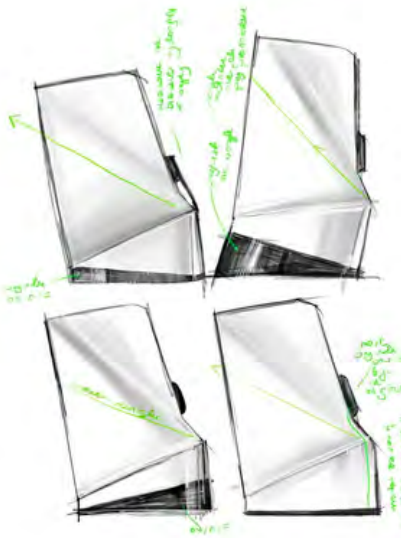
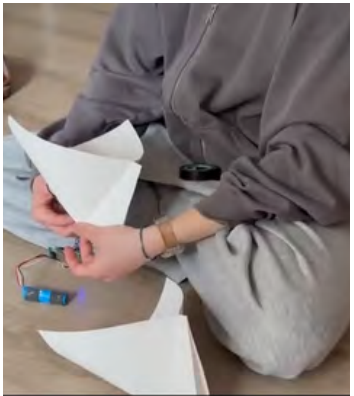
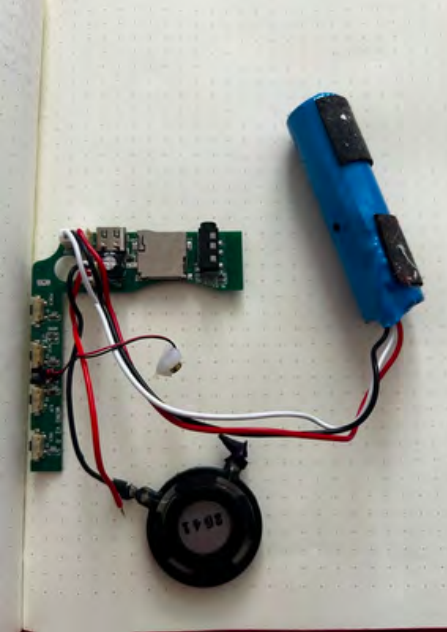
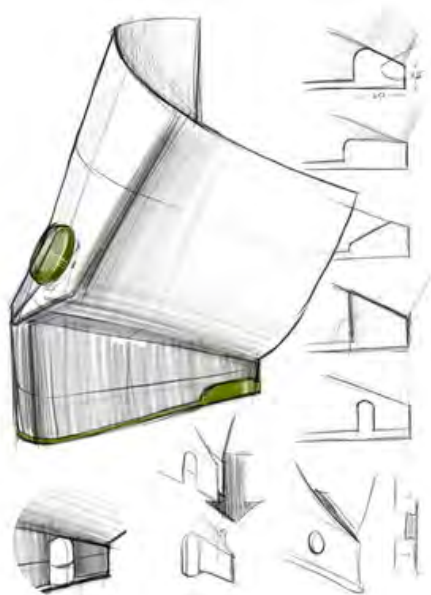
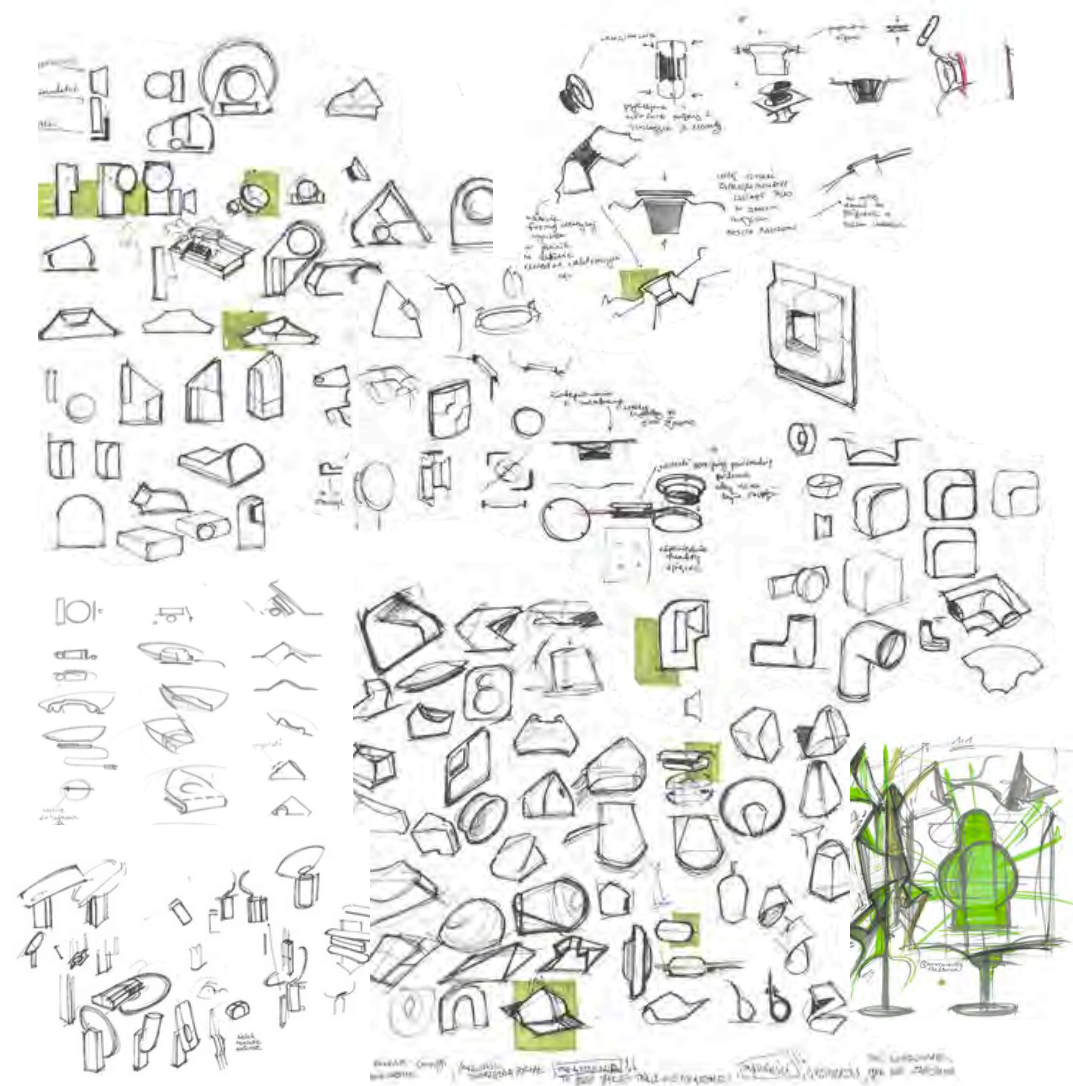
objects
paper as...

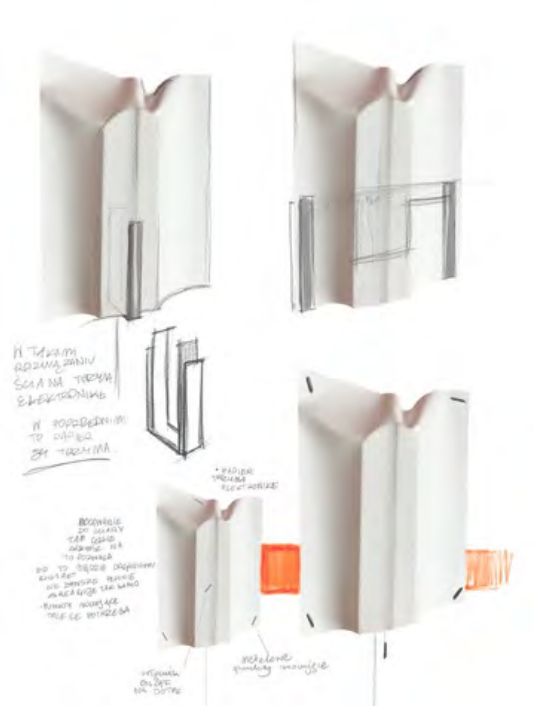
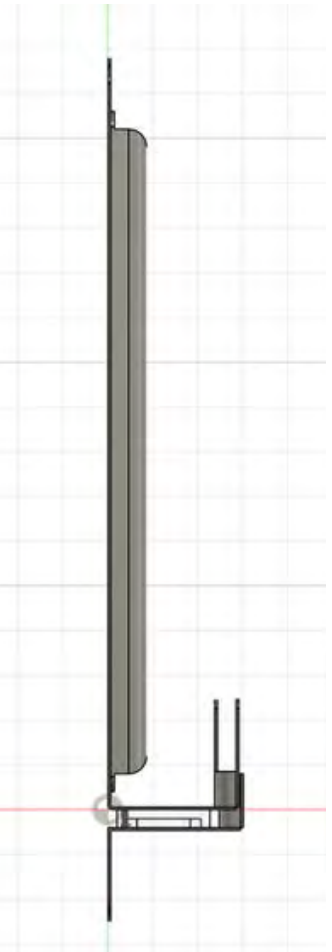
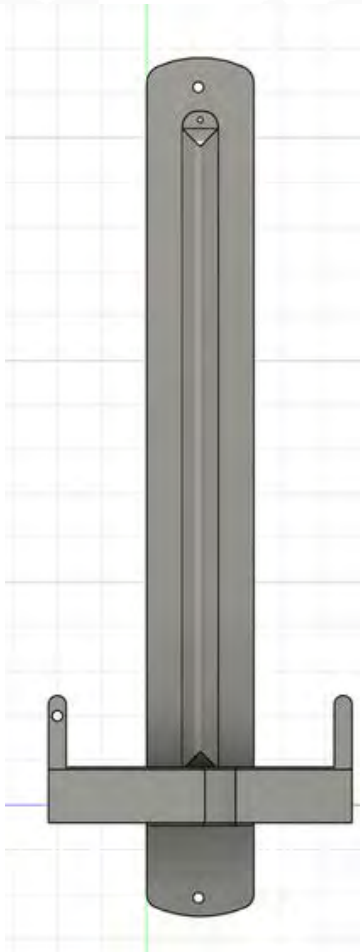
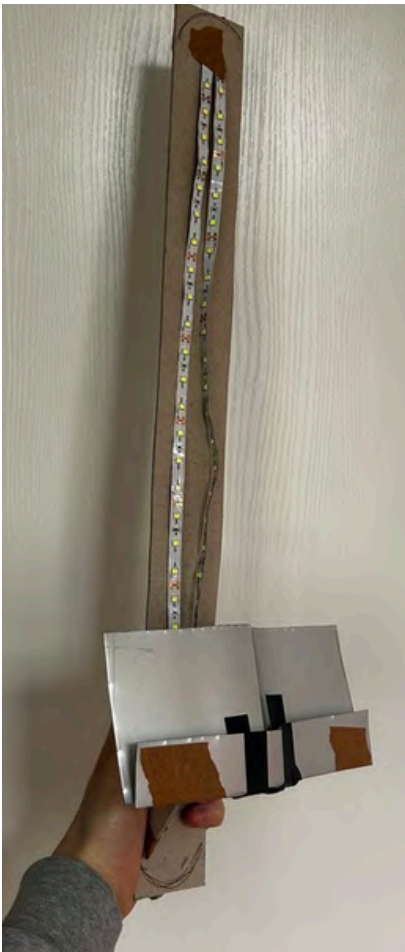
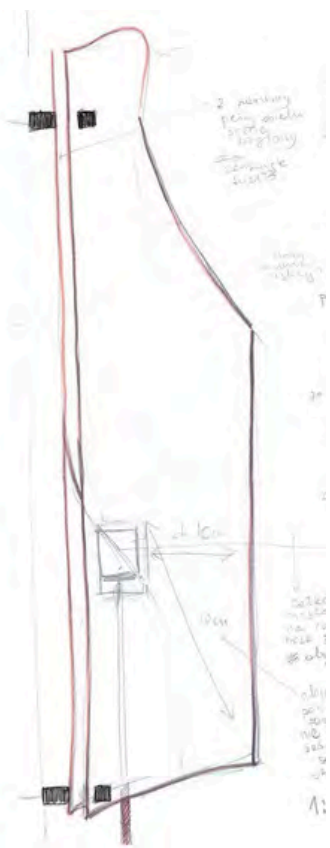
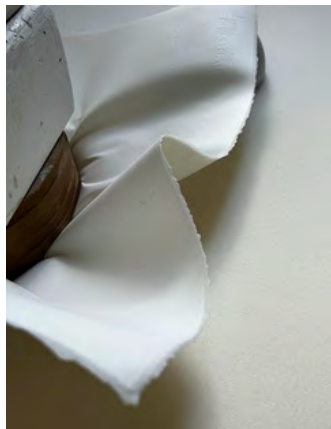
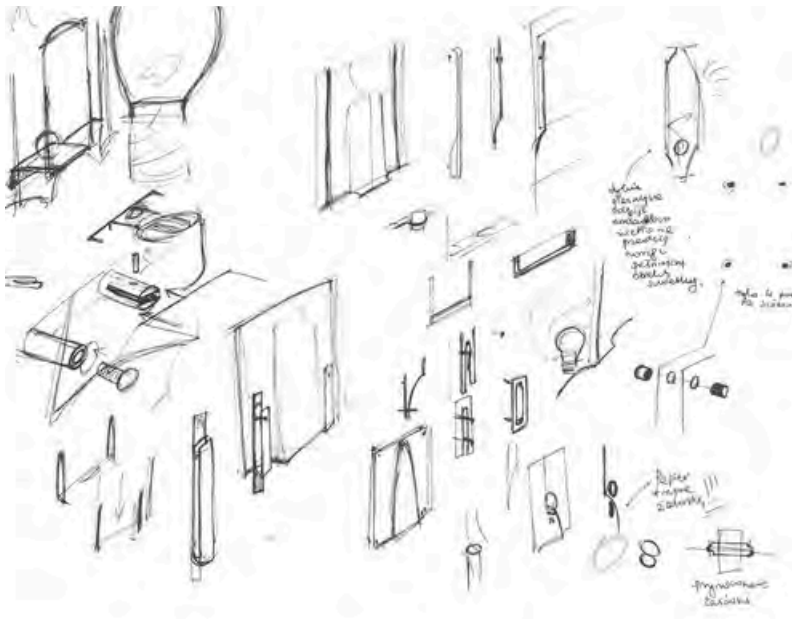


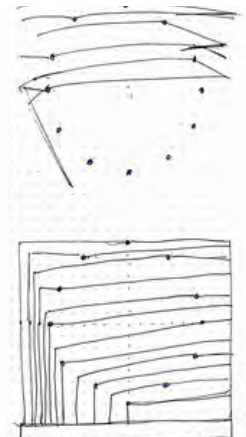
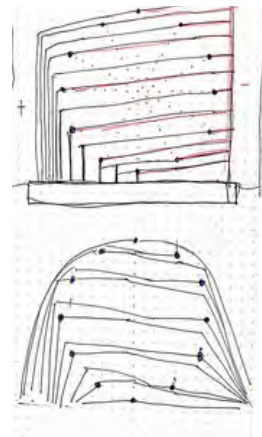
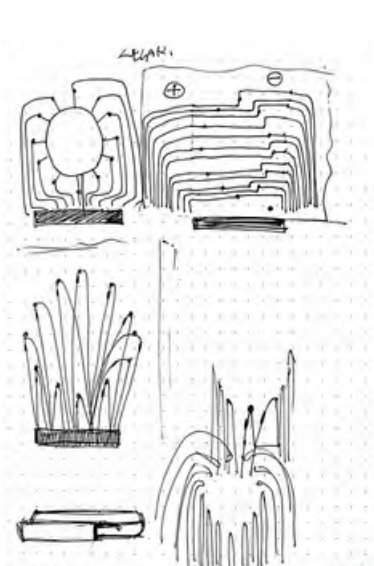
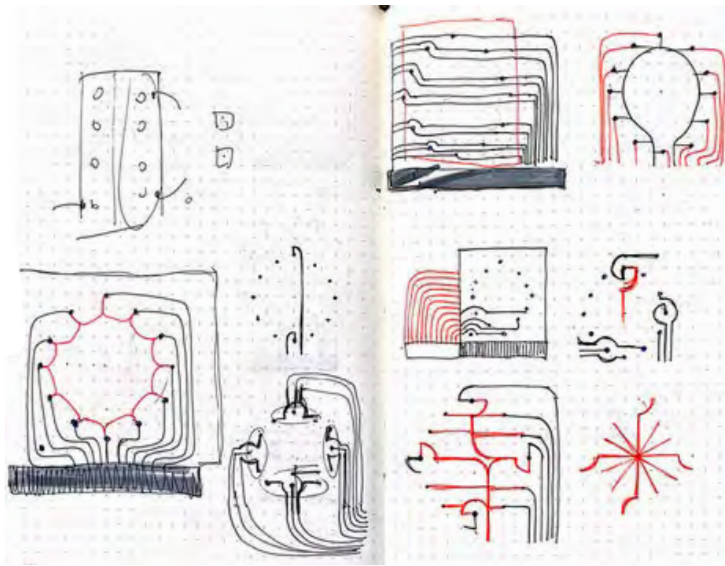
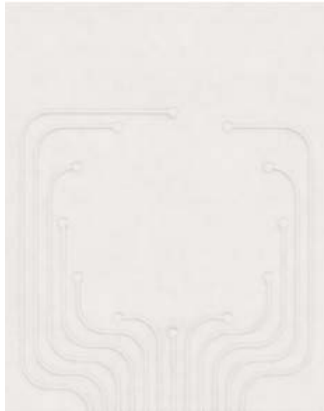
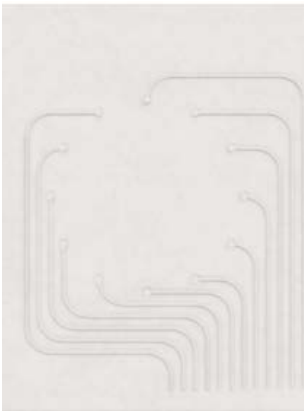
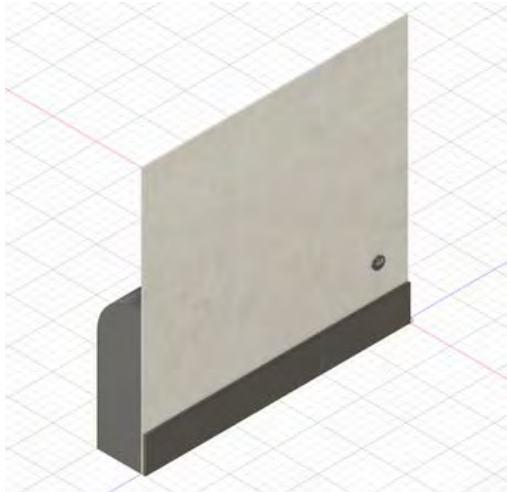
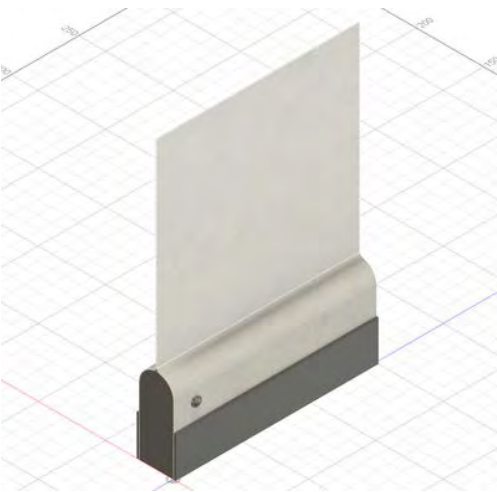
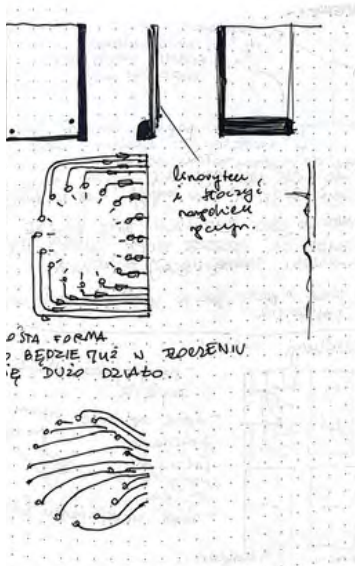
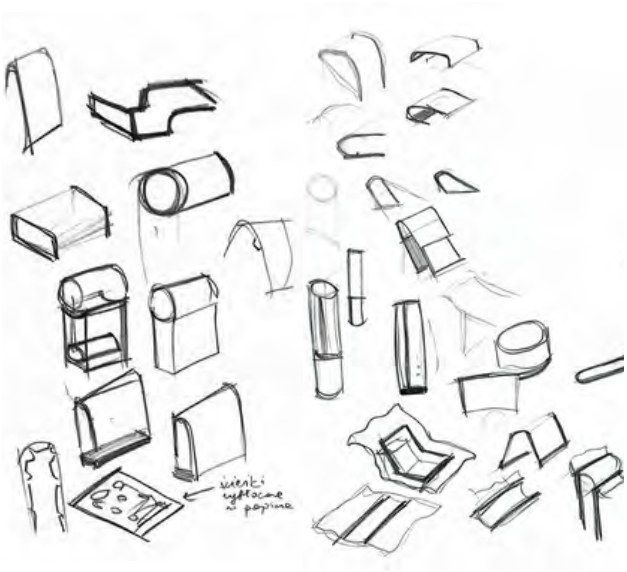
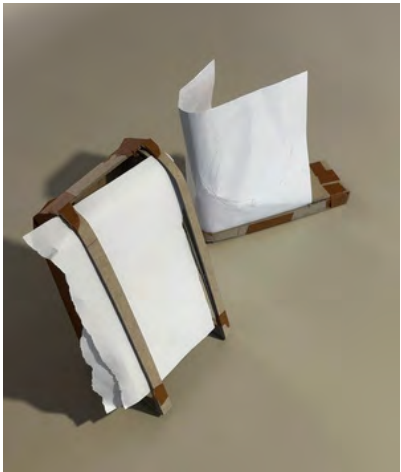
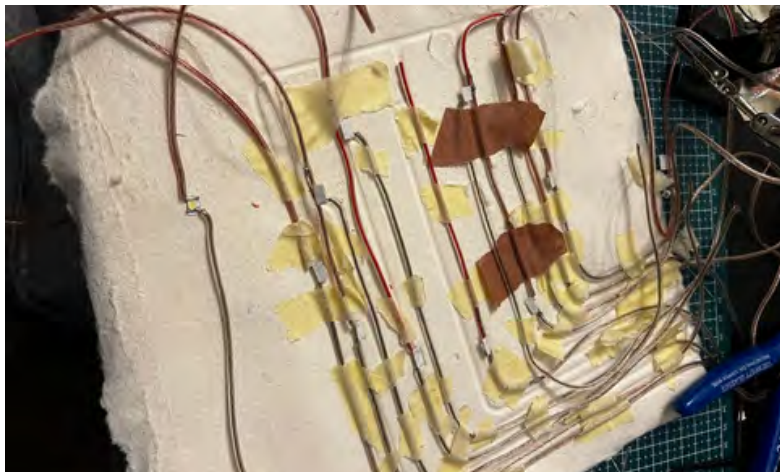
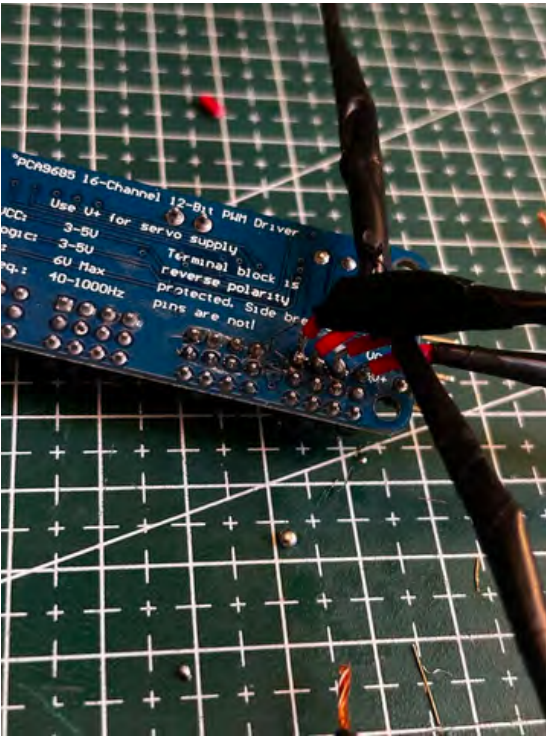
study of paper – experimentation with material

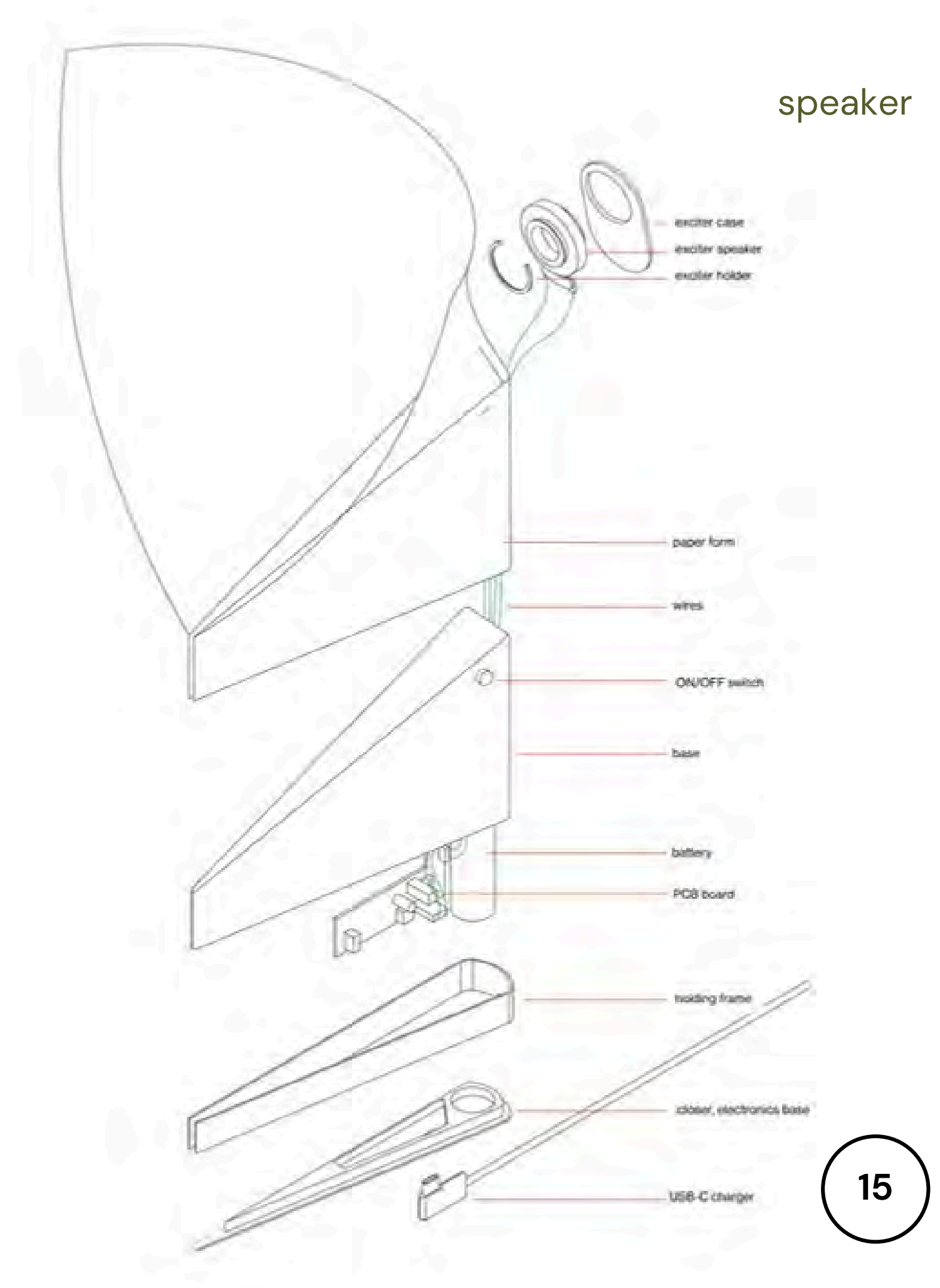
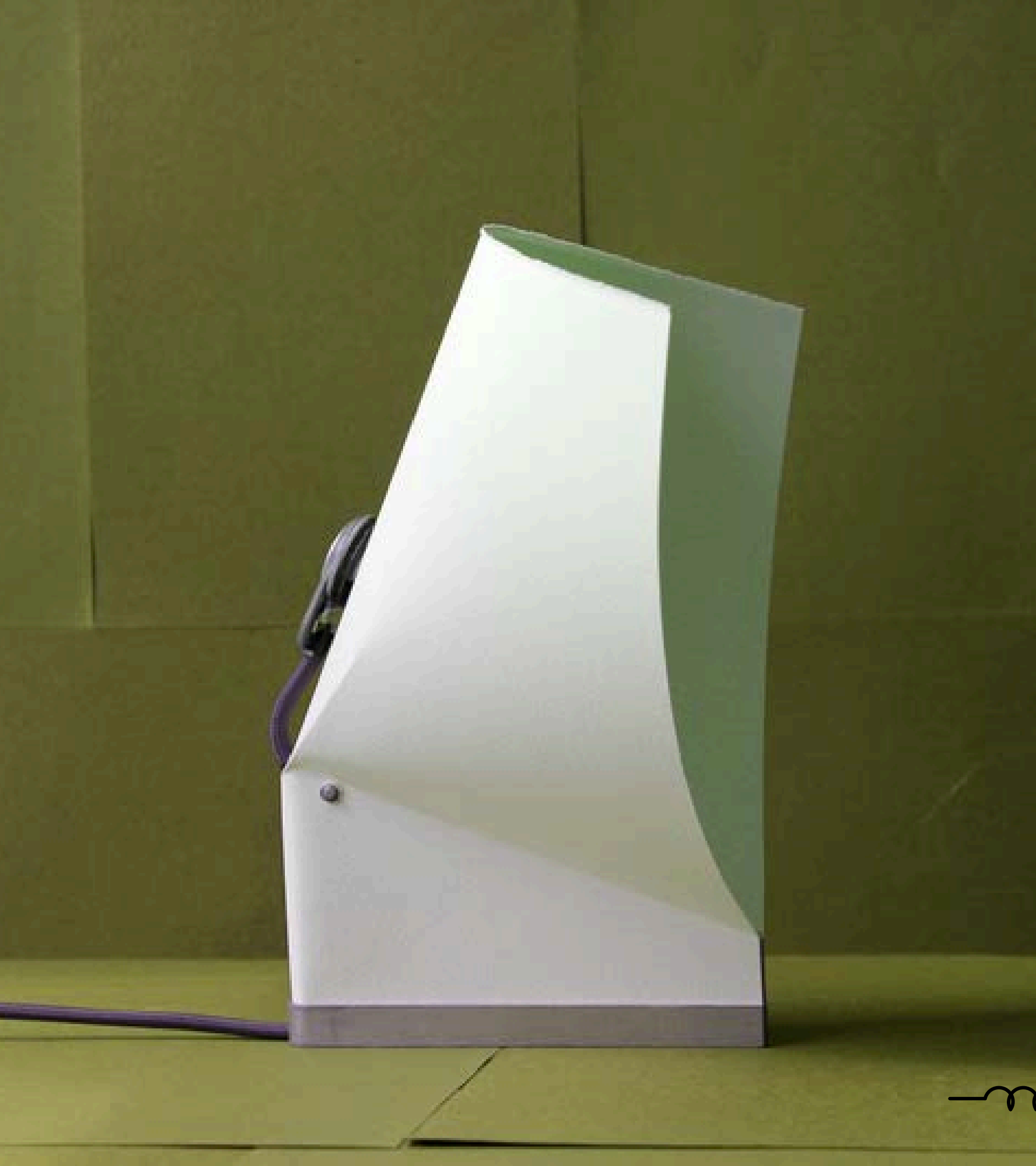
I conducted a series of material- and function-based trials. The experiments included examining how paper behaves in contact with light and sound vibrations, testing its insulating properties in electronic circuits, and exploring possibilities for forming and shaping it.



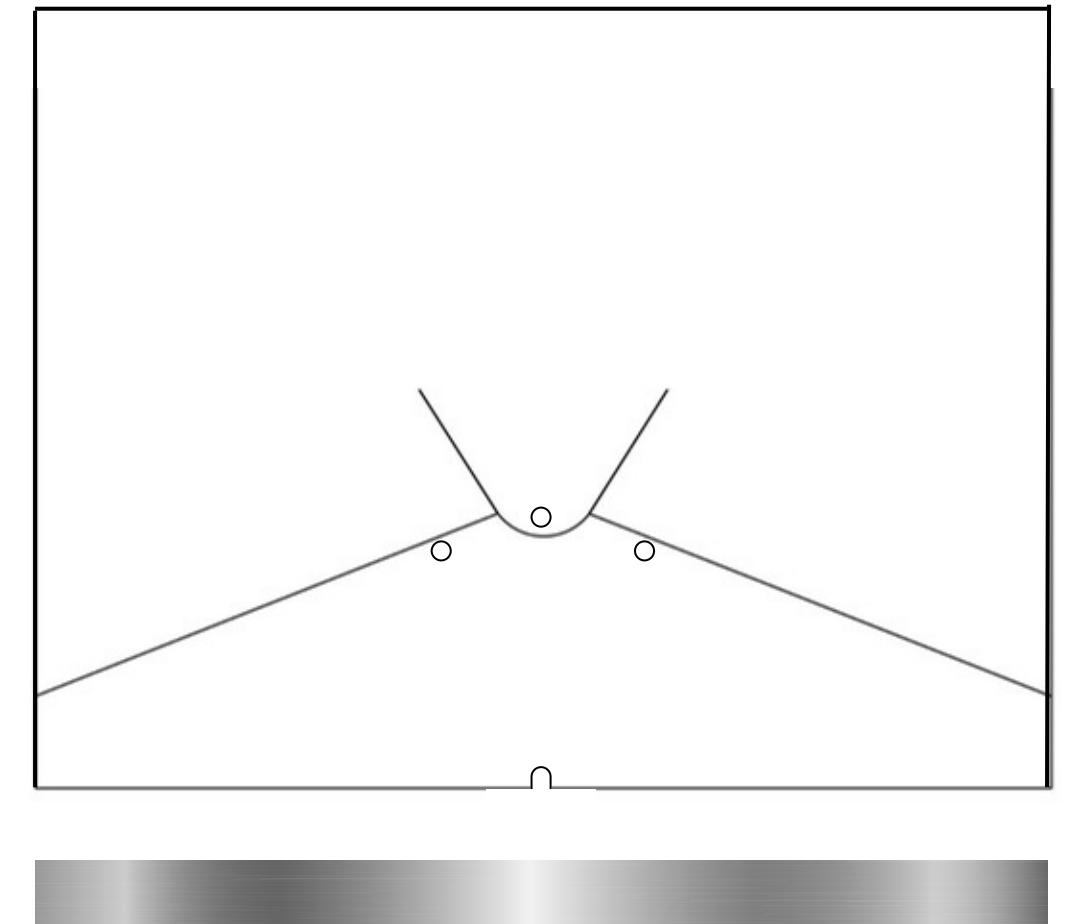








speaker – paper – steel

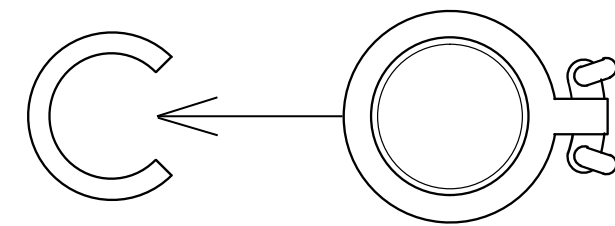
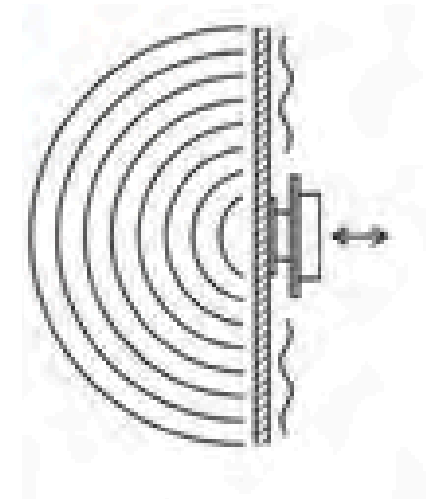


In this object, I decided to use paper and its capacity for folding — designing a fold grid onto which all the components are mounted.

A metal base encloses all the electronic elements and forms the technical core of the object. Steel, in character, contrasts with the nature of paper, although, like paper, it is also often found in sheet form. Steel adds the object the necessary mass and weight.

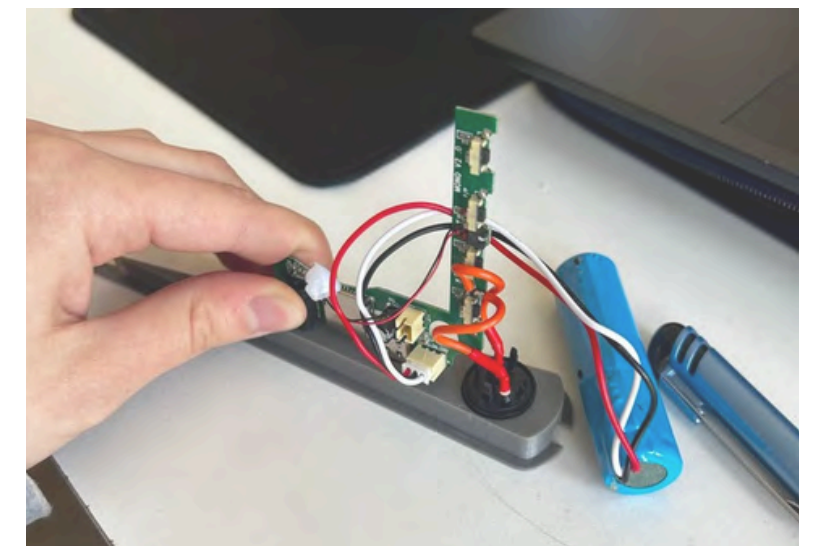
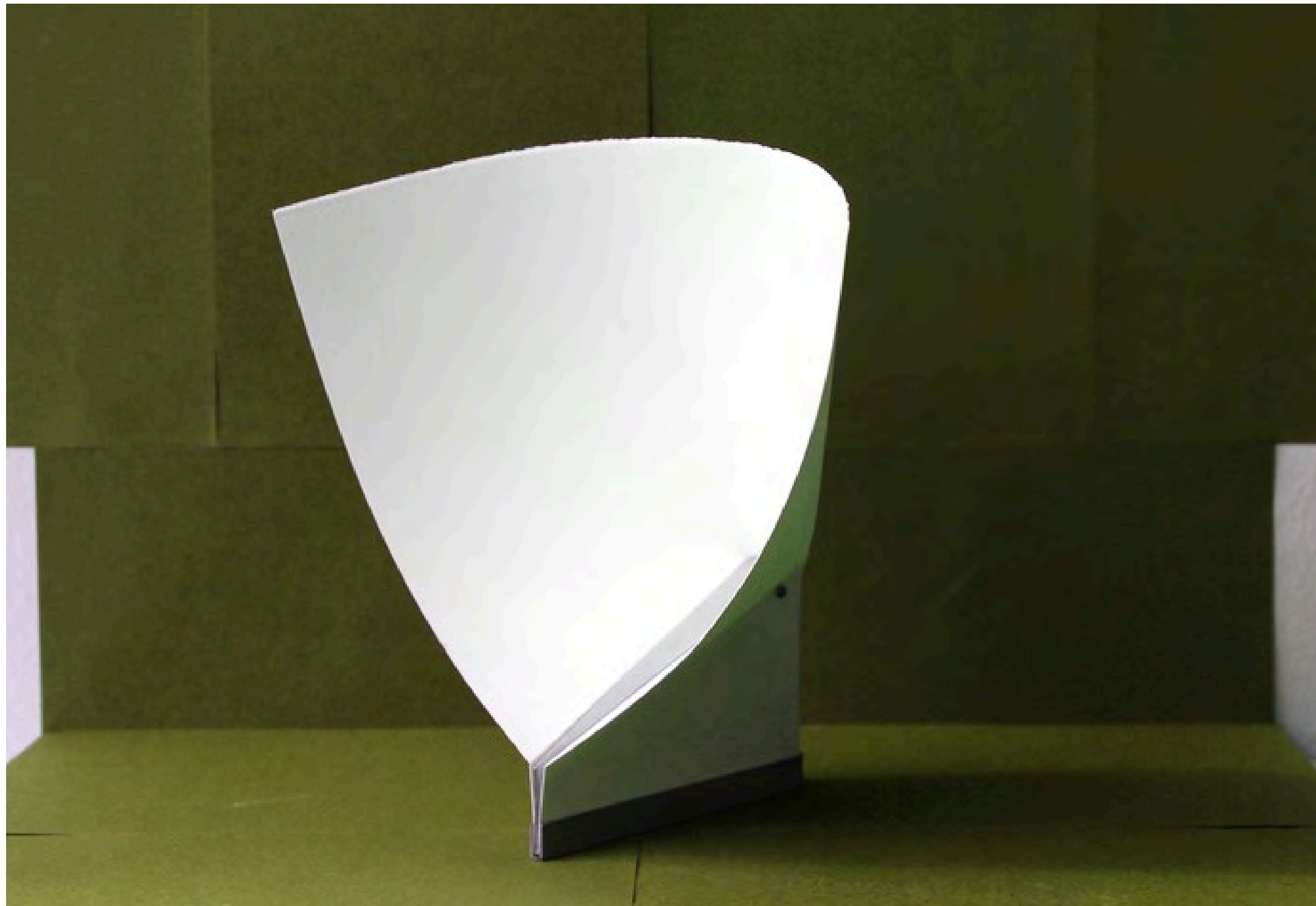


speaker – function – exciter



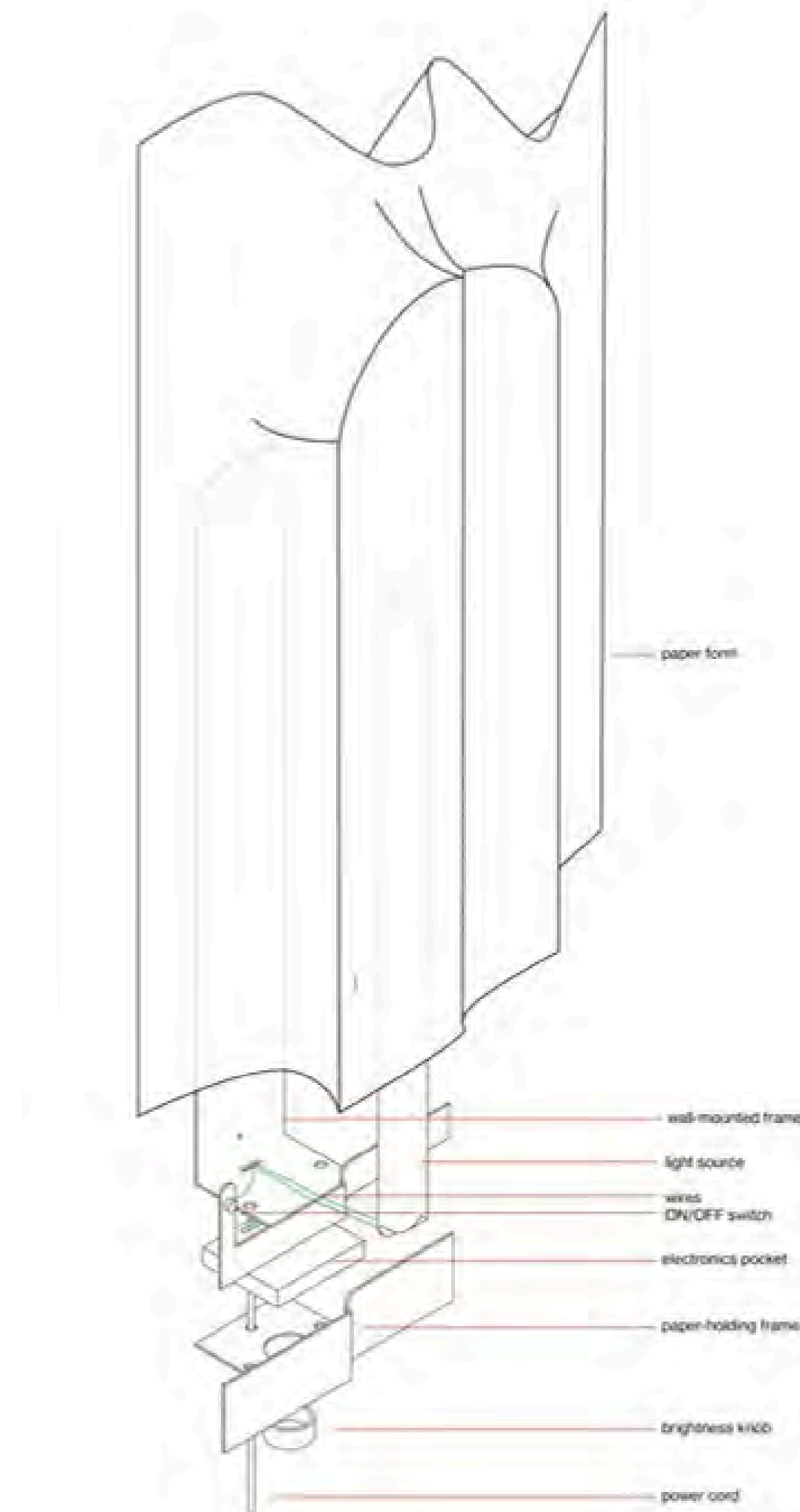
An exciter works like a transducer but without a membrane — the element that normally generates audible tones. Instead, when attached to a surface, it directs vibrations into that surface, turning it into the membrane. In my project, sound is produced through the paper itself, making paper an integral part of how the object functions.





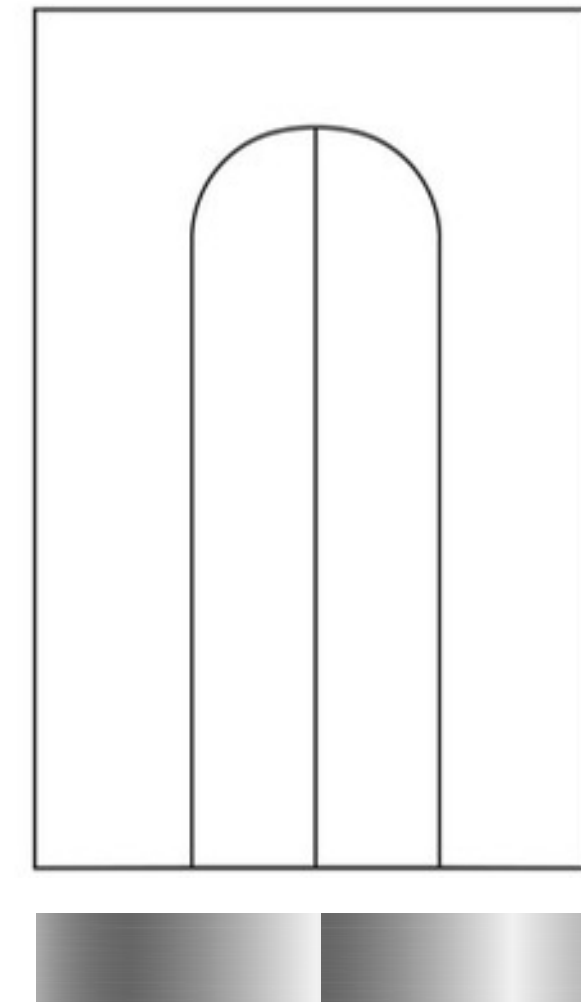
The object is switched on via touch buttons located on its sides and connects to an external device via Bluetooth.





lamp

lamp – paper – steel

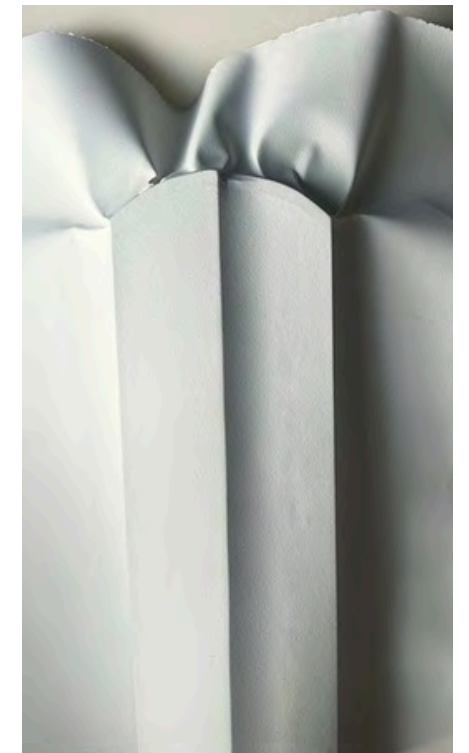


As in the previous object, I combine dedicatedly formed paper with steel, which adds weight, houses the light source, and allows the object to be mounted on a wall. The steel frame is constructed so that it doesn't damage the paper during assembly or disassembly.





lamp – paper – wet forming

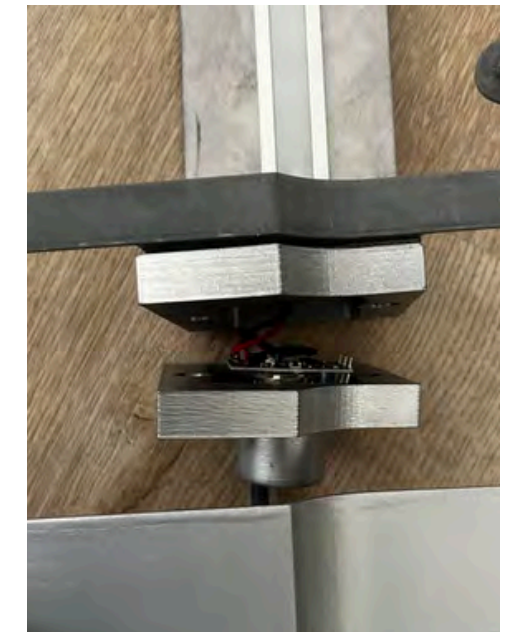
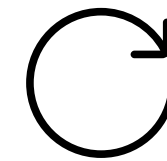


The form emerged directly from material experimentation — wet forming technique allows the sheet to gain spatial depth while retaining its lightness. The tension between the precisely shaped part of the form and the freely arranged rest of the sheet became a deliberate design motif.





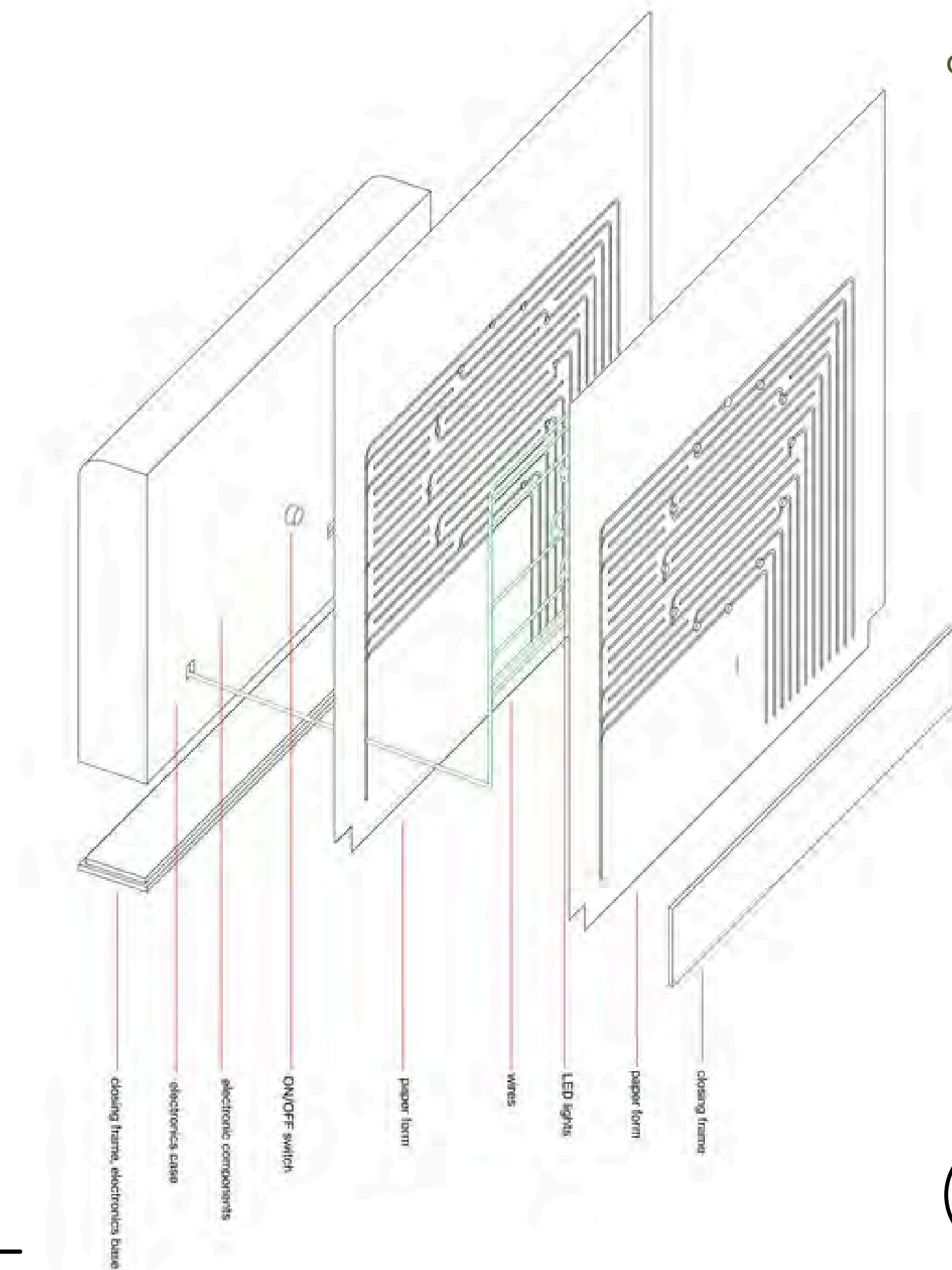
lamp – working- electronics



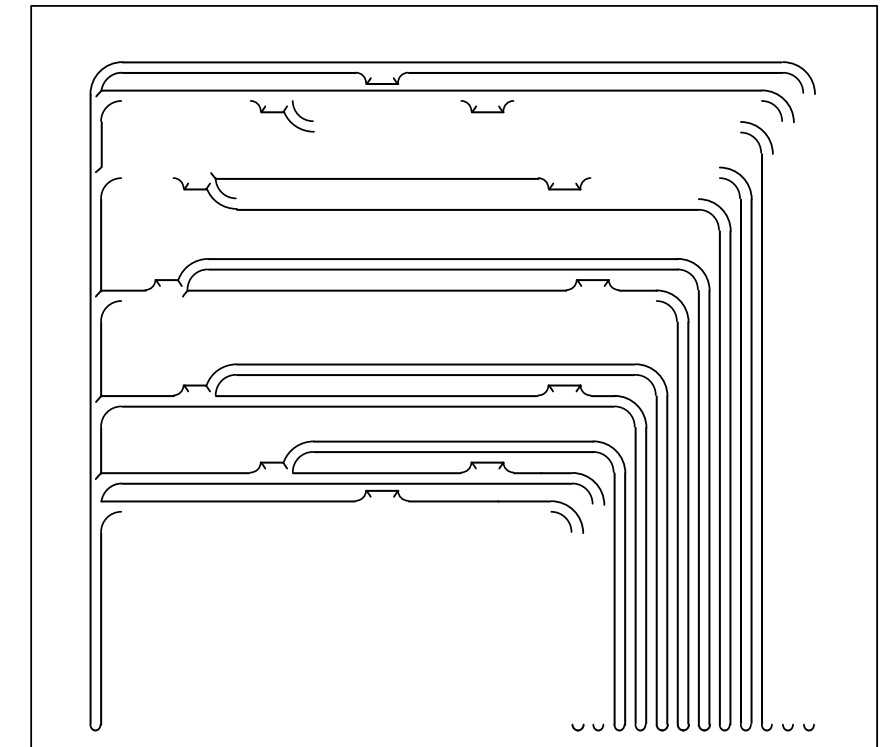
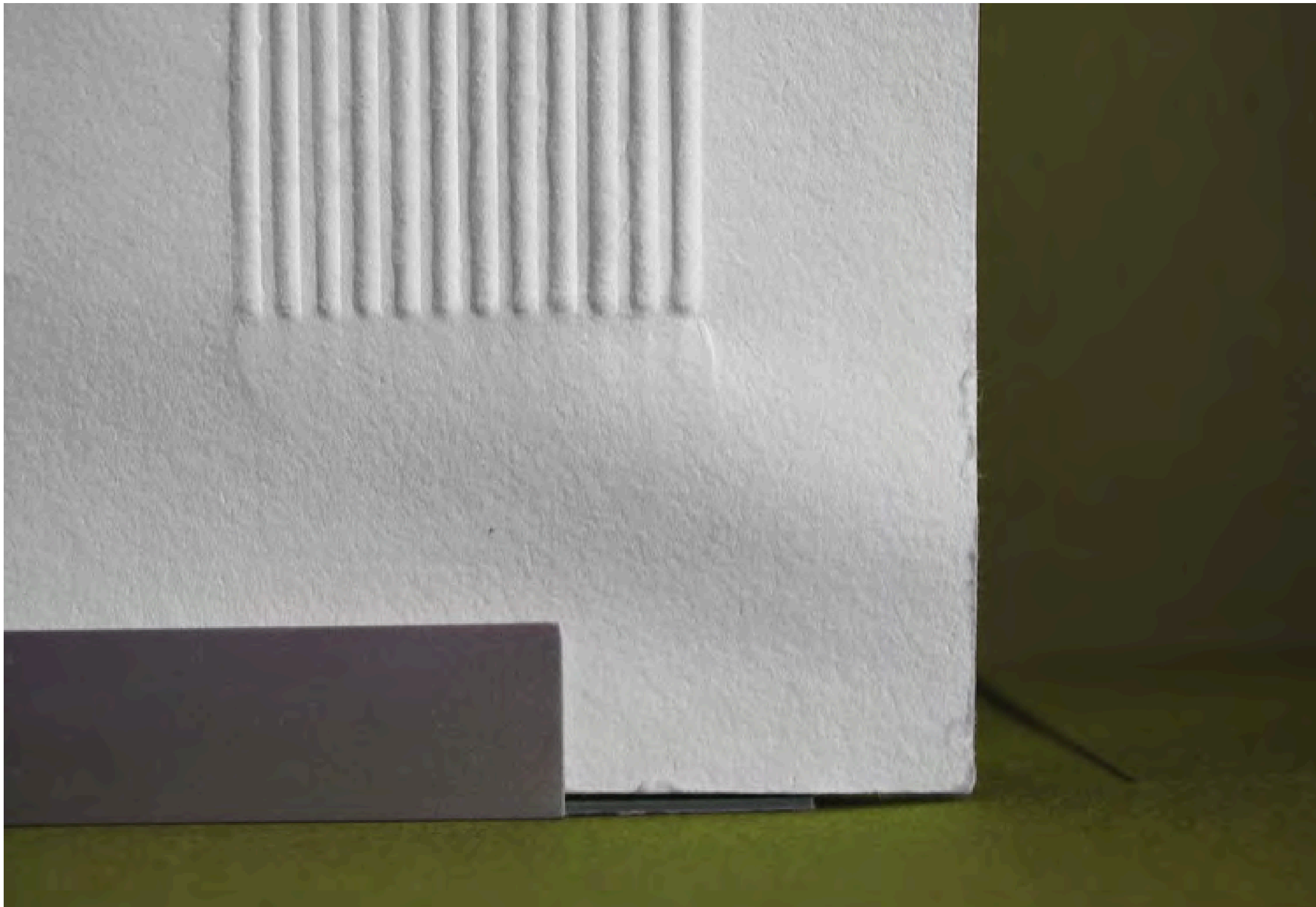
The lamp is switched on via a touch button and also features a rotating dial for controlling the brightness of the emitted light.



clock

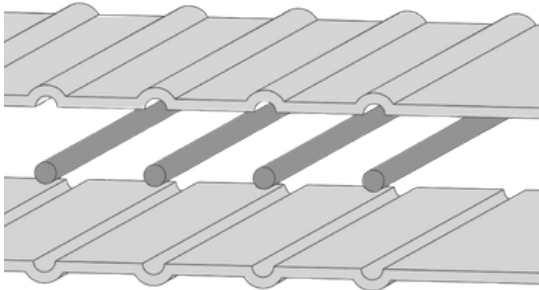
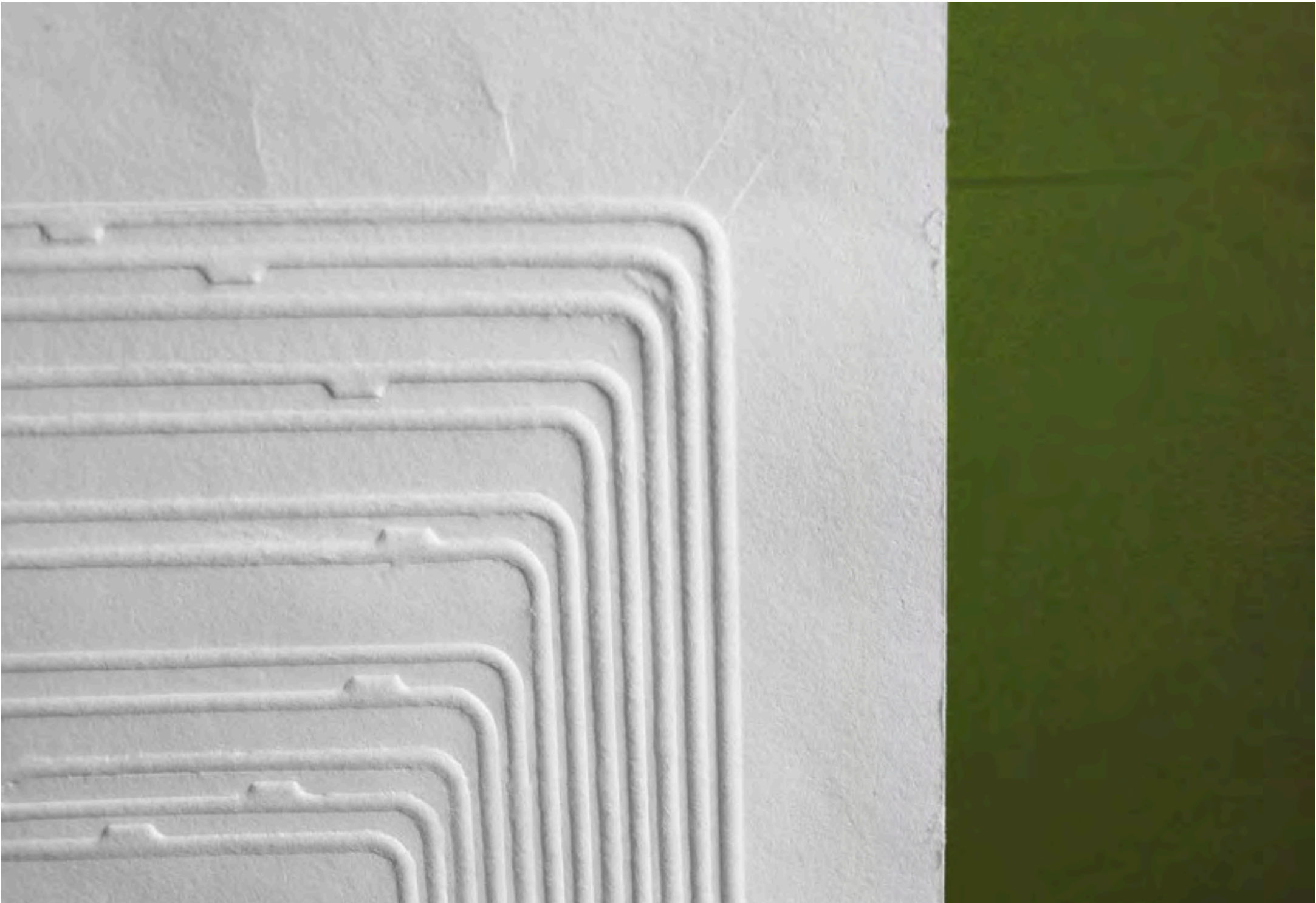


clock – paper – steel



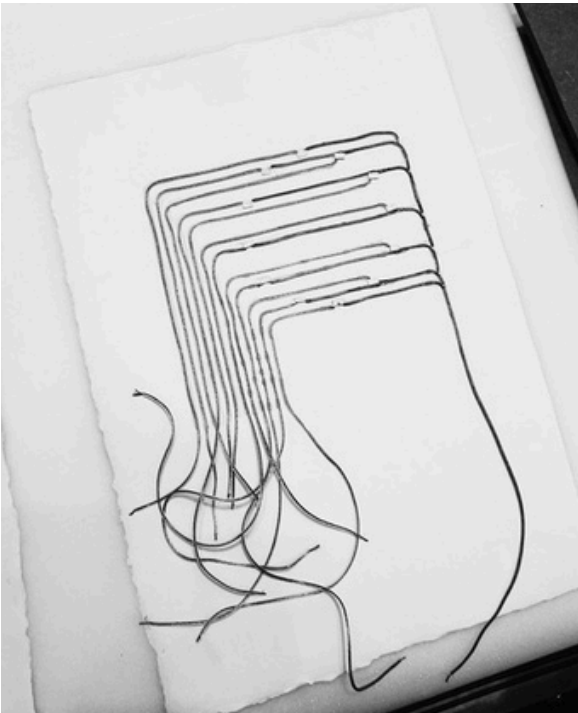
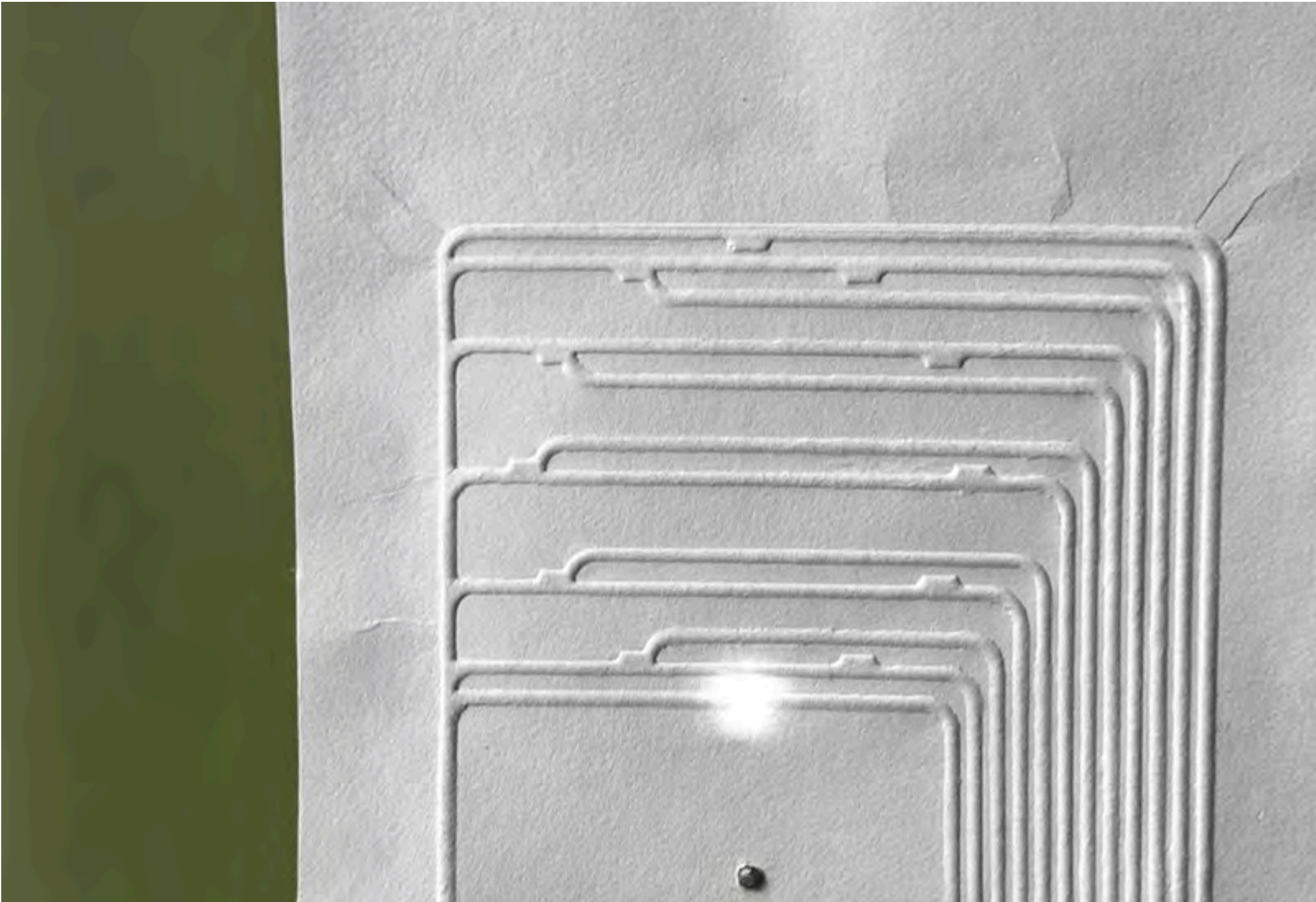
In the clock object, I likewise decided to use steel elements as the construction base, in which the electronic control center is housed.





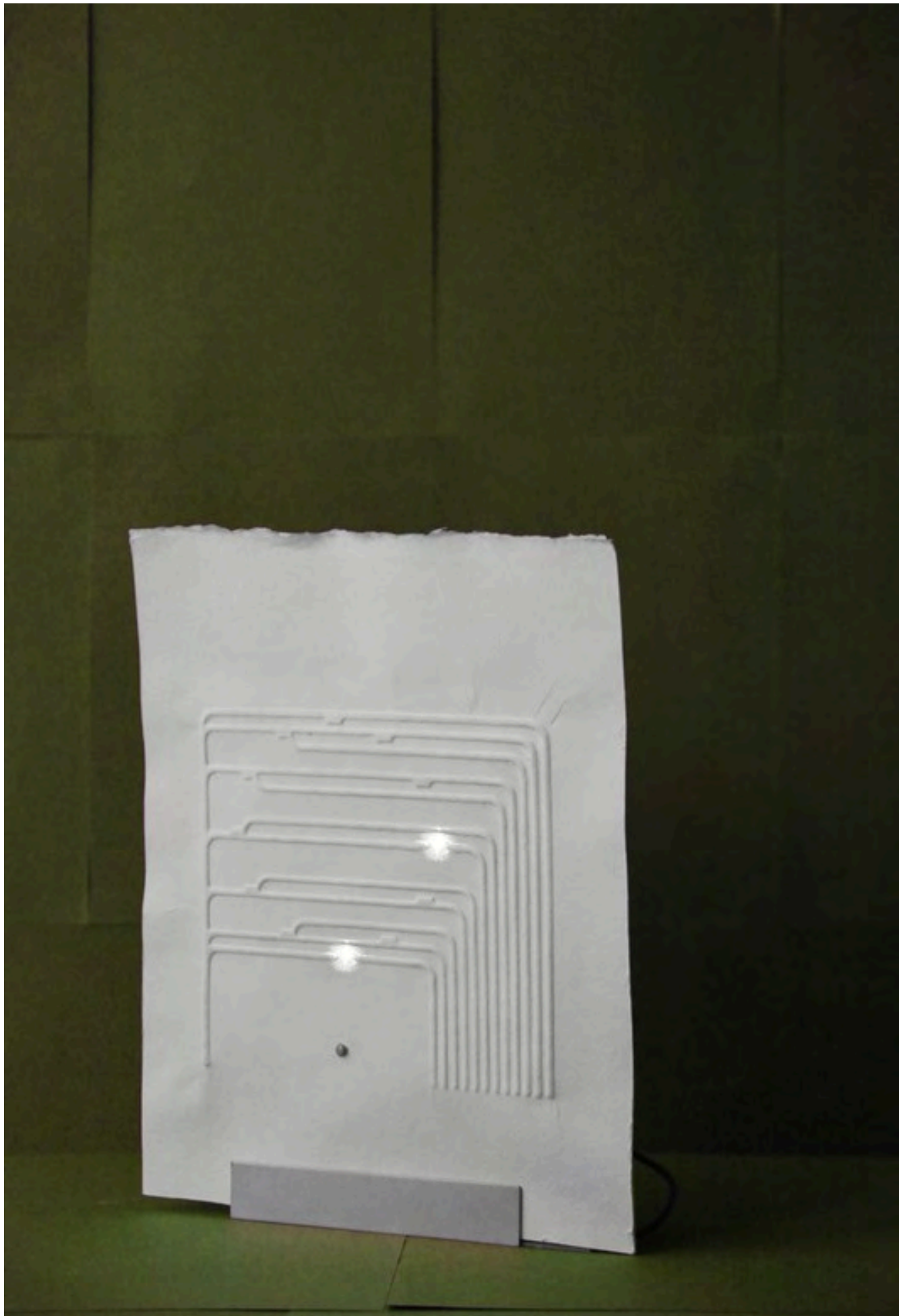
Here, paper is used as insulation for certain components. Wires and LEDs are housed in embossed recesses between two sheets of paper. It serves a structural function as well as that of an interface element, and forms the direct surface of contact between the user and the object.



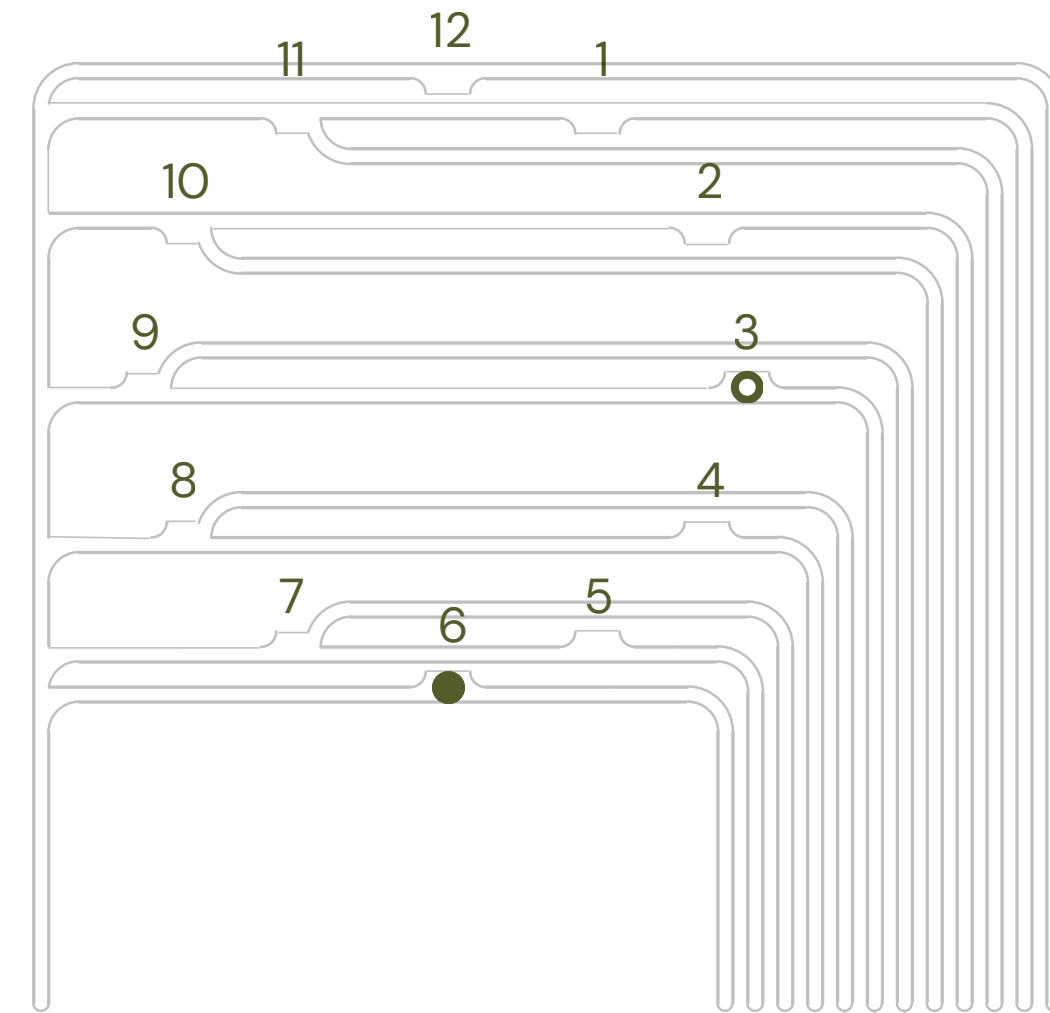


The object is likewise switched on via a touch button; once activated, the appropriately lit LED indicates the time.





clock – function – time



18:15

The design intent was not to read time with second-by-second precision, but rather an intuitive, felt sense of time. A steadily lit LED indicates the hour, while a blinking one indicates the minutes. Interacting with the object feels like interacting with a functional sculpture.



This work was both a material and a design experience — an experiment testing my own observations and intuition. Paper, which has accompanied humanity for centuries, became a medium between people and electronics; I treated its often-overlooked properties as design tools, revealing the potential it holds.

As Anthony Dunne argues, the real challenges of electronics design lie not in functionality but in the poetry and aesthetics of products — an idea that guided this work. My three objects — a speaker, a lamp, and a clock — attempt to answer whether electronics can be brought closer to people. I believe the material an object is made of shapes how we feel about it and whether we want it around us. Paper, with its organic quality and cultural roots, feels like a fitting choice in an age when technology permeates life yet often remains foreign to us.

I hope this work shows that paper's potential in electronics design lies in its closeness to people. Used as a structural material, it can produce objects that surprise, evoke emotion, and are both beautiful and functional. What I value most here isn't just the finished objects, but the new, open quality they point toward.

