DOCUMENTATION

BASTO

A MODULAR CANE FOR A TRANSFORMING AGE

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A modular cane for a transforming age

Graduation theses elaborated by
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Research Abstract.

Change is an inevitable event in all people's lives. The body transforms and with it its abilities. In an early period of life, especially during growth, our organism undergoes a learning process, but in due course this process is reversed. Ageing is an inescapable process and its consequences afflict each individual physically, with varying degrees of intensity and different characteristics, but with relative constancy. Fragility of the skeletal system, weakening of muscles, deterioration of sight and hearing are the most frequent macro-problems in senior citizens.
Given these 'handicaps', tasks that were once trivial for the discussed category now become difficult, sometimes impractical and dangerous. Moving around stairs, sitting, bending down, moving objects, are tasks that require a significant level of commitment, to such an extent that they also impact the elderly person's relationship with the surrounding society. Like a house, even a generic urban place can prove to be a place of discomfort. I personally realise this by observing my grandparents: a couple who have lived for more than sixty years in the same house, which, having remained unchanged, unlike its residents, is now hardly habitable for its owners and often unliveable without help from third parties.
The aim of this work is to help the category of elderly people with specific motor difficulties, who make up a significant part of the population. To do this, it is necessary to conduct research on statistical, social and demographic studies to identify a specific phenomenon among the many motor disorders that occur in old age. Once this last area of research has been identified, the analysis of several case studies is crucial to better analyse the problem, discuss relevant issues and develop project solutions.

General Research.

Socio-demographic context.

The world population has been facing a continuous increase in average age for decades now. It has been estimated that average seniority has risen by +0.25 years per year. In order to define the socio-demographic context, it is important and indispensable to analyse different data. It is possible to get information through different portals and the following data that I am going to list are provided by Eurostat research of 2020, extrapolated from the PhD "Age Friendly Design" (Matteo Zallio, 2022).

It is appropriate to start by saying that countries defined as developed tend to have a higher average age than underdeveloped countries, due to the high birth rates in these regions. Europe, being one of the most developed areas, tends to have a relatively elderly population.

Today the average age in Europe is 44.1 years, with Italy being the oldest country with an average age of 47.6 years, followed by Germany with 45.9 years and Portugal with 45.8 years. Moreover, according to the latest estimates released by the European Community and the European Statistical Institute, Europe is considered the geographical area with the average age of the population higher.

Many debates in various fora deal with the ethical problem of how to literally name the group of people over 65, which, for the sake of simplicity, is referred to as the elderly population.

According to biology and medicine, the elderly are those who have reached a certain age level, generally indicated as being around 65. The ageing process from a physical point of view, however, begins when the individual has completed the period of physical development, which in our society corresponds to around the age of 25. This is followed by a period of full development of youth, then adulthood and maturity, in which the phenomena of ageing appear. At the end of maturity begins old age, or senility, and then longevity, generally defined as over 80 years of age (Pegoraro, 2001).

In 2022 more than one fifth, about 21.1 per cent, of the European population was over 65 years of age. This threshold (65 years) is considered the beginning of senior age, what the British prefer to call ‘older adults’. Therfore, considering the latest indications of the European Community, it is possible to correctly contemplate the age of 65 as a definition of advanced age. Each country has a different percentage of senior citizens and at the top of the European ranking are Italy with 22.8%, Greece with 22%, Portugal and Finland with 21.8%.

Approaching elderly design.

Some speak of a silver market, i.e. of a market especially defined for the third age, others are reluctant to the idea of a market specifically for the elderly, but data, especially concerning the consumption and use of new technologies, show that a large proportion of today’s consumers with considerable purchasing power are precisely those who are close to the so-called third age (Enste, Naegele, Leve, 2008).
Many companies attempt to open up their market by addressing certain needs demanded by the more mature society. Their attempt, however, is not completely accepted by society. One example is Porsche, which decided to modify the doors of its Cayenne SUV, enlarging them and making the car more accessible to older people, who prove to be the main buyers of this kind of car. The problem arises in the cause and effect of these design and marketing choices. Considering Porsche’s example, the company did not decide to redesign certain components of its cars in such a way as to allow a new niche to buy its products, but had to take this route, since their biggest customer segment has always been ‘older adults’.
“They thus created a ‘senior-friendly Porsche’. It sounds like a term of abuse, or at best a joke. Watch out: old people! Social change is obviously a dimension that has not yet entered the minds of mainstream advertising, which still prefers to portray its target groups sitting on Harleys or wearing miniskirts, rather than the average consumer of advancing age.” (Oliver Herwig, 2008, Universal Design).
Another interesting case is in the field of phones. In the present century, leaps and bounds have been made, technologies have changed drastically and with them the functionalities and the user’s approach to the product. The touch-screen has made

phones into smart-phones. In this fast revolution, two factors discriminated the elderly user. The approach of complicated technologies that are difficult to domesticate and the reduction in the size of devices: the latter has conditioned the size of keys and text. The choice of the majority of telephone producers has been to design and sell products only for the elderly, which have large, visible and easy to press buttons, lettering that is possible to distinguish and a general simplicity of the user interface.
What is the problem with this choice? It is discriminatory in that it categorises. This is in fact where what is called Universal Design comes into picture. It is necessary, in order for design to respect social change, to design for everyone and not to restrict the catchment area to a specific category. Design for the elderly should also not be a design model that only has in mind specific problems that the senior citizen has to face on a daily basis, but rather solve specific problems and at the same time be helpful for user x, identified by designers as normal.
Let us consider the UX and UI of a generic product. Greater ease in learning certain dynamics, such as greater simplicity in the use of certain functions, as may be the lettering, key positions or the organisation of components, are not only fundamental for a user with difficulties in sight, motion or memory, but are also welcomed and appreciated by the average user who does not want to have a cumbersome and awkward object in his hands, but who prefers an intuitive product.
Moreover, very often elderly people do not like to be vulnerable and show their possible deficits to society. Therefore, it is important for a designer who decides to interact with this user, to leave as much room as possible to the normal, in order to study each individual case in such a manner that the outcome is not only blended well with the social context but is both a resolution of a problem and a simplification of a situation.

The principles of Universal Design.

The 7 Principles of Universal Design were developed in 1997 by a working group of architects, product designers, engineers and environmental design researchers, guided by Ronald Mace of North Carolina State University. The aim of the Principles is to

guide the design of environments, products and communications. According to NCSU's Center for Universal Design, the Principles "can be applied to evaluate existing designs, guide the design process, and educate both designers and consumers about the characteristics of more usable products and environments".

"Please note that the Principles of Universal Design address only universally usable design, while the practice of design involves more than consideration for usability. Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design process. These Principles offer designers guidance to better integrate features that meet the needs of as many users as possible." (Oliver Herwig, 2008, Universal Design).

1. Equitable Use.

The design is useful and marketable to people with diverse abilities.

Guidelines:
- Provide the same means of use for all users: identical whenever possible; equivalent when not.
- Avoid segregating or stigmatizing any users.
- Provisions for privacy, security, and safety should be equally available to all users.
- Make the design appealing to all users.

2. Flexibility in Use.

The design accommodates a wide range of individual preferences and abilities.

Guidelines:
- Provide choice in methods of use.
- Accommodate right- or left-handed access and use.
- Facilitate the user's accuracy and precision.
- Provide adaptability to the user's pace.

3. Simple and Intuitive Use.

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Guidelines:
- Eliminate unnecessary complexity.
- Be consistent with user expectations and intuition.
- Accommodate a wide range of literacy and language skills.
- Arrange information consistent with its importance.
- Provide effective prompting and feedback during and after task completion.

4. Perceptible Information.

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Guidelines:
- Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- Provide adequate contrast between essential information and its surroundings.
- Maximize "legibility" of essential information.
- Differentiate elements in ways that can be described.
- Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

5. Tolerance for Error.

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Guidelines:
- Arrange elements to minimize hazards and errors: most

used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- Provide warnings of hazards and errors.
- Provide fail safe features.
- Discourage unconscious action in tasks that require vigilance.

6. Low Physical Effort.

The design can be used efficiently and comfortably and with a minimum of fatigue.

Guidelines:
- Allow user to maintain a neutral body position.
- Use reasonable operating forces.
- Minimize sustained physical effort.

7. Size and Space for Approach and Use.

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Guidelines:
- Provide a clear line of sight to important elements for any seated or standing user.
- Make reach to all components comfortable for any seated or standing user.
- Accommodate variations in hand and grip size.
- Provide adequate space for the use of assistive devices or personal assistance.

The problem with households.

A home's main role is to be a place of vulnerability and security. When choosing a house to live in, two paths are usually taken: renting or purchasing. Both choices assume reasons and consequences.

Depending on country and social settings, people act on this choice. For instance, according to an ISTAT survey, in 2021 there were 18.2 million households in Italy and 70.8% lived in a house they owned, 20.5% rented and 8.7% in usufruct or freehold. Whereas, countries such as Germany (49.1%) and Switzerland (42.2%) have by far the lowest home ownership rate in Europe and are the only countries where home owners are in the minority. The reasons behind this decision are mostly economic, but I would now like to analyse these two different approaches from the standpoint of design and, above all, the normal living standards of an elderly person. Living in the same household for a lifetime precludes certain possibilities as it might hinder life in the different stages of growth and decline of the inhabitant. Statistically, the average age at which people decide to buy a house was 38 in 2022. In most cases, the house is purchased when the family nucleus is already enlarged, since the average age of childbirth is fixed at 31, however, also childless couples generally choose to purchase a house with the intention of increasing the number of family members. This enlargement requires a house with more room and enough space for every need. As the years go by, the home becomes empty and the parents tend to live a lonely life in homes that are often too big. The problem changes in magnitude when the lone family members reach an age when they are no longer self-sufficient, at least within a home no longer designed for them. Furniture, rooms and spaces do not change along with the user, who now has difficulty managing his surroundings. This reflection stems from an example I observed through my grandparents. They bought their house in 1967 at the age of 41 and 45. In 56 years, they have changed a lot and today they have different needs than the young adults they were during the purchase. Now aged 97 and 101, their house with stairs and large rooms is no longer as fully usable as it once was. These changes, mainly physical, have caused one of them to be forced to leave the home and move to a hospice where she can be cared for, while the other lives his daily life with noticeable difficulties. Renting a flat, on the other hand, could obviate many of these issues. Houses change as people change. If at one point in life one only needs two rooms, the moment one needs a third, one may opt to find a new accommodation. If the flat one lives in has stairs and it is noticed that one is beginning to have slight physical impediments, he or she may opt to move to a one-storey dwelling. In short, dynamism is the buzzword, and according to some trends it is also the direction in which society is moving, and not only

in terms of housing. Moreover, statistics show how residential areas are increasing in size. A study by Empirica Communication and Technology Research provided data showing that there are 300,000 more residential units in Germany each year and that between 2005 and 2030 and forecasts an increase of nineteen percent to 4.4 billion square metres of residential space.
It is a common desire amongst the older population to live their lives with a certain amount of independence, not only on an economic level, but above all in the domestic context, which as previously discussed can be constricting for people with motor difficulties and other types of age-related impediments.
Therefore, I am pursuing this research, to try to find a solution that goes beyond a purchasing choice. It is necessary to find solutions that simplify daily movements and actions, making the user, autonomous if he or she would not be in a normal situation, and observing the principles of Universal Design, must not be a new impediment for those who do not have those certain difficulties. Home and home environment can form the essential base of independence, while guaranteeing an adequate quality of life in old age.

Usability.

ISO 9241-11:2018 (Ergonomics of human-system interaction - Guidance on usability) (ISO 2018).
Extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.
[SOURCE:ISO 9241-210:2010, 2.13, modified]

Usability is a measure of the quality of a user's experience when interacting with an artefact (J.Nielsen).
Usability is a multidimensional measure that can be broken down into a triangulation of effectiveness, efficiency and satisfaction.
The effectiveness of a system is referred to as the accuracy and completeness with which users achieve specific goals.
Efficiency is defined as the amount of resources spent in relation to the accuracy and completeness with which users achieve objectives.
Thirdly, satisfaction is defined as freedom from discomfort and positive attitude towards the use of the product, referring to the comfort and acceptability of the system to its users and others

affected by its use. A clear example is the use of a sink tap. It is possible to measure, for example, the usability of the object in question by defining effectiveness as the ability to precisely regulate the flow of water, measured on the basis of the additional litres delivered per second for each complete turn of the knob, starting from the fully closed position of the flow; efficiency as a function of the number of turns of the knob required to reach the maximum flow; satisfaction or the average subjective liking expressed by a sample of users, for example through the SUS (System Usability Scale). (Matteo Zallio, 2022)
According to Nielsen, usability is characterised by five different attributes: ease of learning, efficiency (high levels of productivity), ease of memorising functions, low error level, satisfaction (pleasure in use). As stated by Nielsen, ease of learning is a fundamental component that defines usability. It is therefore necessary to subdivide ease of learning into learnability and memorability.
A system that is easy to learn is therefore said to have high learnability. In the specific case of products designed with a focus on elderly users, in whom memorisation skills are sometimes reduced, it is useful that the product's mode of use is easy to recall or that the product has high memorability (memorability) (Polillo, 2010)

Accessibility.

ISO/TR 2 2411:2021 (Ergonomics data for use in the application of ISO/IEC) (Guide 71:2014)
Extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of user needs, characteristics and capabilities to achieve identified goals in identified contexts of use.
[SOURCE:ISO 9241-112:2017, 3.15]

Accessible design: design focused on diverse users to maximize the number of potential users who can readily use a system in diverse contexts.

Note 1 to entry: This aim can be achieved by (1) designing systems that are readily usable by most users without any modification, (2) making systems adaptable to different users (by providing adaptable user interfaces) and (3) having standardized interfaces to be compatible with assistive products and assistive technology.

Barrier-free living.

Raumpilot Grundlagen (Thomas Jocher & Sigrid Loch, 2012)

The following paragraphs are extrapolated from the book “Raumpilot Grundlagen” specifically from the different sections on living spaces free of barriers. The book offers detailed knowledge about spaces, encumbrances and regulations, useful for designing spaces and objects in a home as well as in public places, both for people with and without physical limitations.

Barrier-free stairs must have handrails on both sides with a diameter of 3 to 4.5 cm. External handrails must project 30 cm horizontally above the beginning and end of a staircase at a height of 85 cm (or 85 to 90 cm DIN 18040 draft). The legal regulations on balustrade heights apply independently of the requirement for 85 cm (85 to 90 cm DIN 18040 draft) handrail height, the fall protection must therefore be arranged separately from the handrail at the required height! The height of the handrail is measured vertically above the front edge of the steps or OFF the landings to the top edge of the handrail. According to DIN 18024, DIN 18025 Part 1 and DIN 18040 (draft), a 150 cm movement area is required in front of the stairs for wheelchair users. The top step (exit step, see “Stair parts”) must not be included. However, the intermediate landing may be narrower than 150 cm as it cannot be reached by wheelchair users. (Dimensioning of this landing area according to requirements of LBO and DIN 18065).

Barrier-free ramps enable people with walking difficulties, wheelchair users and people with prams etc. to overcome heights without hindrance. Ramps are required from a longitudinal gradient of 3 percent. In barrier-free ramp planning, a slope of up to a maximum of 6 percent is possible. The usable ramp width between the wheel deflectors, which are at least 10 cm high, is required to be at least 1.20 m wide. After a maximum ramp length of 6 m, an intermediate landing of at least 1.50 m is required. Handrails are to be installed on both sides with a diameter of 3.5 cm to 4 cm at a height of 0.85 m (0.85 m to 0.90 m DIN 18040 (draft) and to extend beyond the ramp 30 cm above the platform surface. Freely projecting handrails are to be terminated with a curve downwards or to the side (DIN 18040 draft). The movement areas at the beginning and end of the ramp must be at least 1.50 m x 1.50 m.

Ramps can be used as an alternative or in addition to stairs or lifts as generous vertical access elements. The inclination of flat ramps is a maximum of 6 per cent, for Belagram ramps (non-accessible) between 6 and 10 per cent, for steep ramps between 10 and 24 per cent (non-accessible).

For **barrier-free lifts**, DIN EN 81-70 sets requirements for door and car sizes as well as for the design of the operating and display elements in order to enable wheelchair users, persons with walking aids, persons with visual impairments, etc. to use the lift independently or with accompanying persons. In addition, DIN 18024 and DIN 18025 or, in the future, DIN 18040 apply to the dimensioning and design of the vestibules. A clear door width of 90 cm is required so that wheelchair users can pass through the doorway unhindered. A cabin size of at least 1.10 m wide and 1.40 m deep is required. A horizontal arrangement of the interior panel in combination with high-contrast, tactile (raised, tactile) button designations facilitates operation, also for the visually impaired. A handrail under the tableau improves usability (90 cm height according to DIN 81-70). A floor-to-ceiling mirror on the rear wall of the lift enables wheelchair users to find their way around when reversing in the lift and when leaving the lift (not required to be floor-to-ceiling according to DIN 81-70, but still recommended). Waiting and movement zone in front of the lift To enable turning with a wheelchair, the movement area in front of the lift door must be at least 150 cm x 150 cm (DIN 18024 Part 1 and Part 2, DIN 18025 Part 1 and Part 2, DIN 18040 (draft) Part 1 and Part 2). All operating devices and grab rails for the wheelchair user must be arranged at a height of 85 cm (DIN 18024 / DIN 18025). In addition to the outer control panel, a lateral distance of at least 50 cm to the wall or to restricting objects must be kept free. DIN 18040 (draft) Part 1 additionally requires for publicly accessible buildings that the 150 cm x 150 cm area in front of the lift does not overlap with traffic routes or other movement areas.

Barrier-free entrance area.

Wheelchair parking space In wheelchair-accessible flats, a wheelchair parking space must be provided for each wheelchair user, preferably in the entrance area of the building or in front of the flat, for transferring from the street wheelchair to the indoor wheelchair. The wheelchair parking space must be at least 190 cm wide and at least 150 cm deep according to DIN 18025. Draft DIN 18040 specifies a wheelchair parking space with a width of 180

cm and a depth of 150 cm. DIN VDE 0510 Part 3 must be observed when equipping a battery charging point for electric wheelchairs. Mailbox system/bell system In principle, mailboxes for wheelchair users should be located within the vertical reach and be accessible by wheelchair. Letterboxes should be installed in such a way that the distance between the lower edge of the floor and the access flap is not less than 50 cm or not more than 170 cm. The operating height should be between 85 cm and 105 cm. Entrance to the outside of the building Access should be without thresholds. According to DIN 18025, thresholds up to a maximum height of 2 cm are possible in exceptional cases. The main paths (width ≥ 120 cm) to the house entrance, to the garage and to the waste collection containers should be safe to walk on, even in unfavourable weather. The longitudinal slope of paths should be ≤ 3 percent and the transverse slope ≤ 2 percent for wheelchair-accessible planning. House entrance inside According to the draft of DIN 18040 and DIN 18025 Part 1, the turning area for wheelchair users must be at least 150 cm wide and 150 cm deep (for detailed information, see chapter Barrier-free).

Barrier-free kitchen planning.
Minimum movement areas in front of kitchen equipment for wheelchair users in accordance with DIN 18025 Part 1 and DIN 18040 Part 2 (draft). Accessibility for wheelchair users must be guaranteed over a width of at least 90 cm. Minimum movement areas in front of kitchen equipment for barrier-free planning according to 18025 Part 2 and DIN 18040 Part 2 (draft). Sufficient legroom should be ensured when sitting.

Space requirements for dining areas.
Minimum space requirements for wheelchair access in accordance with DIN 18025 Part 1 or DIN 18040 (draft) Part 2 for square and round dining areas, section and floor plan. Minimum space requirement barrier-free in accordance with DIN 18025 Part 2 or DIN 18040 (draft) Part 2 for square and round dining areas, section and floor plan.

Relaxing and communicating barrier-free.
Seating group with representation of the minimum movement areas for wheelchair-accessible planning in accordance with DIN 18025 Part 1 or DIN 18040-2 (draft). Seating group with representation of the minimum movement areas for barrier-free planning according to DIN 18025 Part 2 or according to DIN 18040-2 (draft).

Barrier-free sleeping.
The movement area must be 150 cm wide along one long side of the bed (along the entire length of the bed) and also in front of wardrobes. The movement area must be at least 120 cm wide along the other long side of the bed so that the wheelchair user can also reach this side of the bed if necessary. The movement area must be 120 cm wide along one long side of the bed. In front of wardrobes and along the other long side of the bed, the movement area must be at least 90 cm wide.

Cleaning and care barrier-free.
WC. The seat height including the seat should be 48 cm above the upper edge of the finished floor (OFF) (46 to 48 cm, DIN 18040 draft). If necessary, height adjustment must be possible. The movement area next to the WC can in principle be arranged to the left or right of the WC, depending on the individual disability.
Washbasin. The washbasin must be able to be mounted at the appropriate height for the user's needs. It must be flat (15 to 18 cm) and accessible from below. It must be equipped with a concealed or flat surface-mounted siphon.
Shower area. The sanitary room must be equipped with a wheelchair-accessible (step-free) shower area. It must be possible to install a bathtub in the shower area that is accessible with a lift. In barrier-free sanitary room planning according to DIN 18025 Part 2, the sanitary room should also be equipped with a shower area that is accessible without steps. It should be possible to install a bathtub in the shower area at a later date.
Ventilation. The sanitary room must have mechanical ventilation in accordance with DIN 18017 Part 3.
Walls and ceilings. Walls and ceilings must have a load-bearing construction for the attachment of holding, furnishing, supporting and lifting devices as required.
Fittings. Single-lever mixer taps with temperature limiters and swivel spouts must be provided.

Usage-neutral space according to DIN 18025 Part 2 or DIN 18040-2 (draft).
The movement area must be at least 120 cm wide along one long side of a bed, and at least 90 cm deep in front of furniture such as cupboards, shelves, chests of drawers and beds. This results in minimum dimensions of the floor space and movement area of 360 cm x 410 cm for a barrier-free (not wheelchair accessible) use-neutral room.

Private outdoor areas barrier-free.
Barrier-free terrace exit with threshold ≤ 2 cm. A gutter with grating cover is arranged in front of the door. “Barrier-free transitions require special sealing solutions that have to be coordinated between the planner, door manufacturer and the person carrying out the work. Sealing alone cannot ensure tightness at the door connection. Therefore, additional measures are required, if necessary also in combination, for example:
- Trough-shaped drainage grate, if necessary heatable, with direct connection to the drainage system.
- Slope of the water-bearing levels
- Protection against driving rain and splash water by roofing
- Door frame with flange construction
- Additional sealing in the interior with separate drainage

Think-aloud Protocol.

Discussing one’s problems is not straightforward and interviewing a person about them involves the use of specific and targeted questions. However, asking the right questions may not bear fruit due to the sensitive topic. This is why Think-aloud Protocol is a valuable alternative to an interview through prepared questions, since it allows the interviewee to wander with his or her discourse in order to address the topics that most strike him or her. In this specific instance, it involves asking the interviewee to talk in as much depth as possible about his or her typical day. The distance and the type of conversation created between interviewee and interviewer allows the subject of the conversation to be analysed as objectively as possible.

Interview.

Date: 09 August 2023

Name: H.K.

Age: 101

Country: Germany

Place: Home

I. Tell about your typical day.

H.K. My typical day? What do you need it for? Why do you need to know this from me? What do you need to know that for?

I. It’s research for my university, nothing more.

H.K. It’s very simple. I get up at 5:30. Then I prepare myself from head to toe, completely. Then what do I do? It’s 6.30 until I’m ready. I drink a coffee, get upstairs and ride the bike (exercise bike). And then it’s 7.30/8.30. Usually at this point I sort the house out a bit and get ready to go out by 9.30. I stay out more or less three hours, 10.30, 11.30, 12.30, just walking outside. Then when I get home, I have to cook, eat, tidy up the mess, and another two hours pass. So it’s 3 o’clock and finally the time comes when I can say I’m free, but usually after all these things I’m exhausted, after walking, tidying up the house and everything that goes with it. Even though the day has only just begun at this time I can’t take it any more. I read a bit, walk around a bit, tidy the garden, trim the hedges up there a bit, pick up the cut grass, clean the steps in the garden. Now it’s 6.30 and at this time I watch the news, which goes from 7 to 7.30. Thereafter I am exhausted. I read some more, look around a bit and think about my life.

* Briefly digresses into personal talk *

H.K. So I’m done. But then what is this thing for?

I. It doesn’t really have a purpose, it’s meant to be a way of indirectly questioning people about small difficulties they encounter in their day.

H.K. But then I’m the wrong person.

I. Oh no, little things, like when you don’t know how to handle your house keys, where to put them when you get home, or how to avoid losing them. To name one thing.

H.K. For me it is very simple. I have a very long wire where I put all the keys, with different colours. How many times have I put my keys on the cabinet and never found them, but with this wire and the colours, it doesn’t happen to me anymore.

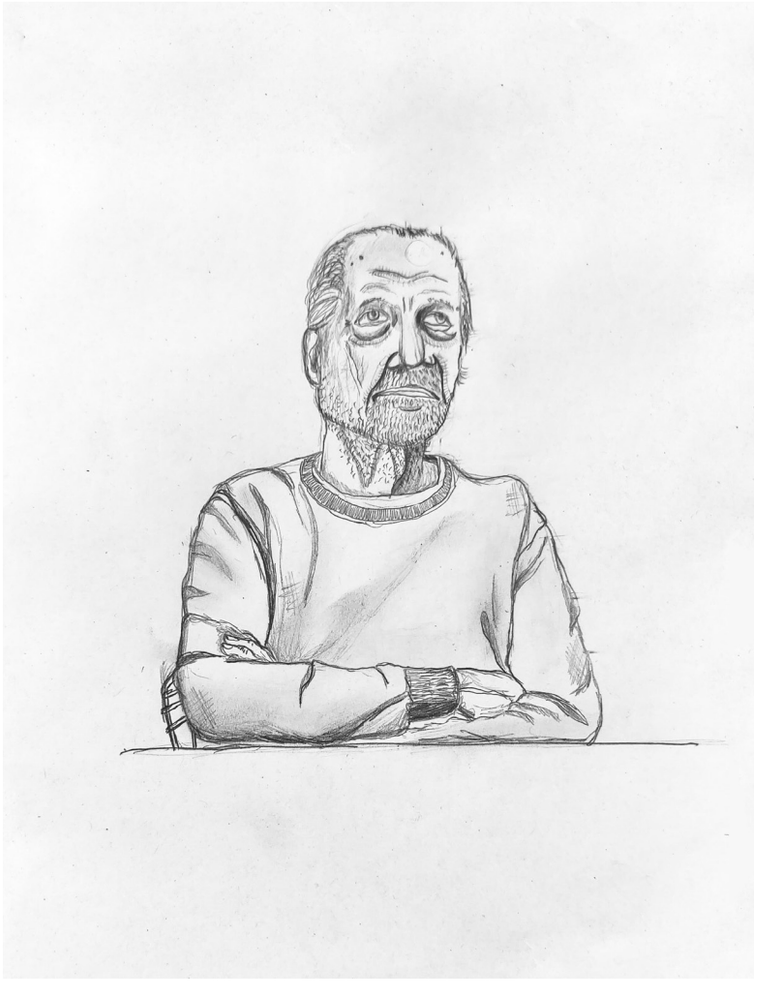
I. And for example the shopping, would there be a way to facilitate it, to transport it, to put the bags in the trunk of the car?

H.K. I don't think that all these aids would help, you just have to make the effort to do it and be willing. It's the same with walking. How many times I don't feel like walking and I want to go for a shorter route. But I know that by not walking as much as I do I would regret it the next day. One has to move.

* Small digression on encounters during the walk *

H.K. It would be very useful to make this window electric.

* Start a new story *



H.K.
Interview
09 August 2023

Case Study.

First Draft.

Alongside theoretical research, it is necessary to carry out a practice-oriented research. This type of research involves collecting case studies, analysing them, and consequently identifying the most authentic and correct path to follow. It should be specified that this path of mine did not have a concrete starting point, as there was only the theory, explored in detail in the previous part of this documentation. The collection of these case studies led me to a categorisation activity. Dividing into more or less tidy categories was useful to give my research different directions that could be explored equally, until I identified the path that would allow me to take the next step.
The first partition was divided into four categories: Transition, Movement, Visibility, Social. Transitional stands for a situation that changes from A to B, for instance, sitting-standing, dark-light, in-out, up-down. Movement stands for grasping, walking, lifting etc.. Visibility, is not only concerning light but also situation in which the ease or difficulty of seeing influences the user both physically and mentally. Finally, social stands for a more psychological and non-discriminatory approach. Following this categorisation, I was able to consider a second division by subject. In this way, I identified four areas that I was interested in exploring. These zones allowed me to explore different problems the user might experience. The distinction was differentiated into Upper body, Lower body, Psychological and Light. It was the latter that triggered the greatest interest in me.
Analysing what the market and other professionals thought needed to be created for the same category of people I was considering, is useful for thinking not only about the objects itself, but it is also necessary for observing what needs were prioritised, thus putting the user in first place.
The following paragraphs will carefully explain the characteristics of the different categories created and briefly analyse some of the most important case studies chosen.

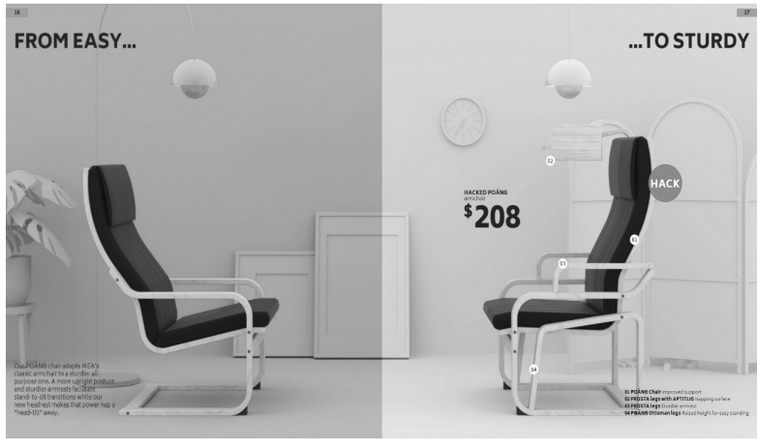
Transition.

Objects representing a transition are the first ones I have considered. Such movements include all those actions that vary from situation A to situation B, where A and B are often opposites. Actions such as sitting down and standing up, walking from a dark to a lighted place, going through a door and moving from an external to an internal place and so on are all excellent examples. These movements are important to consider not only because they are everyday situations that are most often read in a different way and with a common meaning, but primarily because the term transition itself represents something non-static.

HACK CARE by Lien, is a manual inspired by the one published periodically by IKEA, full of tips and tricks on how to hack the Swedish company's products to better serve people with dementia. This example falls into this category because of its change and thus transition, the objects depicted in this guide, from an A situation offered by IKEA, are changed to B, to better serve and adapt to those who may need them.

The ramp is a far from trivial instance. Indeed, it is sometimes the only means for people with disabilities and/or physical difficulties to get around an obstacle such as steps. The ramp is a transitional structure because it allows the user to move between two different floors of different heights in a way that would otherwise be impossible or very complicated.

The transfer board is another example of an anonymous transitional design. If previously, the change between sitting and standing and vice versa was described as a transition, the change between sitting and sitting must also fall into this category for the user who has no possibility of using his or her legs efficiently. The board in fact gives people with an immobilised lower body the possibility of transferring themselves from, for example, a bed to a wheelchair.



HACK CARE
LIEN

Ramp
Anonymous

Transfer board
Anonymous

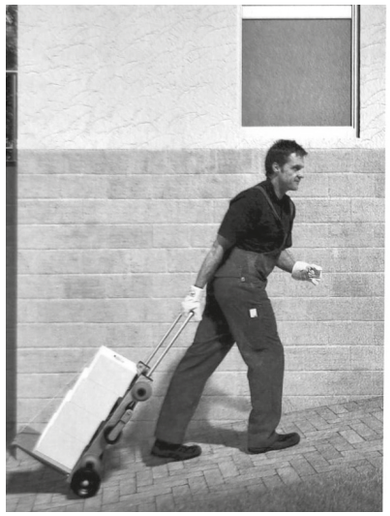
Movement.

The category Movement can also include objects identifiable as transition, but in the following examples I will try to distance them as much as possible by considering more peculiar case studies. Movement includes actions such as lifting and moving objects, grasping objects and of course walking and moving on one's own legs.

PULLMAN 50 is useful for moving loads that are difficult to handle, giving the ability to pull on wheels and lift with a sliding carriage objects that would otherwise be too heavy. This case study is also an excellent example of Universal Design, as it helps different types of users equally. Whether it is a young, athletic person who has to lift a large load or a tired, elderly person who has to lift a shopping bag.

Sausage casing by Gesa Nolte is also a relevant example for movement problems. In fact, it highlights the grip problems that especially affect the fingers and hands of elderly people. Sausage casing is a different and more comfortable way to peel a sausage, dividing it into portions and giving the possibility to close it easily. The user, therefore, benefits not only from a simplification in the use of his or her hands, but also from a simplification in the movements made before, during and after eating.

The walker is another case study of a more or less anonymous design. Although there are several variants on the market, which differ not only in their aesthetics but also in their functions, its main duty is to assist people with motor difficulties in walking. What object better than a walker could therefore fit into the movement category.



PULLMAN 50
Martin Hauenstein

Sausage casing
Gesa Nolte

Walker
Anonymous

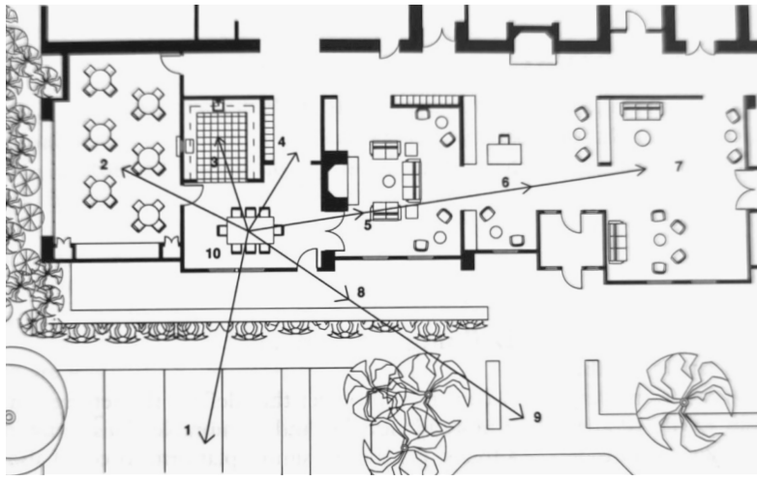
Visibility.

Visibility is the category that encompasses problems and respective solutions concerning light and the general sense of security that sight can provide. This, therefore, means that not only lighting systems were taken into consideration, but also objects and situations of various kinds.

An example of this is The 100% Corner. Taken from the book ‘Design for Assisted Living’ (Victor Regnier & FAIA, 2002), the 100% corner is a situation in which from a specific point at which you stand in a place, the possibility of having a 360-degree view of your surroundings conveys safety and well-being, especially for an older person who may have their senses slightly dulled.

MAYDAY is a lamp designed by Konstantin Grcic. This lamp breaks away from the canonical types of lighting because it can be used in different situations and different places. This is not only because of the convenient hook and long cable, but also because of different types of grips that enable the user to use it as a pocket torch, for instance. In addition, it has a simple and intuitive design, which is essential not only for a good product, but especially for a product made for a user who has difficulty adapting to the new as an elderly person may be.

M-Smart Jumbo is a simple wall switch. Its particularity is its size. This peculiarity is also the reason why it is included in this collection of case studies, as it is an accessible button, easy to use and, above all, easy to locate in poor visual conditions.



100% corner
Anonymous

Mayday
Konstantin Grcic

M-Smart Jumbo
Merten

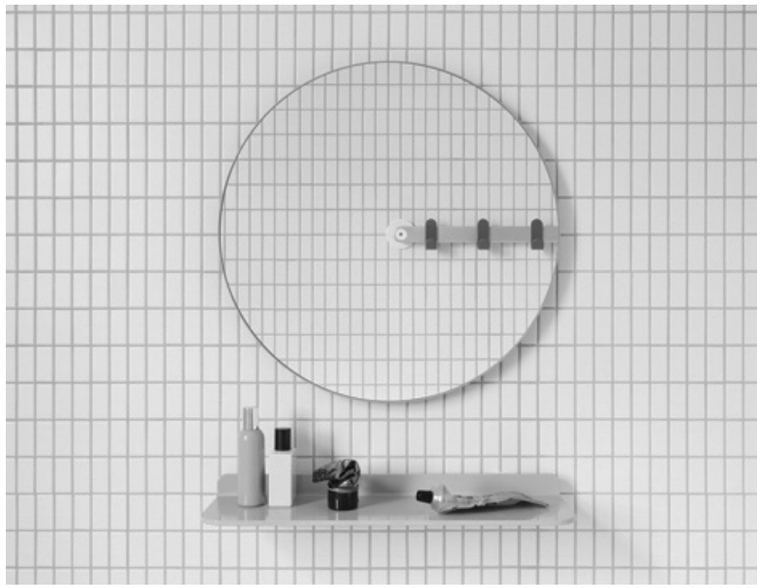
Social.

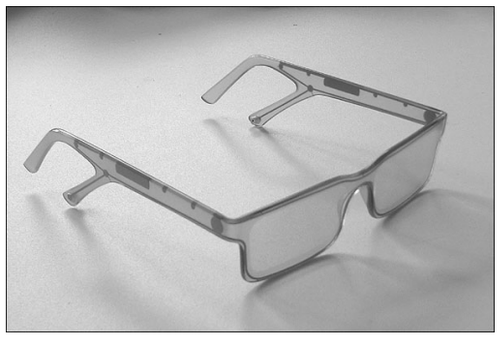
The social category is relevant to all those objects that improve the social sphere of the user, restoring pride that may have been lost with the loss of certain faculties. During old age, in fact, with the loss of independence, the person may feel uncomfortable in the position they are in.

Savi Space is a combination of a simple and non-invasive installations and contemporary colours and clean lines, which has as a result a product line that is intended to attract young and old users. This promotes a high level of inclusivity and autonomy by giving the user the possibility to manage a private sphere of their home, such as the bathroom, independently thanks to the ease of installation.

Surround sound are eyewear that incorporate acoustic devices in their arms that allow the user to receive sound from the side in which the gaze is directed. This type of glasses allows the user to hide any hearing aids in an elegant and sober manner and thus not have to feel uncomfortable with other people about their disability.

Alvise coffee table is part of a set of furniture, which reintroduces into the life of the elderly user a component of life that is often forgotten in their old age. Indeed, it is common for an elderly person to suffer from loneliness and social distance, and this table is the perfect example of this.

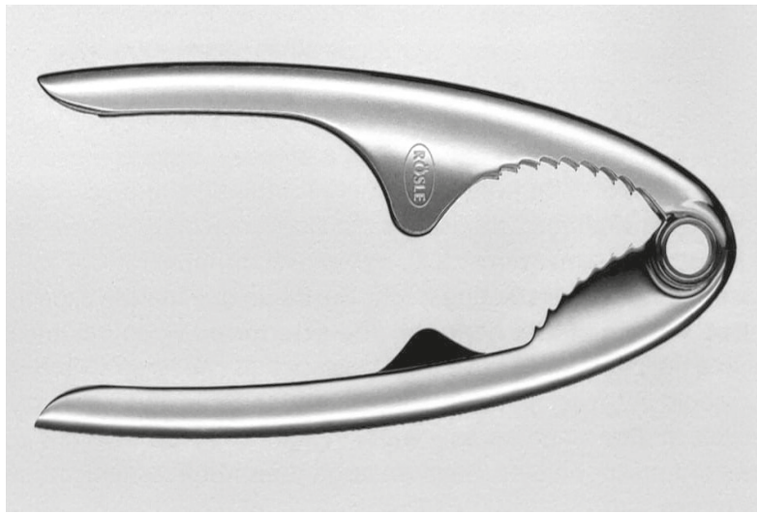


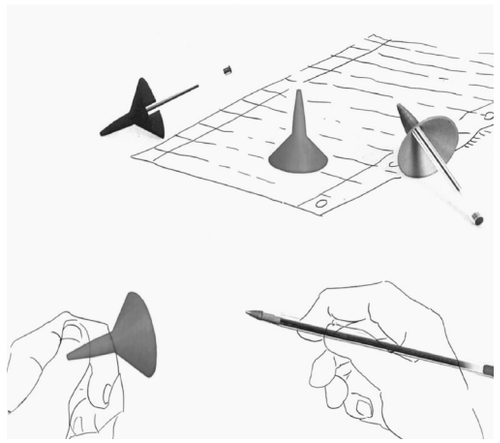


Sabi Space
MAP

Surround sound
Industrial Facility

Alvise coffee table
Elena Tamburini

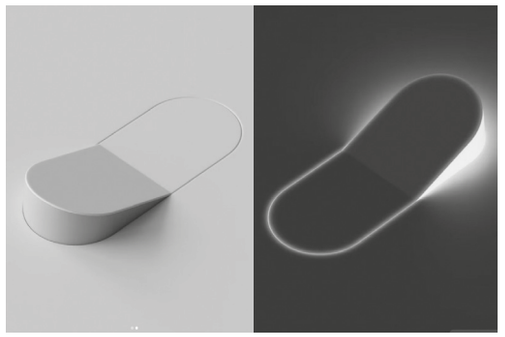




Sociopetal space
Anonymous

Lotte chair
Sarah Hossli

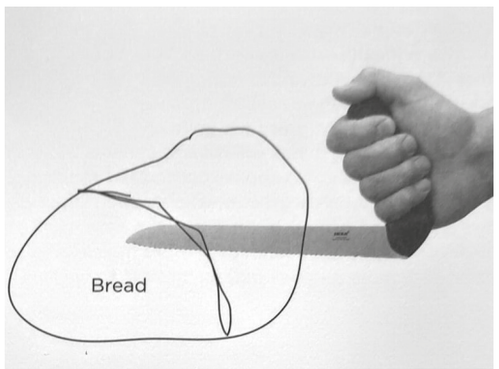
Donut
S.Graiaa, E.Malacarne,
G.Massacesi



Nutcracker
Rösle

Handy
Brian Sironi

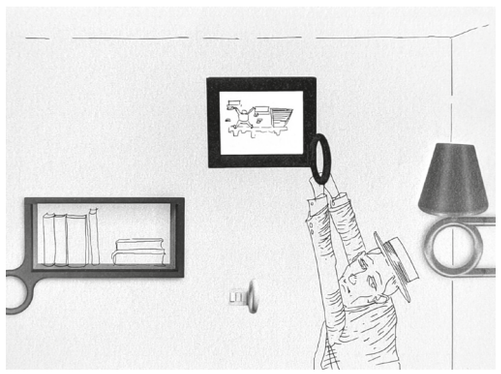
Switch
Benjamin Fryc



365
Ergonomidesign IKEA

Cane holder
Anonymous

Nobi
Nobi



Cane
Omhu

Ultra Latch
Door Knob

Handle for you
TheFabLab (C.Larcher)

The following four categories represent the second subdivision, in key points, after the analysis of the different case studies.

Upper Body.

Grip
Differences in materials such as differences in texture or softness/ stiffness of the grip area, can influence grip efficiency.

Holding position
The grip position influences the effectiveness of the grip. Some objects are better held horizontally or vertically or in a third position.

Strength & weight
These two aspects are very much related to each other especially for elderly users. The two characteristics influence fatigue and so as well as ease/difficulty of use.

Accessibility for optional
Switches, knobs, inscriptions, instructions, detachable parts, compartments and everything identifiable as necessary but not in all cases indispensable, must be easy to locate and use.

Lower Body.

Obstacles
The feet must be free of impediments, whether related to clothing or objects that may hinder the movement of the lower body. The road travelled must also be clear and as safe as possible.

Linearity
Referring to even pavement, firm supports and in general a path that is easy to walk on.

Balance
Referring primarily to the agility of the lower part of the body, echoing the first point (obstacles). The upper part must also be free of impediments, objects carried must not affect the user's balance (weight, size, manoeuvrability etc.).

Psychological.

Familiarity
A place, object, movement or action should be made familiar in order to facilitate use and limit possible problems. In addition, familiarity increases the user's desire to use a particular place or object.

Routine
It is important to favour a routine, not only to facilitate use but above all so that the user does not lose the desire to use it. The user must be stimulated.

Light.

Light colour
Warmer tones and more conventional lights, such as incandescent bulbs, have more of a yellow or red hue, and often feel darker, while cooler light is perceived as brighter. Bright, cool lights can feel harsh, especially at night.

Task lighting
Task lighting refers to specialized, focused lighting that makes it easier to perform certain activities.

Accesible lights controls
How accessible are the light switches around one's home?
Motion-activated-lights in important areas.

Night lights
Illuminated paths or reference points.

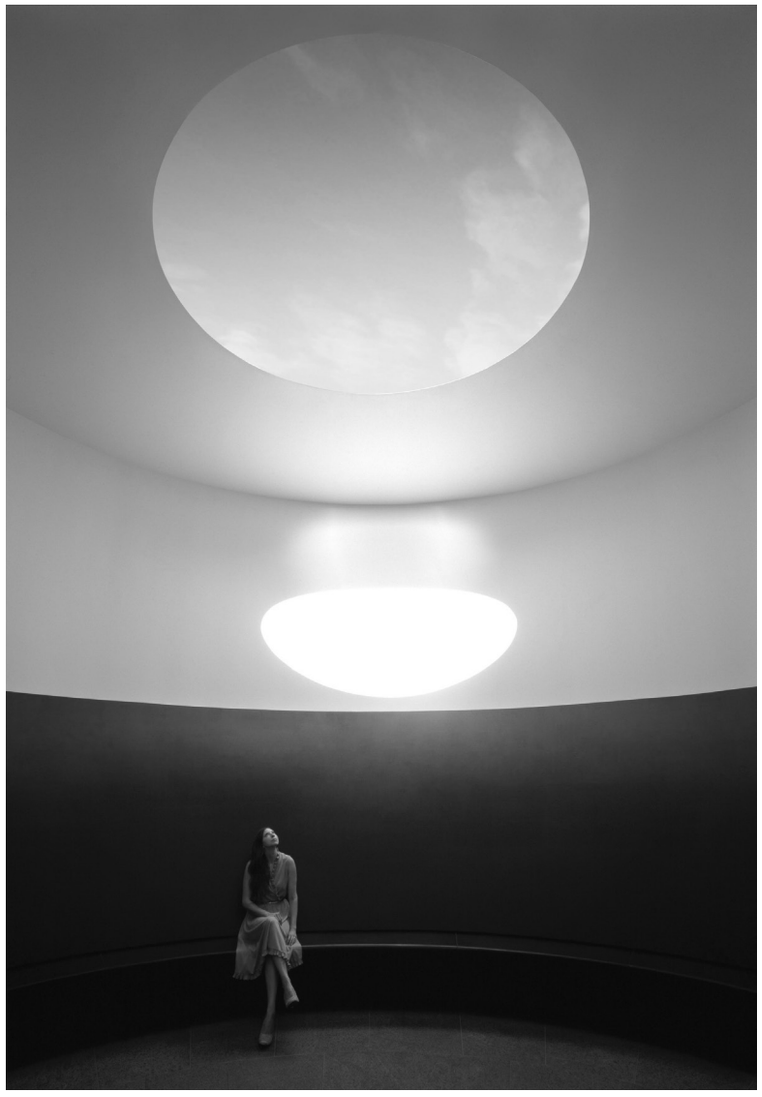
Diffuse light
Sharp lights create strong shadows: Sharp lights are helpful if directed or used in specific tasks, but not for the lightning of spaces.

Moveable/Fixed:
1) Can be moved and carried around, can light the way when moving.
2) It has a fixed location, which prevents it from being lost or left lying around, it has its own task and does not confuse the user.

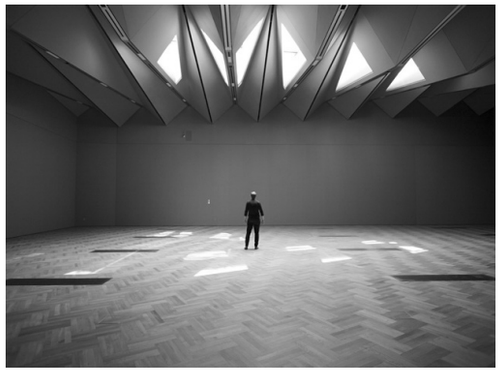
Cable
Can be an obstruction, especially if it is designed to be moved (see eg. Mayday lamp). It prevents batteries from draining and the often frustrating recharging ritual.

Investigation on light.

The subject of light is covered by several branches, and is so vast that it is impossible to explore it completely. Light is a fundamental aspect of anyone's daily life. It has the capacity to be not only physical but also emotional. Poor lighting or poorly designed lighting could become an obstacle for people with visual impairments and/or motor problems.
Lighting is such an important topic that it is easier to talk about atmosphere Light instead of Light. This term is used to describe the set of emotions, feelings, tones and vibrations surrounding a given situation or context, going beyond objective or material aspects. Atmospheres can be created through the use of elements such as music, lighting, colours, dialogue and setting. These factors help to shape the overall experience and convey a certain mood or specific emotion to viewers or participants. In summary, the concept of atmosphere in the non-physical sense refers to the feelings and emotions that a given environment or context evokes, going beyond tangible aspects and influencing the way people perceive and interact with that context.
Think of the sky: 'The Atmosphere'. How much a certain type of lighting can affect our day and our life. The sun most often gives a positive, warm and peaceful feeling. A gloomy sky, on the other hand, can trigger negative emotions. This is the most telling example of what the word atmosphere means and probably also the derivation of the word itself and its meaning. This is also a quite interesting starting point for the development of an idea.



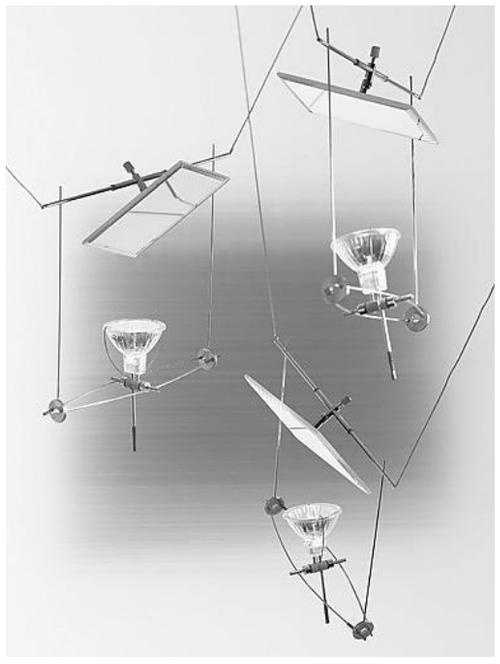
The Color Inside
James Turrell



YaYaho
Ingo Maurer

16.480
Bocci studio

Shade
Simon Heijdens



Sonnenenergie 22
Olafur Eliasson

YaYaho Element 2
Ingo Maurer

Light Case Study.

Light is accordingly a subject touched upon by the most varied categories of designers. On the previous pages you can see examples of architects, designers and artists who have used light in their projects in a distinctive way. For example, James Turrell uses natural light to play with space and atmosphere in closed and open spaces. Olafur Eliasson's Sonnenenergie 22 also works with natural light and its reflections to illuminate large public spaces. Then there are real products such as Ingo Maurer's YaYaho collection that use artificial light in fully customisable lighting systems to illuminate certain points and corners of a private place or not. Another example of an architect making use of natural light is Simon Heijdens, who uses skylights positioned at different angles to illuminate a large room, creating a pleasant play of light. Light can also have an atmospheric impact outdoors, using artificial light as Bocci studio does in its projects. One example is 16,480, a light installation in Vancouver. These projects, however impactful they may be from an atmospheric and therefore visual point of view, take an almost artistic direction, almost becoming true installations.

So where would we need to orient ourselves towards more 'democratic' lighting systems? The market today offers an uncountable number of lighting systems, ranging from indoor lights to outdoor lights, from fixed lights to movable lights. In this regard, this study of light and its sources began with a collection of different case studies that could be of relevance to this project. For instance, work lights, which can be clamped or positioned in different ways while working in large and chaotic spaces, such as in a workshop, lights that do not need to be carried such as head lamps, which can move depending on where you direct your gaze, or even compact lights that can be defined as task lights that can be clamped in different places depending on the activity being performed so as to optimise the lighting.

The choice is truly vast and it is interesting to note that most of these examples fall into the category of anonymous design, i.e. they are so much in demand and therefore produced and reproduced that they lose their own name and acquire popularity among the masses.

An example of this type are also camping lamps. Certainly different brands and manufacturers customise their products, with different shapes and colours, but their aesthetics always remain

Head Lamp
Anonymous

Working Lamp
Anonymous

Portable Clamp Light
Anonymous

very similar. These types of lighting are interesting for their portability and ease of use, often solar-powered and almost immortal. New technologies also have an impressive impact in the lighting industry, with the introduction of LED and more recently of intelligent and autonomous control systems, large industries such as Philips have decided to exploit these opportunities. An example of this are all the lamps and bulbs that are part of the large HUE family, which are nothing but fixed or portable lamps, equipped with intelligent bulbs that can adapt to different situations with colours and intensities.
Mobility and ease of use are therefore important factors, especially when we are talking about elderly users, who do not have easier access to new lighting systems and technologies.

Camping Lantern
Anonymous

HUE go
Philips

QUASAR
Samy Rio
(Petite Friture)

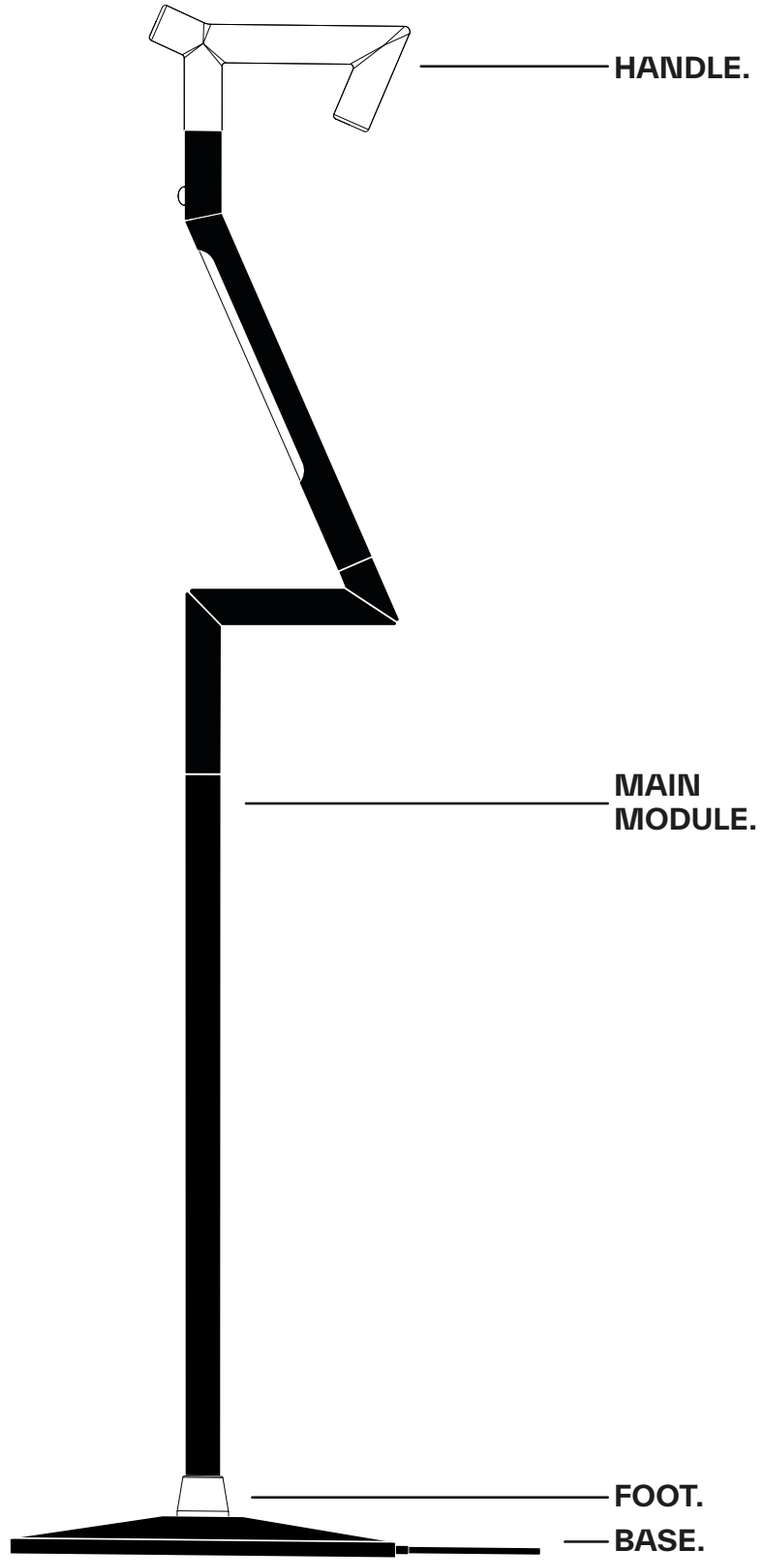
Research Considerations.

I have found myself in a place far from my starting point. The research opened up a path that I originally followed very thoroughly, only to end up on the same path, but in a direction that could no longer be easily traced back to the starting point. Therefore, I had to take a few steps back and find an anchor point to achieve what I had set as my goal: to help the elderly population and their general physical problems through design.
My current research has found the topic of light as a new starting point. It is indeed relevant to the elderly, as it is an excellent aid in situations of poor visibility, which is indispensable for “normal” people, but it is even more important for people with visual impairments. Nevertheless, as I said above, this direction has proven to be slightly dangerous when it comes to achieving a goal. I have found myself in the situation of designing and planning very general lights and lighting systems that deviated from my long preliminary research.
Therefore, I came up with the idea of analysing something that in some way represents the population group I want to help. The walking stick is an object that can very easily be classified in this category. Its main function is to support the user in walking, while helping in standing moments and in the transition between standing and sitting positions. The walking stick is indispensable for some users and makes permanent use of at least one of the user’s hands in the actions described above. There are also different types of walking sticks with different handles, each with different functions and features. It is in itself a simple and functional object, but it can change drastically with small changes.
Back to the subject of light: I tend to divide light into two categories, fixed and movable. The former can also be defined as ambient light and usually illuminates an entire area, such as a room. Its essence is to create favourable conditions for general movement, but can be less effective in some situations by creating unwanted shadows and areas of poor visibility. It should also be added that switching these light sources both on and off is done almost exclusively through the use of switches, which are also placed in fixed locations around the room, sometimes even in inconvenient places.

Movable lights, on the other hand, are those that support us in a more direct and personal way. A torch, a lantern, for instance, they are there to illuminate specific points of interest to us while we are walking or doing certain less generic actions. These, like walking sticks, take up a hand in most cases. This being the case, a person X would have one hand occupied and a perfect view of what is in front of and around him/her. However, a person who is dependent on a walking stick finds him/herself in the situation where both hands are occupied, in situations where, especially for this category, a second handhold could be essential.
Hence, this process has as its basis the hybridisation of a stick and a light, yet it does not intend to stop there, as it is possible to have a more or less dull result. It is a good rule to try to widen one’s gaze, and try to analyse different problems, or rather needs, in such a way that, without falling into the trap of the all-in-one, one can design a concept that has more than one face. This is why I believe it is essential to implement a modular system, which allows the user to use the object, which he is forced to have always or often next to him, in different situations.

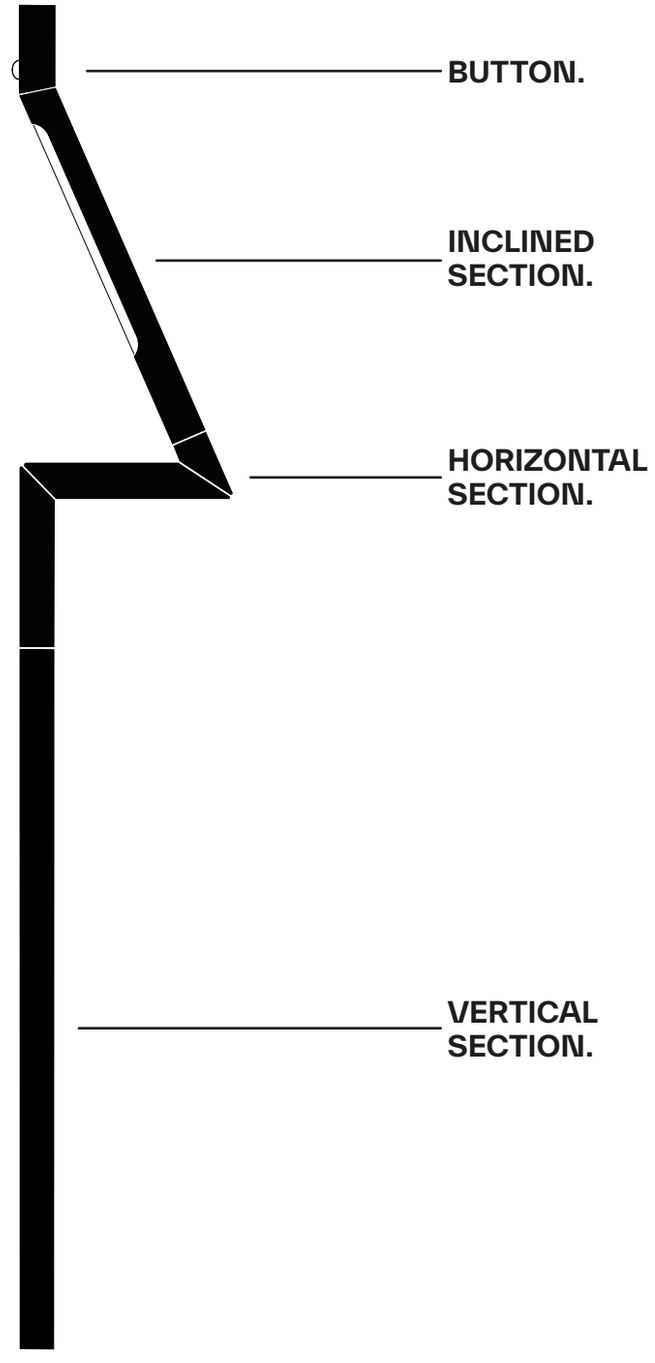
Concept.

This concept is my response to one of the many possible ways of helping an elderly person with motor difficulties. It consists of several components that classify it as a cane but want to confer on it characteristics and motivations that are different from the ordinary.
The cane consists of an aluminium main module, designed for industrial production. This section is the heart of the stick, being not only the largest but also the structurally most important part, besides the fact that it is indeed the part that gives an identity to the entire stick due to its shape and peculiar light.
To this module, different types of handles can be attached at the very top. The design provided here features three shapes, with a simple and linear aesthetic, which can be changed if necessary with handles produced by specialised manufacturers for maximum comfort, giving the handle an ideal level of ergonomics for the individual user.
Furthermore, a rubber foot is attached to the main module, which simply and securely wraps around the end of the cane. Several additional terminals can be added to the foot, through a simple interlocking mechanism, each designed for a different use.
Finally, a base has been created. This base has the straightforward task, apart from being a resting place for the stick when not in use, of recharging the light in the main module.



Body.

The main module, as described earlier, is the heart of the stick. It can be divided into two parts, the first consisting of a simple tube that is cut to fit the user's physical structure, while the second is represented by a tube with an angular profile. This shape, in addition to being a hallmark of the object, has several practical functions. The first refers to the section inclined at an angle of 66°. As this is the section housing the light source, its function is to direct the light beam in a downward direction so that it is not dispersed in non-essential points and does not cause discomfort to the user. The second, referring to the horizontal section, is primarily intended to be a second handhold when standing up or sitting down. Secondly, it proves to be an excellent foothold for the cane, on the edges of flat surfaces such as tables and shelves or the backs of seats.
This module is also the host structure for the electrical circuit that powers the LEDs featured here. The entire circuit is distributed at strategic points in the cavity of the stick so as not to compromise the weight and balance of the object. The latter are essential both for walking, and the ease of using the cane as an auxiliary object in walking, and for allowing the cane to be rested properly and effortlessly on both the base and the above-mentioned surfaces.



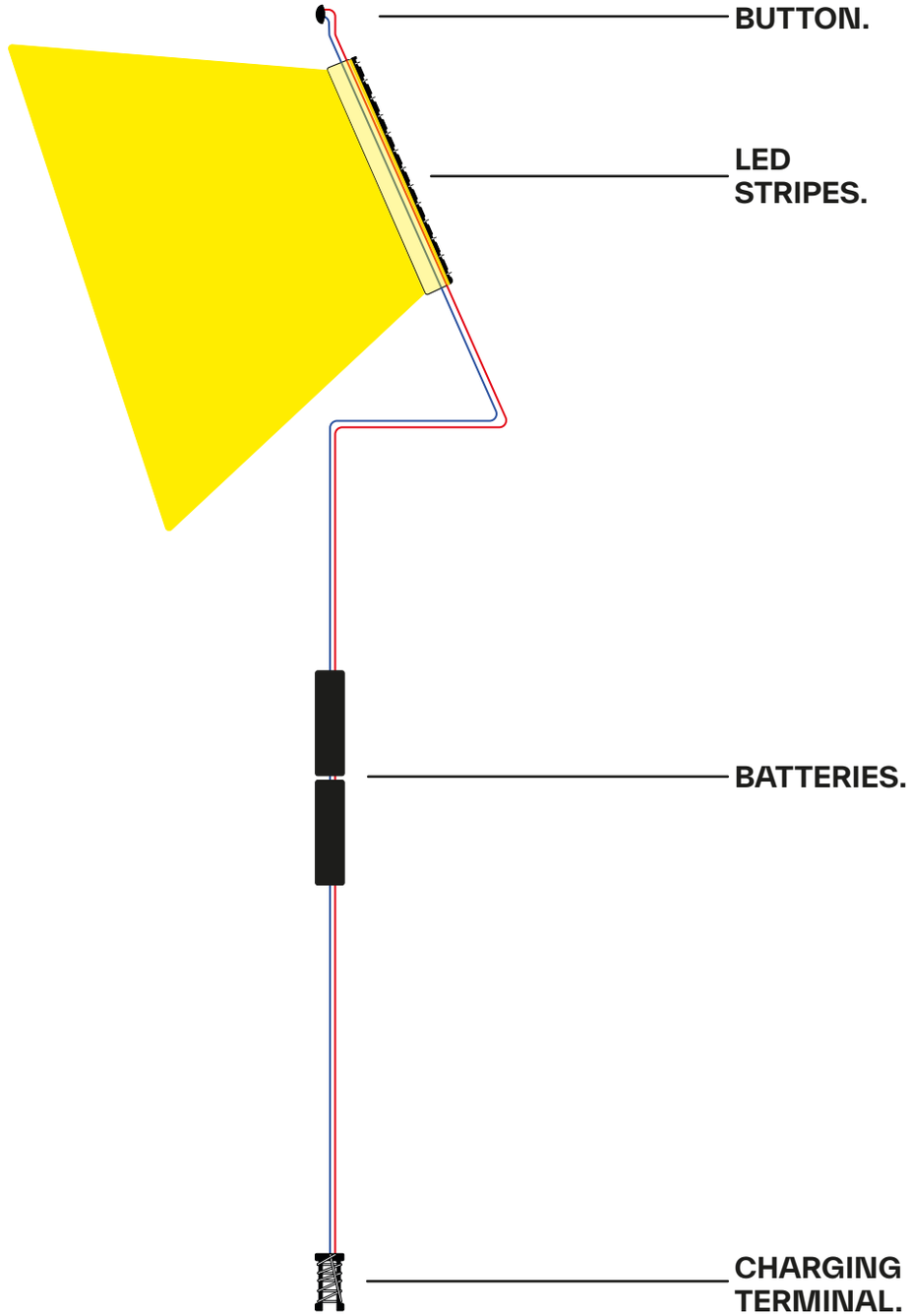
Light .

Light is certainly an integral part of this project. It is in fact the starting point of this research. As already described in this documentation, light is essential for everyone, all the more so for the elderly who may suffer from visual impairments and/or physical problems of various kinds which make their movement particularly difficult in dark places. Implementing a light in a cane is therefore the easiest way to get around the problem of moving and at the same time having to keep a hand occupied with something to light the way. Furthermore, because of the way the stick is designed, the light used here becomes an excellent light source for performing even static actions, especially thanks to the implementation of the base, part of which will be discussed on the following pages.

The light is angled downwards. This decision followed the construction of several prototypes that directed or accommodated the light and its source in different ways. In fact, it was noted that light originating at a lower position generates shadows that are projected upwards, thus optically distorting the position of objects, especially dark ones. It is therefore clear that the light must be located in a fairly high area. In answer to the question of why it was angled downwards, it was noted that the light must first illuminate the path and then the ground with its possible obstacles. If the light is horizontal or even worse inclined upwards, a large part of the illumination is dispersed into the surroundings, in addition to the potential to create reflection discomfort for the user.

The light is provided by COB LED strips. These specific LED types are one of the most advanced technologies in lighting today. They offer an extraordinary level of brightness with an equally extraordinary efficiency in heat dissipation and durability. What's more, the light beam has a radius of more than 160°, and when used in an LED strip, the light will come not from individual luminous dots, but from a continuous line running across the entire length of the strip.

As described before, the LEDs are powered by a concealed circuit located within the cane that terminates at the foot where the charging terminal is located, which will also be explained in the following pages.



Handle.

The handle in a stick is often what defines the object. This is the part of the stick that guides the user in choosing the right item for him or herself. They vary in shape and material, carefully selected for the intended use. The existence of straight handles that provide greater stability, custom handles designed for a single hand, handles designed for long walks or even handles designed for specific activities shows that the choice is truly vast.

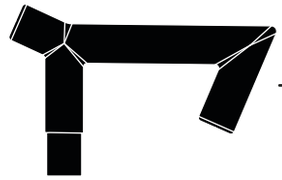
This design implements three types of handle: a straight handle, a walking handle and a crutch handle. These three handles follow a simple design, coordinated with the shapes and angles of the cane. Although they were designed with comfort in mind, they were not conceived with a desire to prioritise ergonomics. In fact, it is important to note that they are secondary to the main module. It is therefore possible to leave the design of more precise shapes and grips to the specialised sectors, which can then be implemented through a simple interlocking mechanism to the main module of the cane.

The first handle, with a straight shape, is categorised in the Fritz or Derby type, used to give greater stability than the classic curved handles (Tourist) and promote a more natural and comfortable grip. In addition, it has an atypical bend for these types of handles, implemented to give the possibility of being hung, an extremely useful feature when combined with the light in the stick.

The second handle, for walking, is vertical, with a slight angle at the end. This handle is inspired by classic walking and trekking sticks. It therefore has a more sporting orientation that puts stability in second place by raising the grip a few centimetres and allowing the wrist a more natural position in relation to the pole.

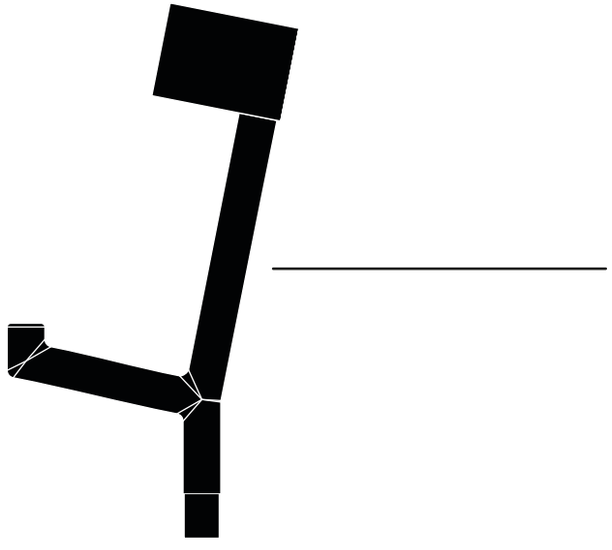
The third handle follows the canonical shape of a crutch. It is in fact designed for users who have suffered injuries or who need to place more support on the cane itself.

The three handles can then be customised as desired to improve grip. For instance, the application of a padded band like the one used in the cycling world significantly softens the grip.



STRAIGHT HANDLE.

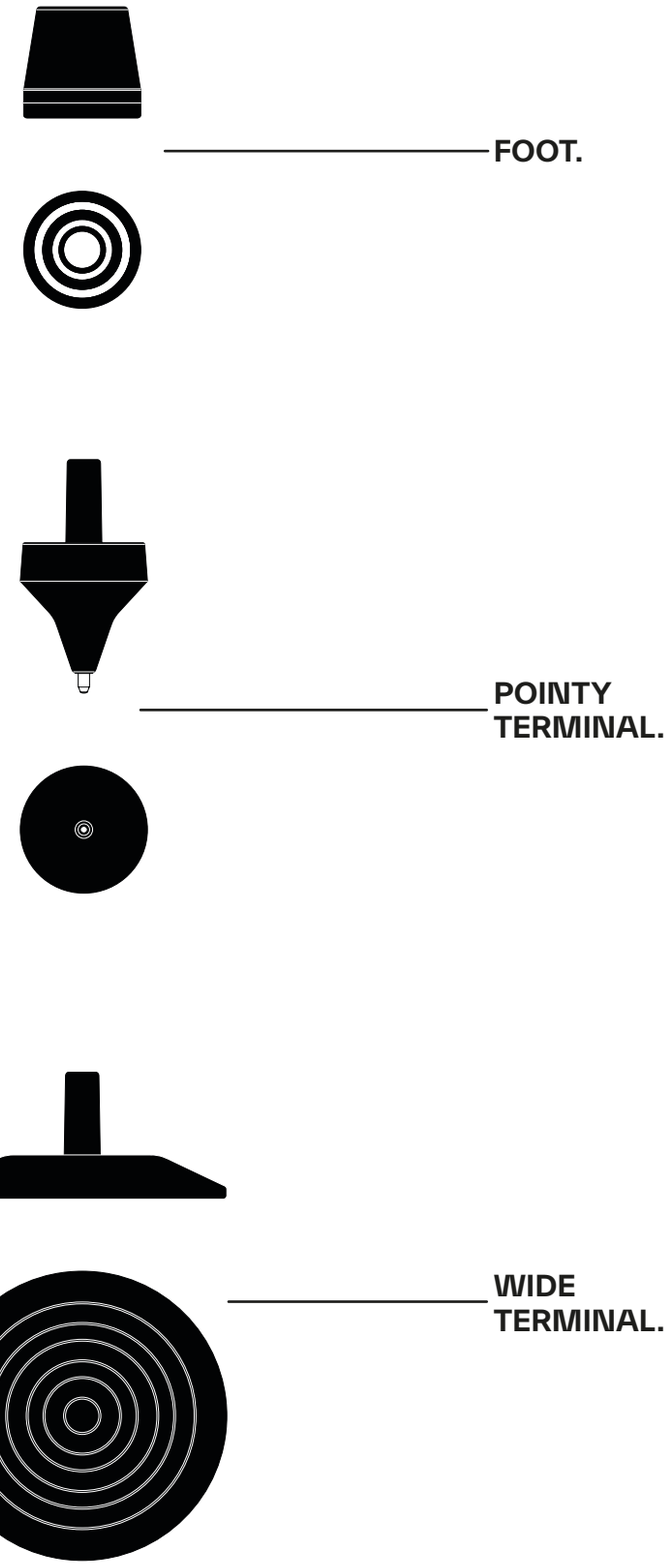
WALKING HANDLE.



CRUTCH HANDLE.

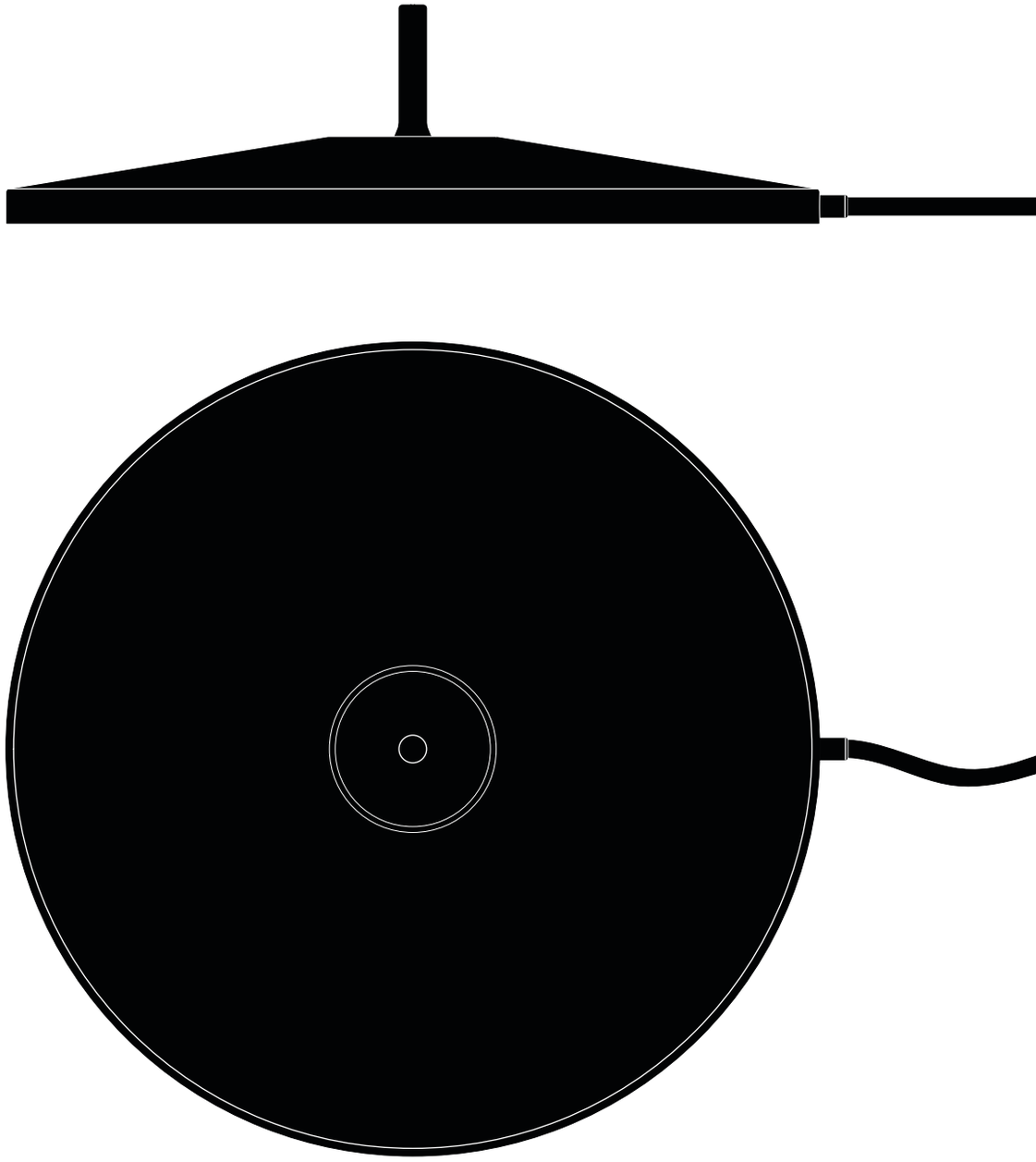
Foot.

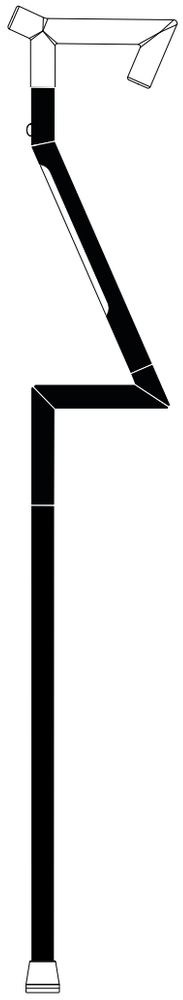
The foot of the stick is the area where contact between the ground and the stick occurs. It is important that it is stable and absorbs the vibrations of the shocks from every time it touches the ground with every step.
This foot is designed to be made of soft material so that it adheres firmly to the walls of the stick. The bottom is made of raised concentric circles to give maximum grip and stability no matter how it touches the ground.
An important feature is the central hole. This hole, in addition to being designed to accommodate the base, which also acts as a charging point for the light, is also used to accommodate different types of tips. In fact, there are already tips on the market that are designed for different terrains and uses, such as thin, pointed tips for earth or wide, flat tips for surfaces such as snow.
Here too, the design choice is not intended to be ergonomic, but an example of different types of terminals that can be used. In fact, their application is simple, where with a shape that follows the curves of the foot and fits firmly into the central hole, any type of terminal can be created. Remarkably, especially for this case, the use of 3D printing can be an incredibly valid choice, thus leaving the user or whoever for him or her the possibility of creating customised tips for every need.



Base.

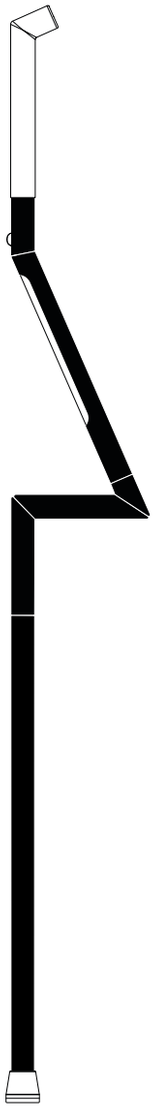
The base has a great communicative purpose in this project. Its task is to be a charging point for the light implemented in the stick as well as a place to store the stick when not in use. This last function gives the stick a second use. The base can in fact be placed wherever one prefers in one's home, but depending on the location, the meaning of the object is altered. Placing the base at the entrance, for instance, if the user only requires the stick when walking outside, the base plays a role similar to that of an umbrella stand, of storage. If, on the other hand, the base is placed next to a seat, such as an armchair, it has the power to transform the cane into a useful lamp for actions such as reading.
The base is easily attached to the stick, thanks to the central pin that fits inside the hole that runs through the stick and the foot of the stick. This method is designed to implement an induction charging mechanism. In fact, there are copper windings in both the pin of the foot and the hole in the stick that connect the circuit inside the stick to the household current. The same mechanism is used in many household appliances and utensils, such as modern mobile electric toothbrushes.
The base is designed to have a pleasant and minimal visual impact, while retaining the stability needed to support the pole. In addition, the hole and pin are designed for easy insertion, thanks to conical and bevelled shapes.





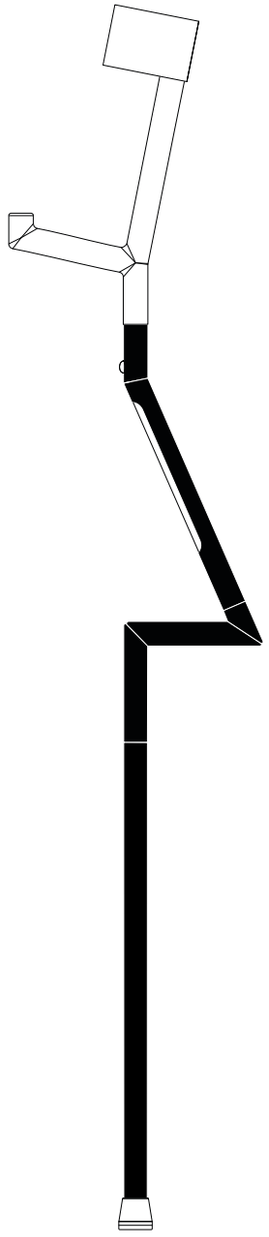
Straight handle.

Normal foot.



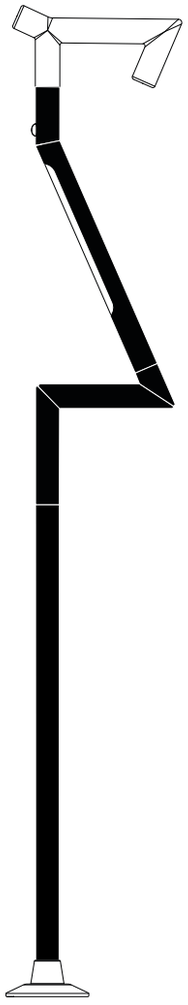
Walking handle.

Normal foot.



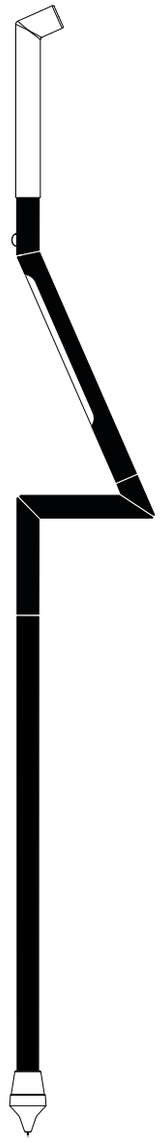
Crutch handle.

Normal foot.



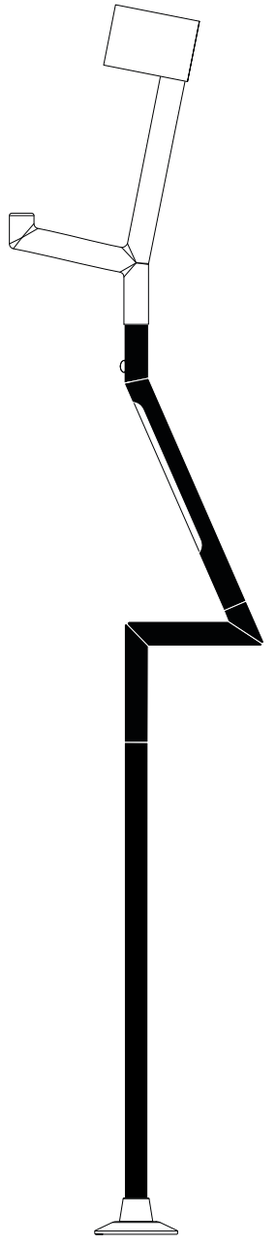
Straight handle.

Wide terminal.



Walking handle.

Pointy terminal.



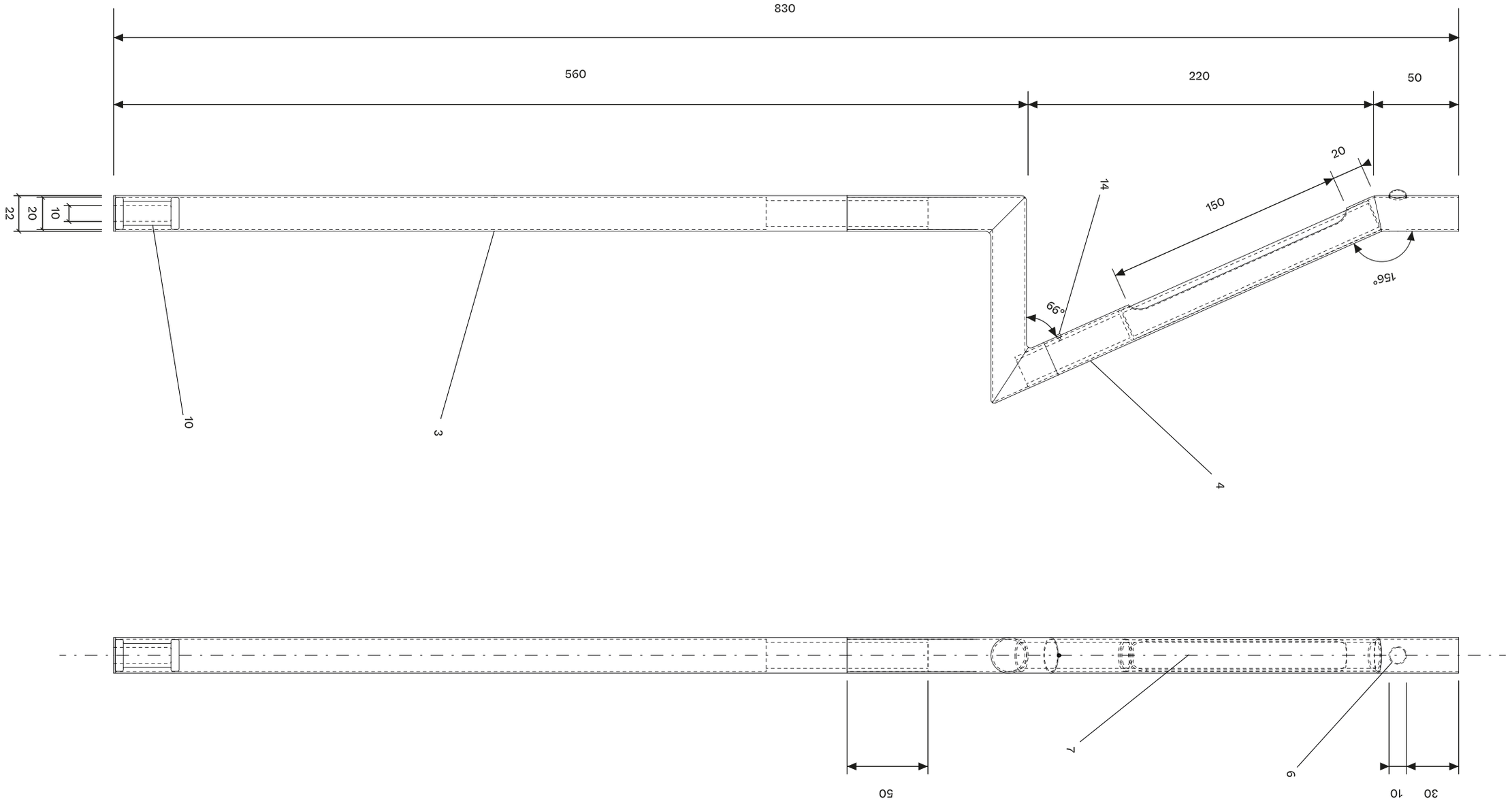
Crutch handle.

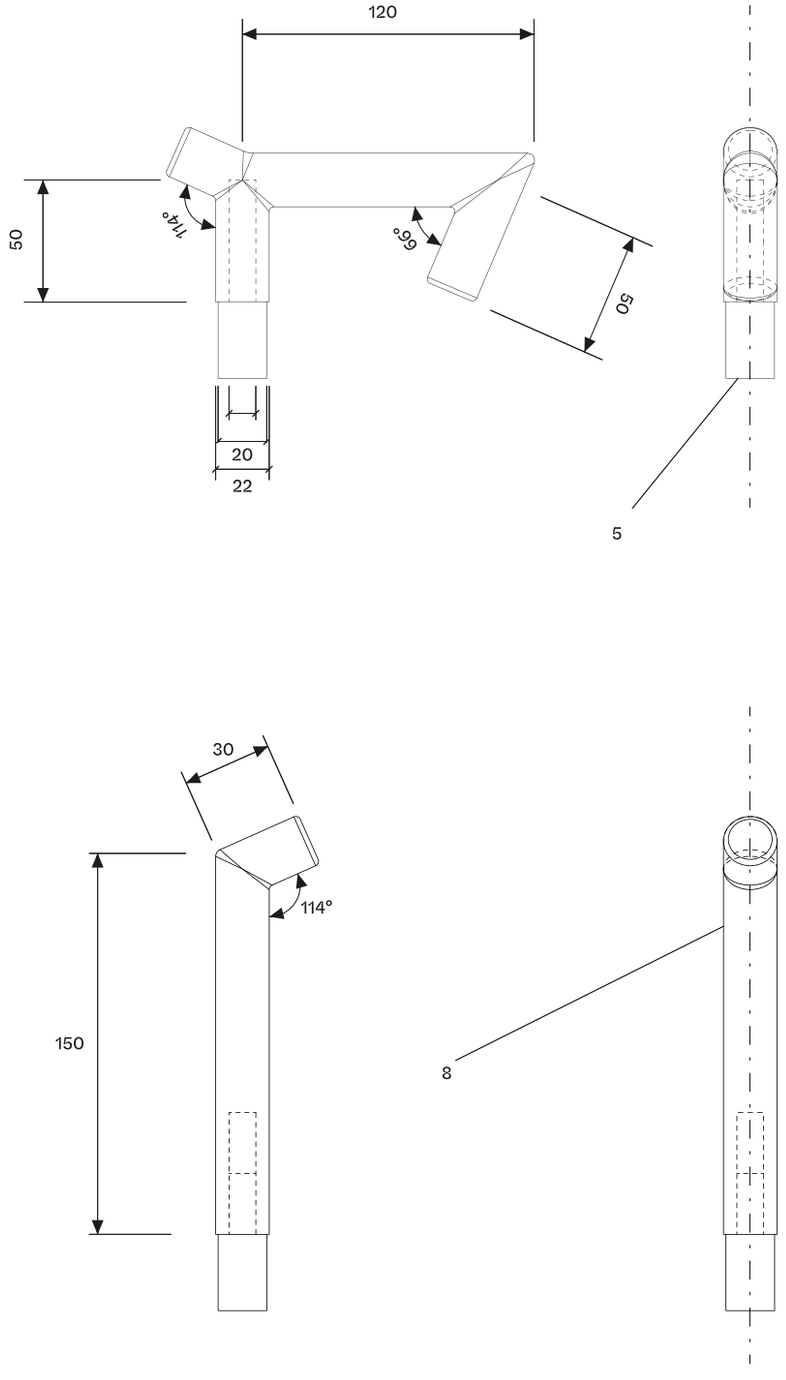
Wide terminal.

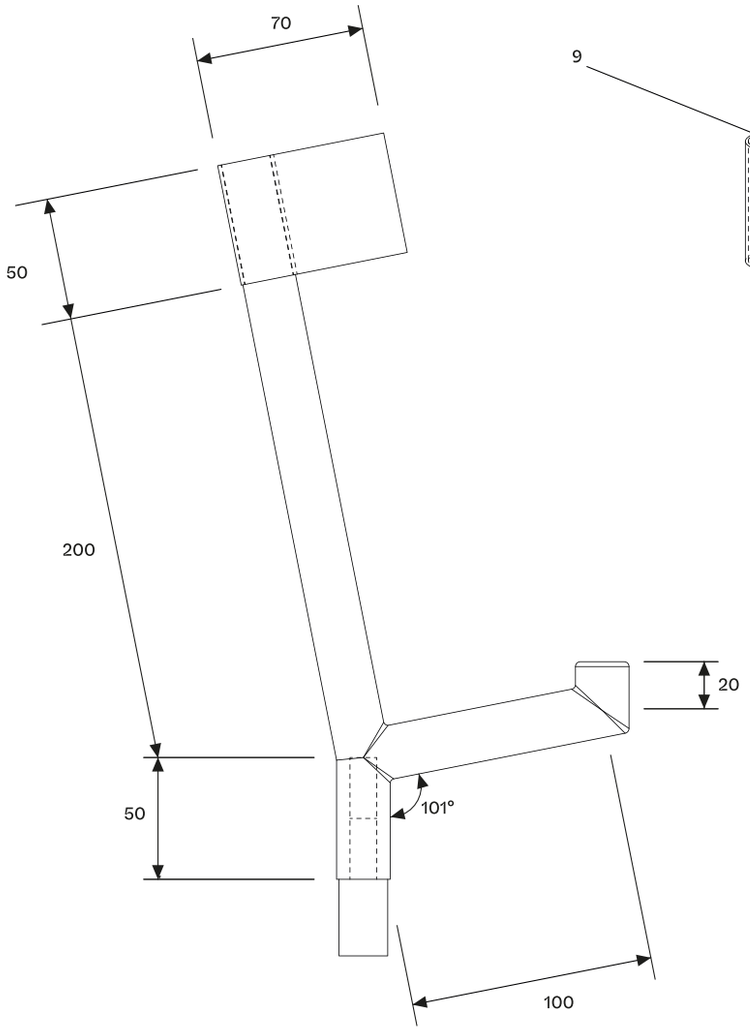
Techincal Drawings.

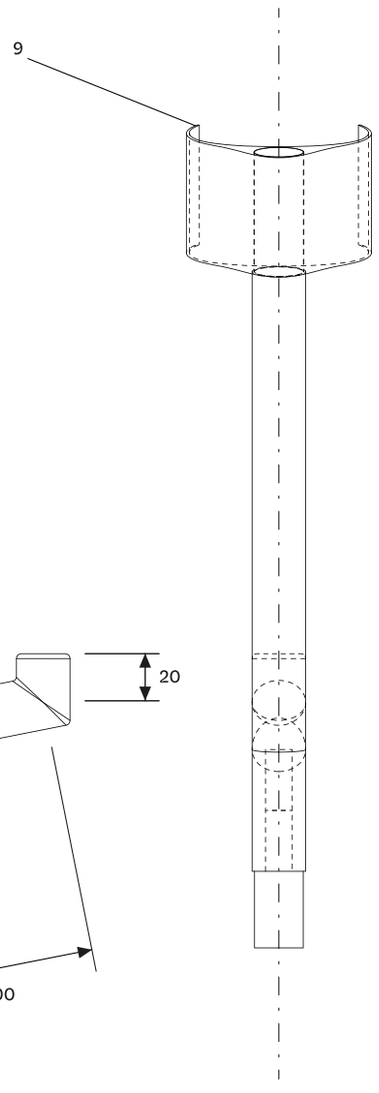
The following pages provide a deconstruction of the tables relating to the technical drawings. It must be noted that they are not meant to be lay out in the documentation but are meant to be a document apart, useful for communication between the designer and the fabricator. A legend listing the different components and their information appears below. All components were numbered for maximum comprehension.

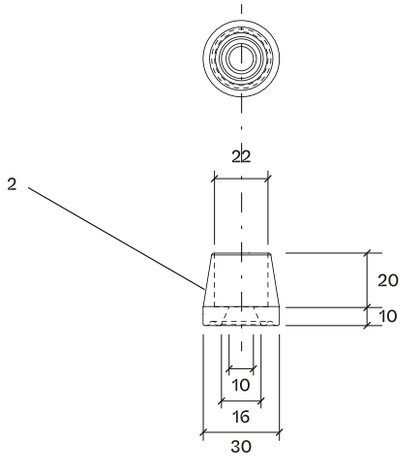
14	Screw	Steal	Units	mm
13	Pointy term. Tip	Steal		
12	Pointy terminal	TPU	Scale	1 : 3
11	Wide terminal	TPU		
10	Charge insert	TPU	Project	BASTO
9	Crutch handle	PLA		
8	Walking handle	PLA	Created by	David Dell'Anna
7	Diffuser	Acrylic glass		
6	Button	Silicone		
5	Sraight handle	PLA		
4	Main module 2	Aluminium		
3	Main module 1	Aluminium		
2	Foot	TPU		
1	Base	PLA		
Item	Name	Material		


830
560
220
50
22
20
10
20
150
14
99°
156°
10
3
4
7
6
50
30
10

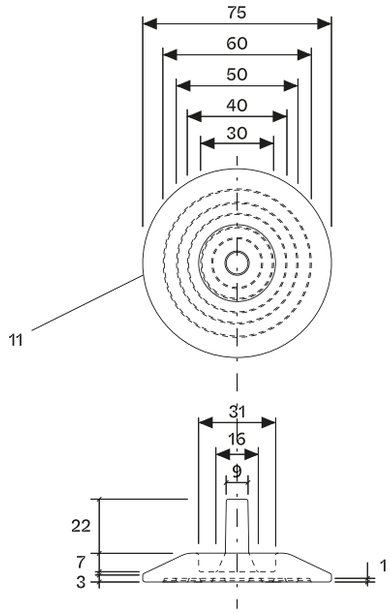

120
50
114°
66°
50
20
22
5
30
114°
150
8

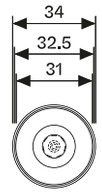

70
50
200
20
101°
50
100

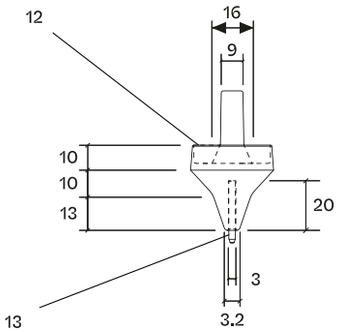

9

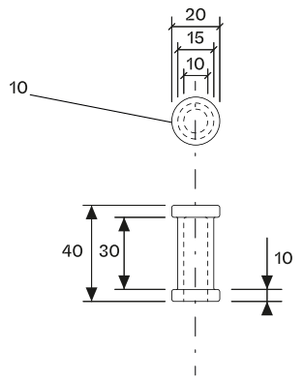

22
2
20
10
10
16
30

38
15
10
1
9
50
230

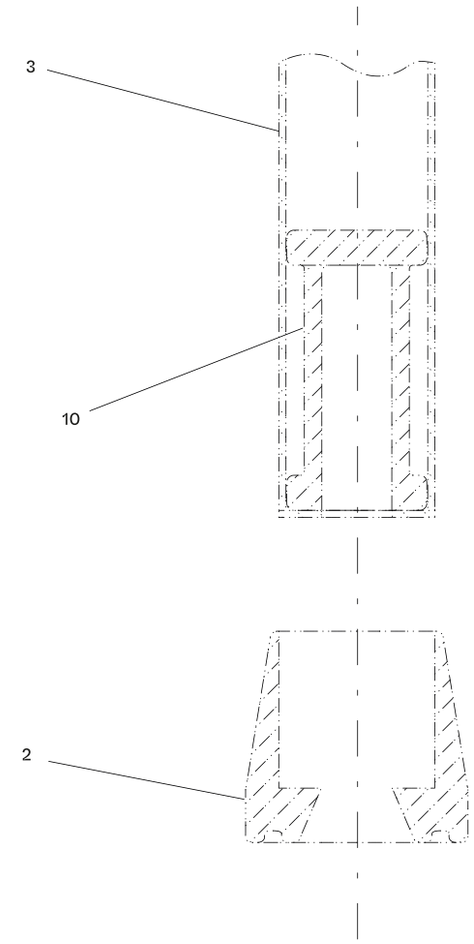

75
60
50
40
30
11
31
15
9
22
7
3
1

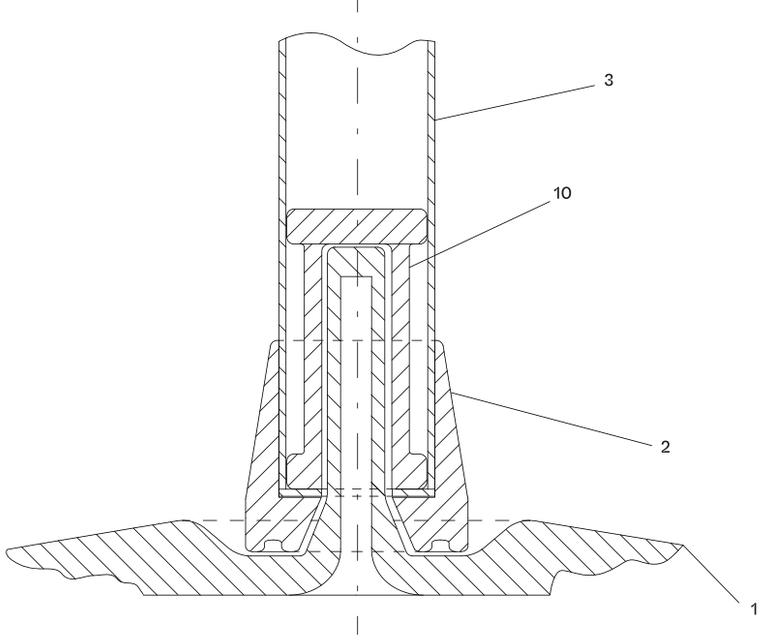

34
32.5
31


12
16
9
10
10
13
20
3
13
3.2

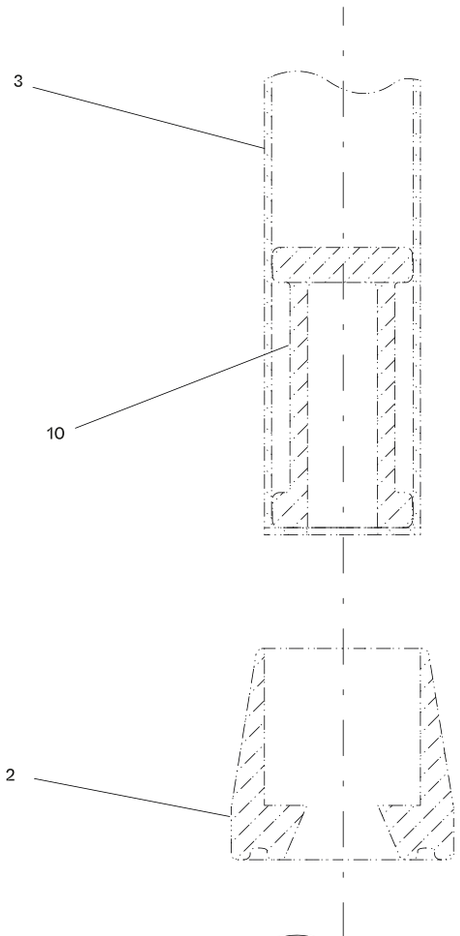

20
15
10
10
40
30
10

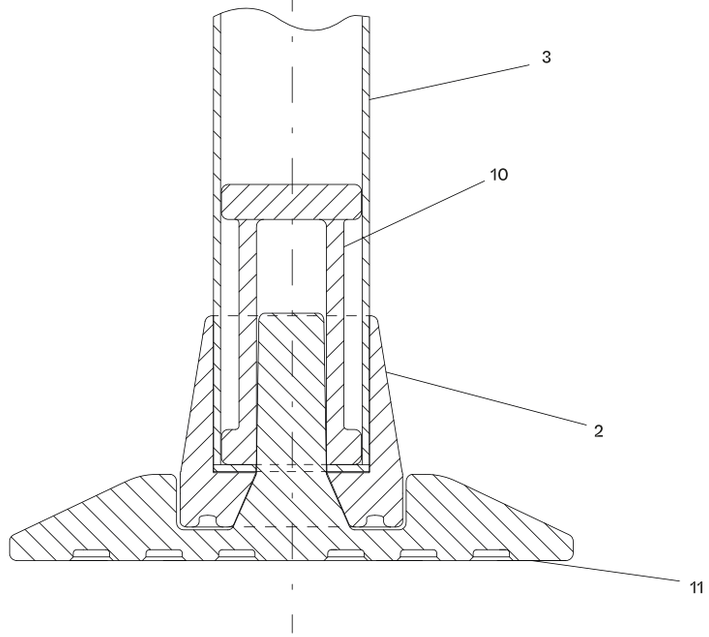
Assembly detail
3, 10, 2, 1
Scale 2 : 1





Assembly detail
3, 10, 2, 11
Scale 2 : 1

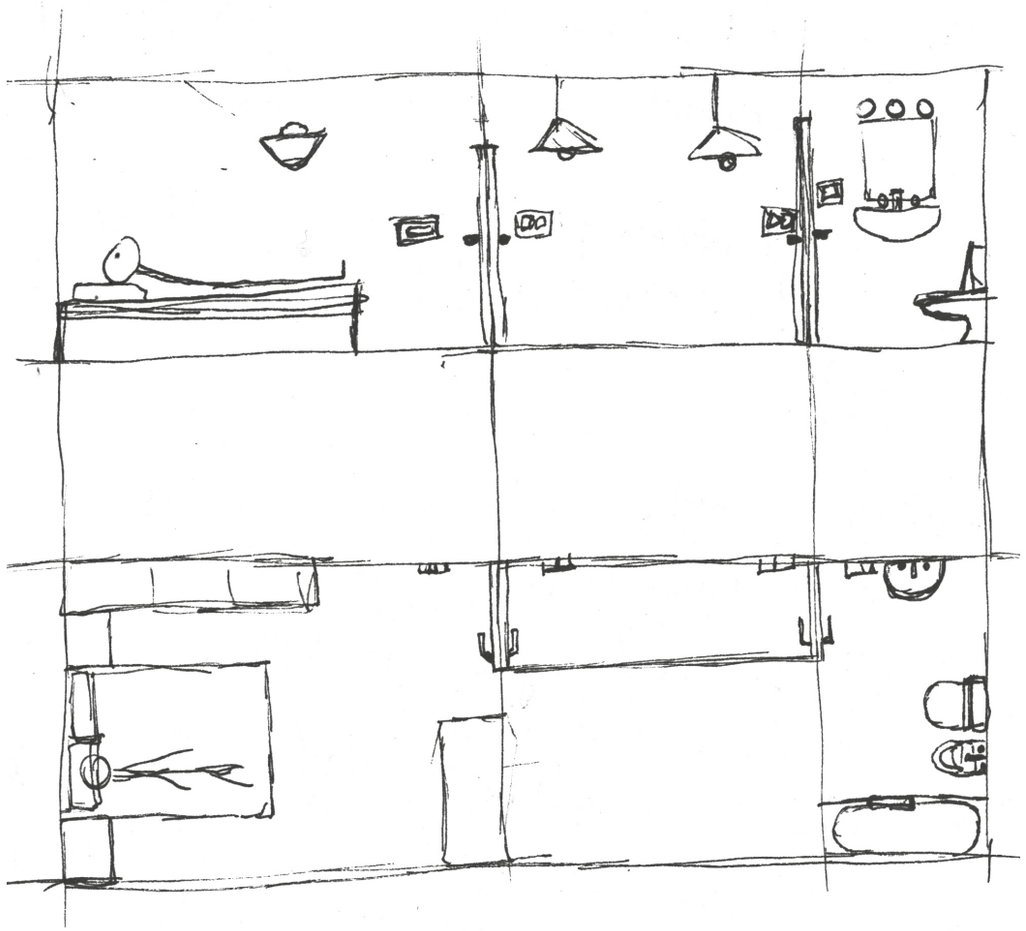


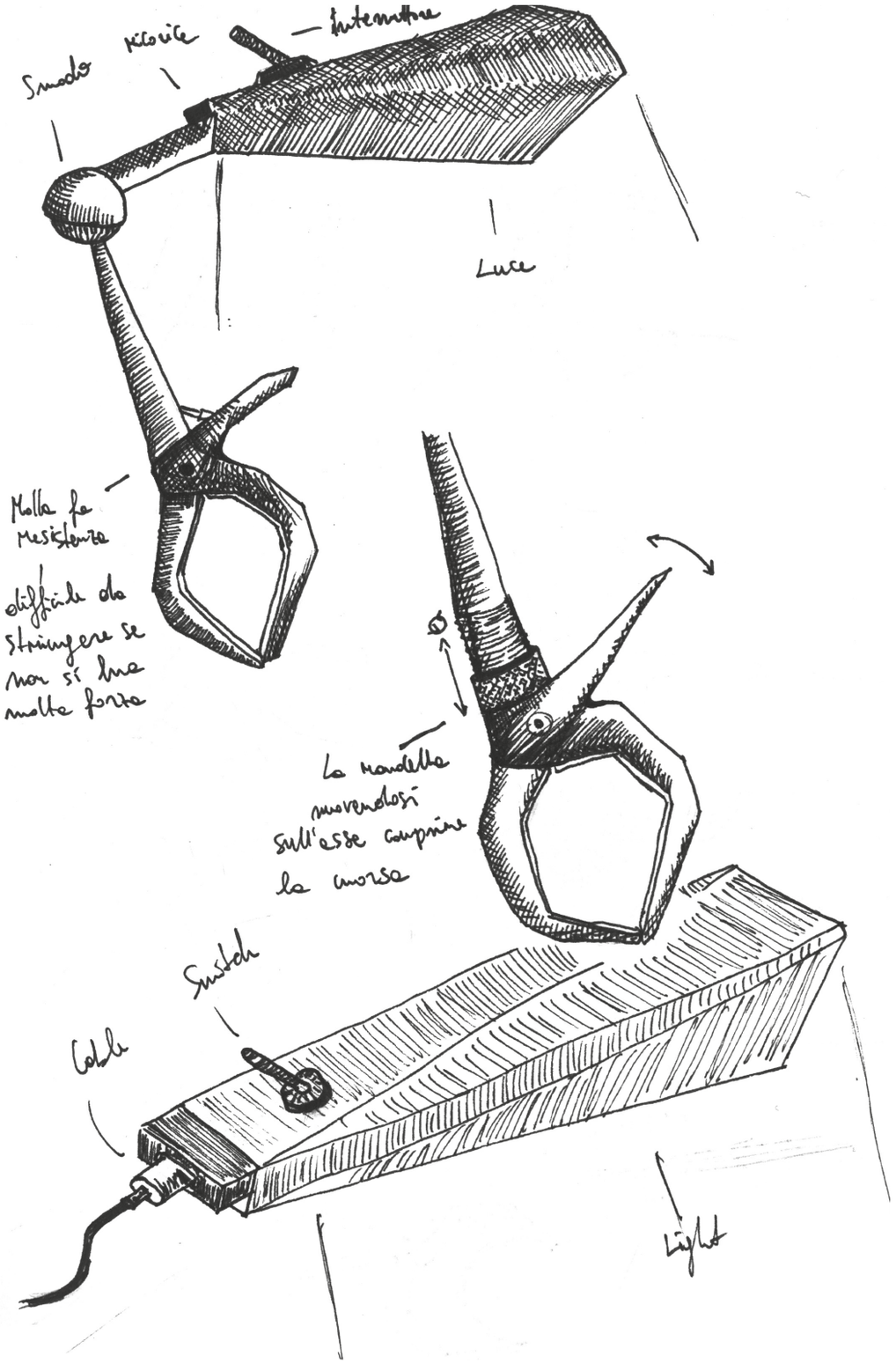


Design Process.

The design process consists of several steps. Having gathered a significant amount of information and data through research, it is then a matter of putting these results into practice. From sketches, through 3D modelling, to prototyping of real models, the project can take shape.
This new section began with the parallel study of various subjects of interest to my concept.
Walking sticks, the different shapes, the different types of handles and feet, depending on use and need.
LED technologies taking into account their compactness as well as their efficiency.
The same kind of process took place for the different power supply systems on the market. Compactness is a major theme during the build, given the small space in which I had to operate. In fact, the circuits and components could not exceed an internal diameter of 18 to 20 mm.
A charging system that was easy to use and tame, while at the same time allowing maximum mobility of the instrument.
All this clearly accompanied the ergonomic and aesthetic study of the object, which I tried to detach from the canonical forms of a cane, giving it more degrees of usefulness and comfort.

Sketches.




Snodo
ricovile
interruttore
Luce
Molla fa resistenza
difficile da stringere se non si fa molta forza
La manetta muovendosi sull'asse comprime la morsa
Cable
Switch
Light

[white light/Red light]

CURVE HANDLE

X Hanging

Usable while walking and if hanged

Light

Switch

Battery

WHAT TO "I" NEED?

- Blind Elderly world with light
- Light
- Movement
- Ease of use
- Simplicity

1 = Cane = good representation of the elderly world

2 = Implement light

3 = Make light usable on different situation

4 = Redesign the cane form
- for innovation
- to use it in different situation

5 = Grip -> During using and resting

6 = Balance -> During use / hanging / resting

7 = switch -> Where how → Where to put components?

8 = Could be interesting to make it stand alone

STRAIGHT HANDLE

LIGHT

PIEDE?

Cosa serve?

- Grip
- Stabilità
- Comfort (poche vibrazioni)

Come?

X Materiale

X Pattern

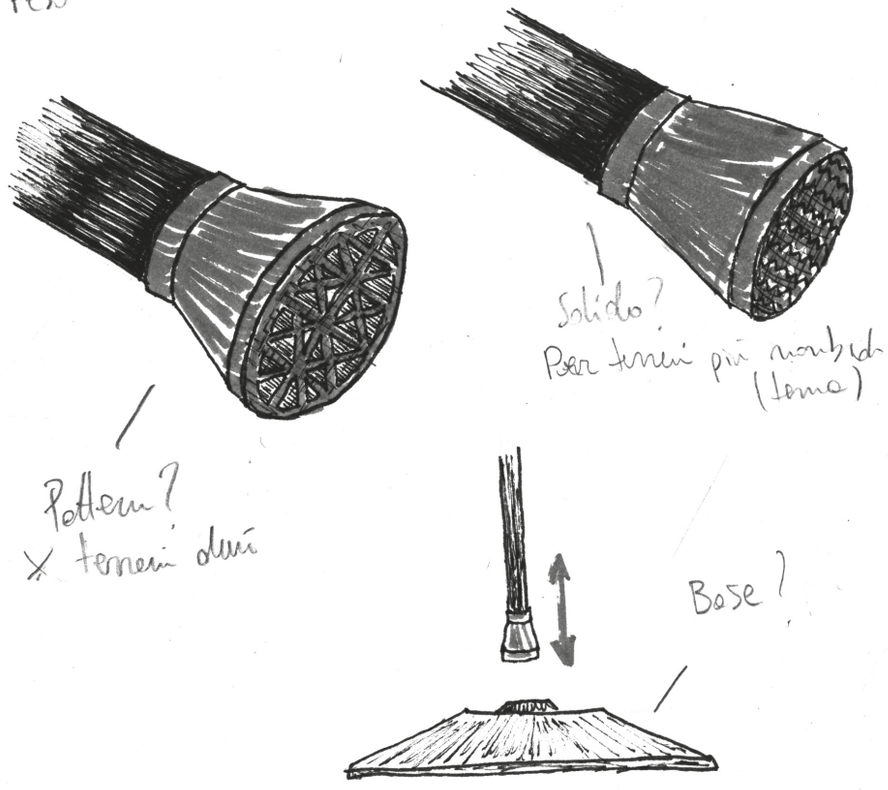
X Forma

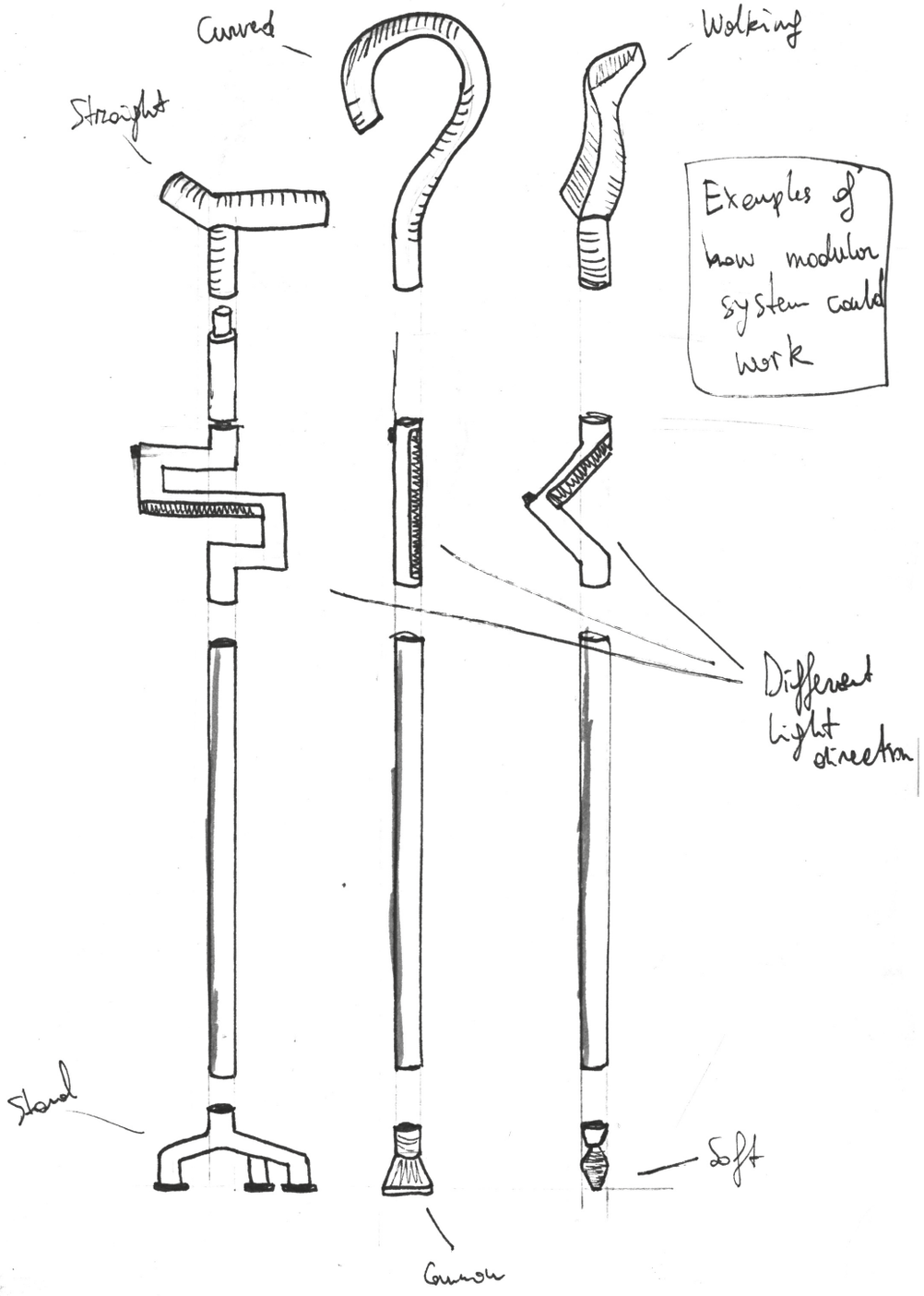
X Spessore

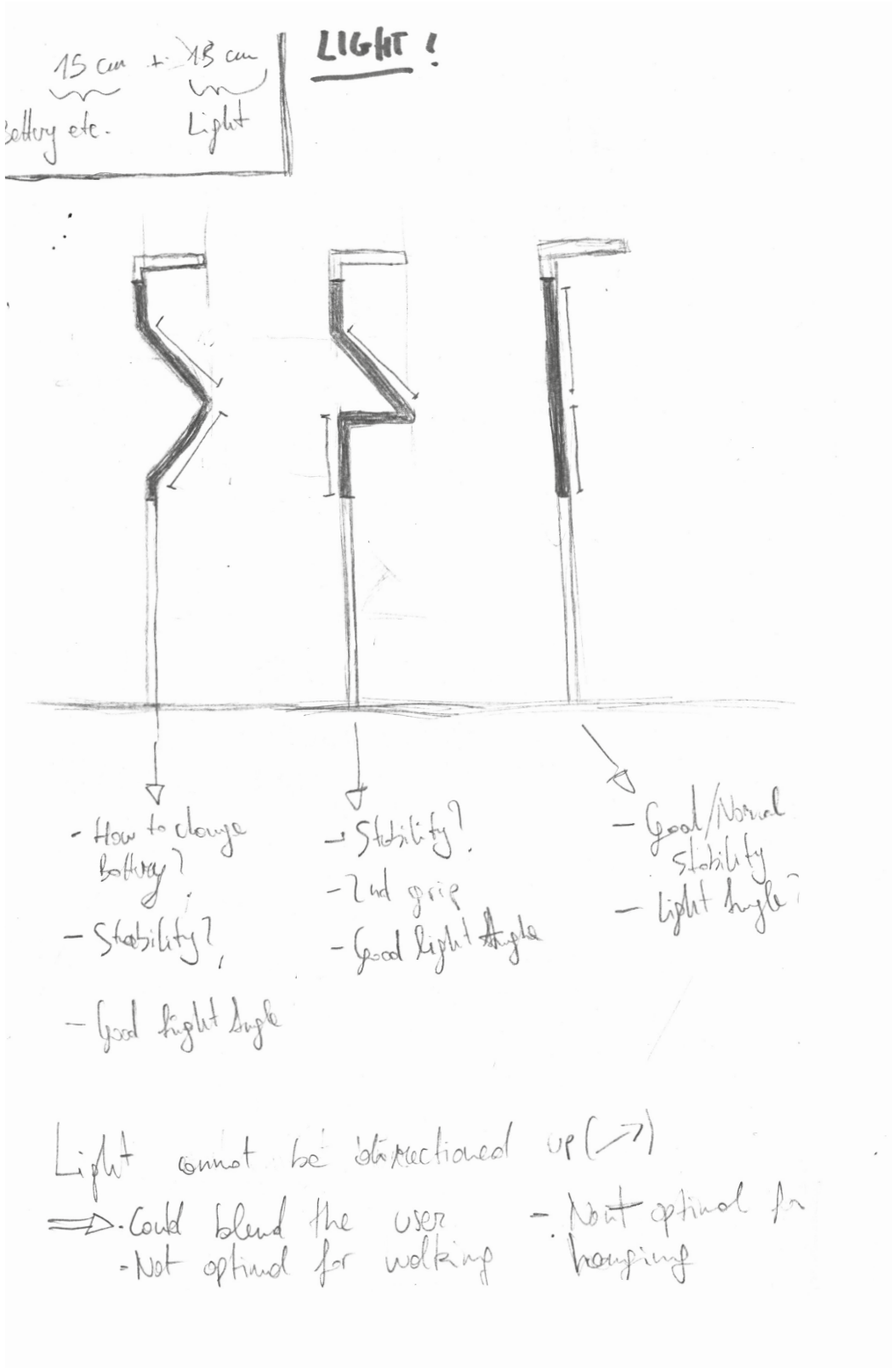
X Peso

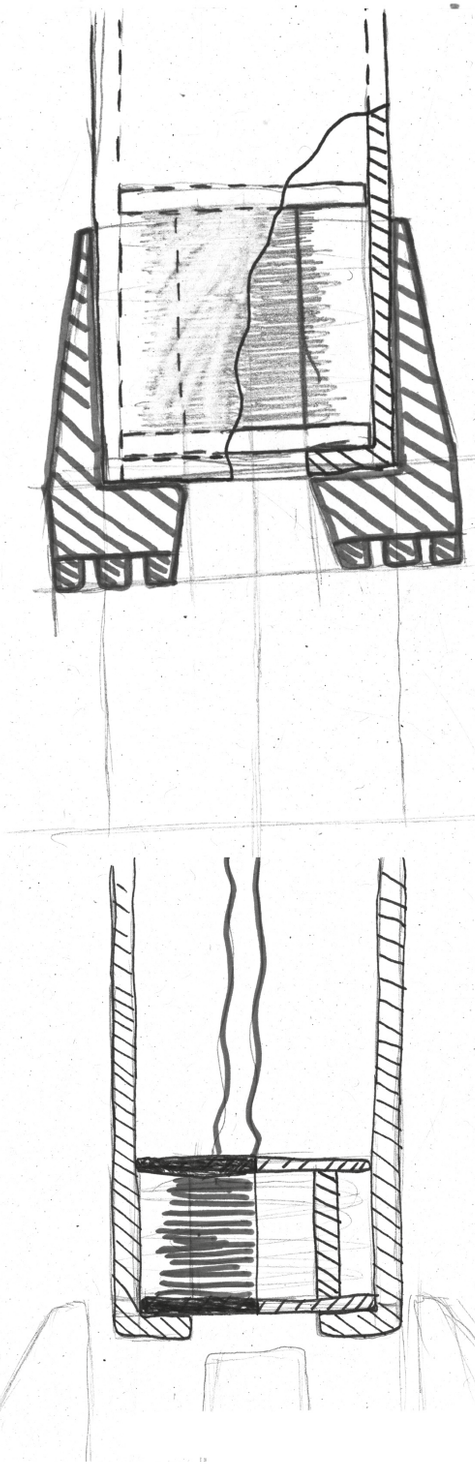
Perché?

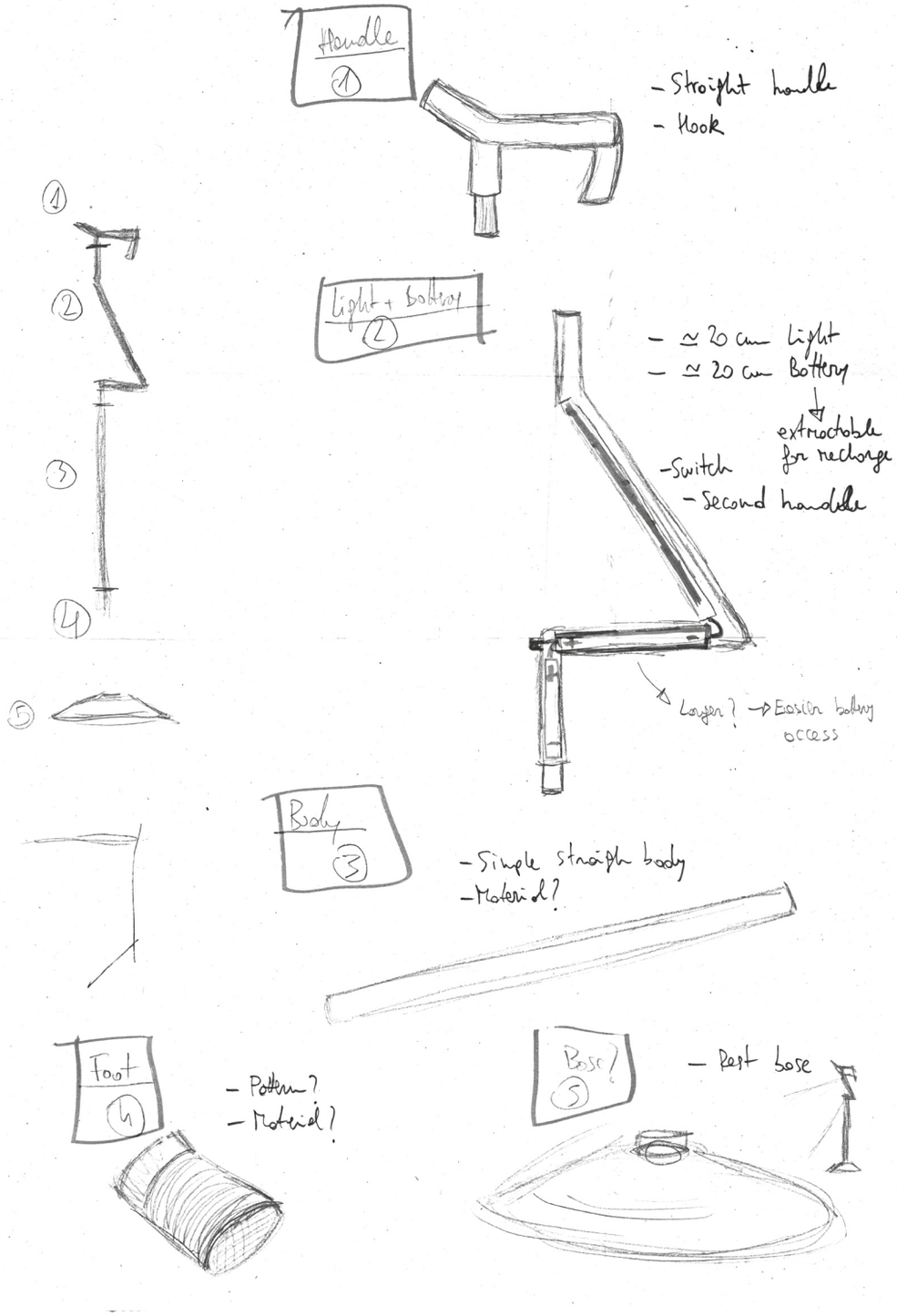
- Diversi terreni
- Diversi utilizzi




Curved
Walking
Straight
Examples of how modular system could work
Different light direction
Stand
Soft
Common


15 cm + 13 cm
Battery etc.
Light
LIGHT !
- How to change Battery?
- Stability?
- Good light Angle
→ Stability?
- 2nd grip
- Good light Angle
- Good/Normal Stability
- Light Angle?
Light cannot be directioned up (→)
⇒ - Could blend the user
- Not optimal for walking
- Not optimal for hanging



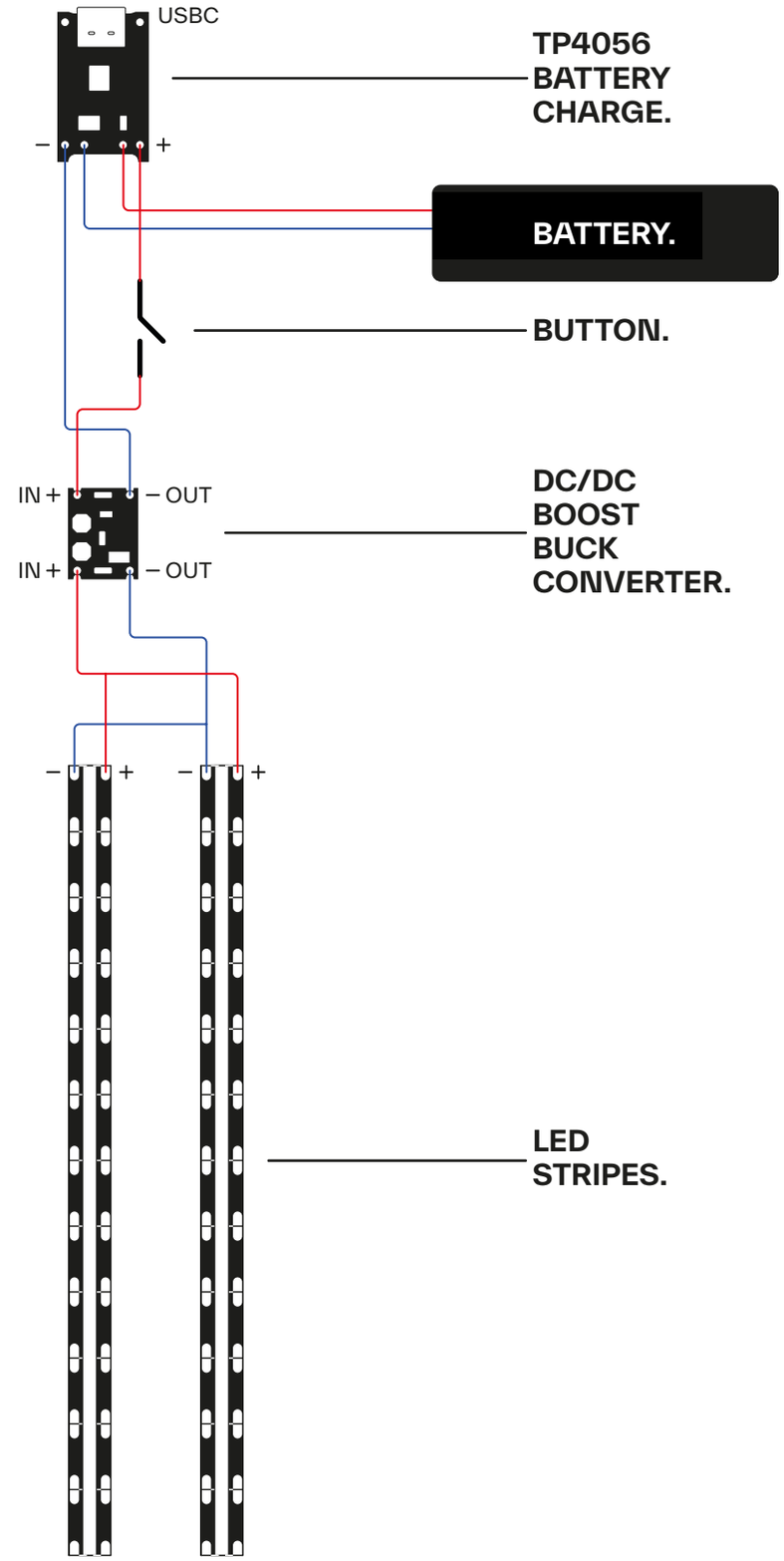

Handle
1
- Straight handle
- Hook
Light + battery
2
- ≃ 20 cm Light
- ≃ 20 cm Battery
extractable for recharge
- Switch
- Second handle
Longer ? → Easier battery access
Body
3
- Simple straight body
- Material ?
Foot
4
- Pattern ?
- Material ?
Base ?
5
- Rest base

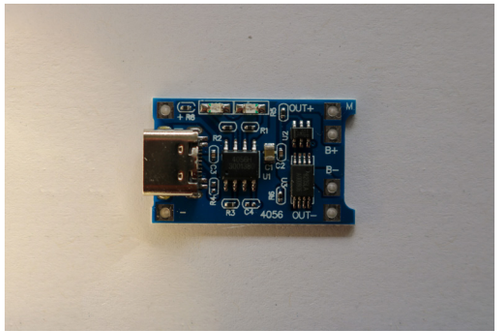
PVC prototype.

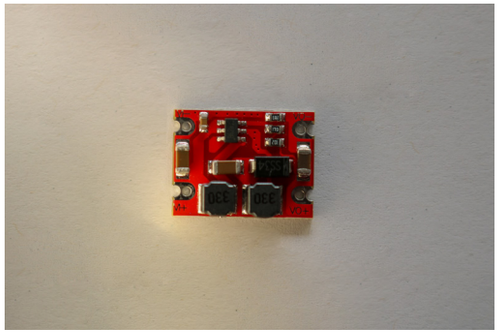
PVC prototyping is useful for analysing shapes and dimensions. As well as being cost-effective, the plastic material is easy to model and transform, thus giving a considerable margin for error.
In the specific case of the cane, it proved to be useful for understanding tolerances and angles. The latter were fundamental to the study of the operation of the light implemented in a stick. In fact, as described in the previous chapters, the creation of rough prototypes helped me to identify the most functional shape for the addressing and use of light and its source.
The heights, although standardised by specific regulations, also underwent variations in this state of design, such as the distances between the handle, tip and eventual modules.

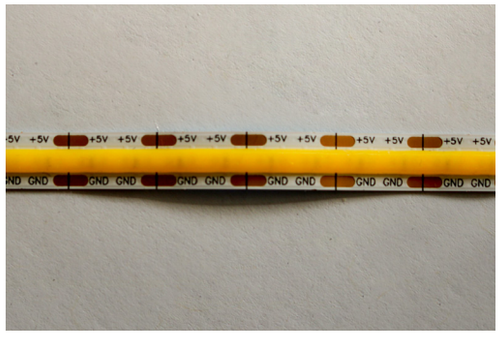
Electrical circuit.

The cane is equipped with an illumination system. This system has been described several times within this documentation. But the realisation of the electrical circuit within the prototype differs somewhat from the circuit designed for industrial production. Whereas the latter is equipped with an induction charging system, for logistical reasons, the prototype houses a wired charging system.
The circuit starts with a charging board (TP4056 Battery charge) supplied with a USBC port, to which a button is connected at one output pole, for switching the LED on and off, while a power converter (DC/DC Boost buck converter) is connected to the opposite pole, transforming the incoming energy into a 5 V output that is necessary and sufficient to power the two LED strips connected directly to the converter. The battery is simultaneously connected to the charging board as well. This circuit therefore allows the LEDs to be operated either battery-powered or powered by a cable connected to the household current via a transformer, so that while the battery is charging, the light can be used continuously.
This circuit has the same operation and layout as the circuit ideally used in the final product, so that the weights and balances are not significantly altered.







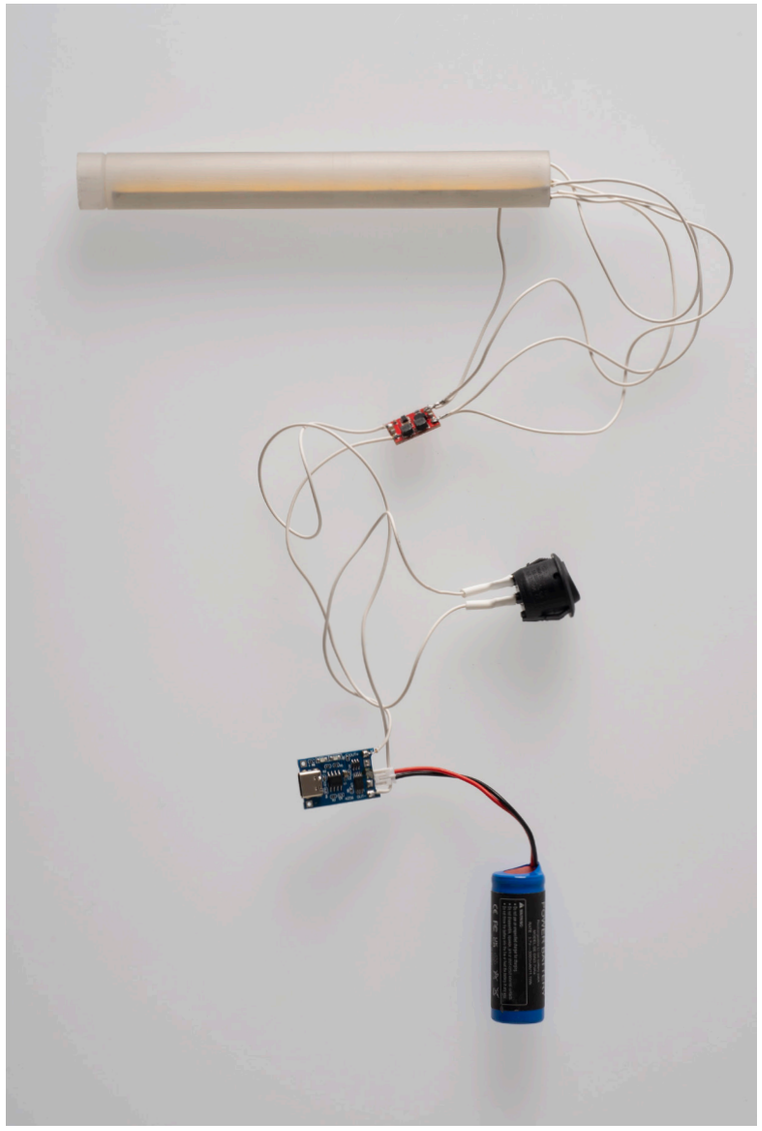


TP4056
battery charger.

DC/DC boost
buck converter.

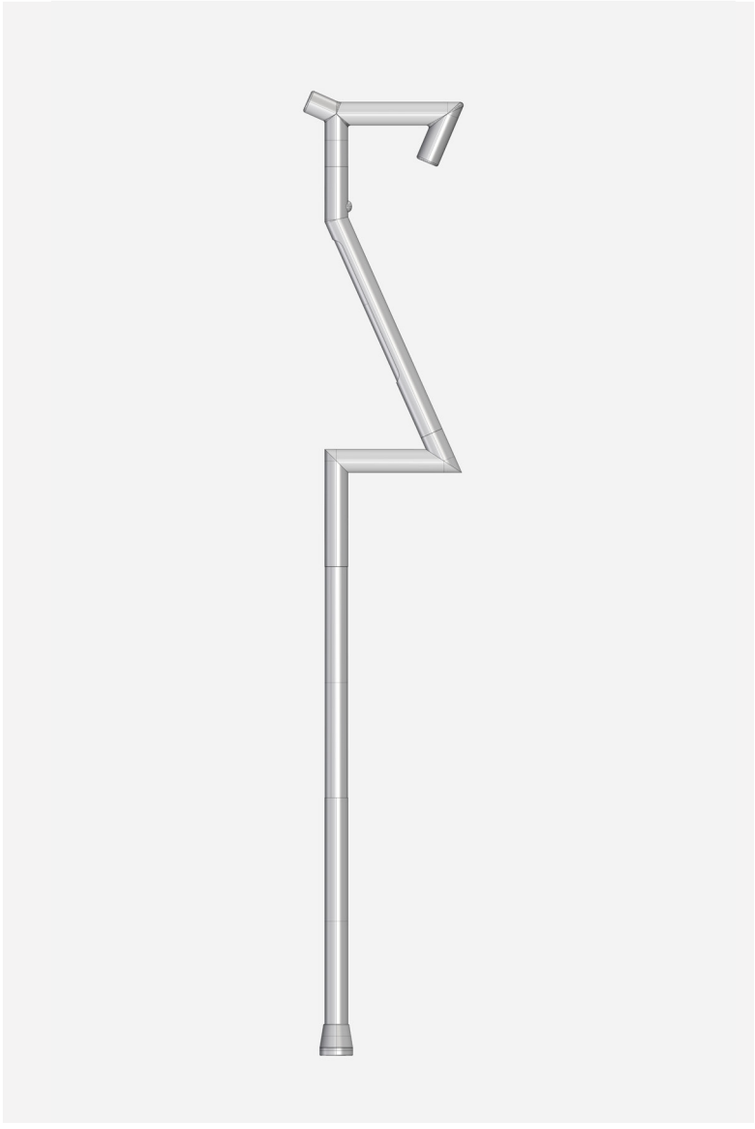
Battery.

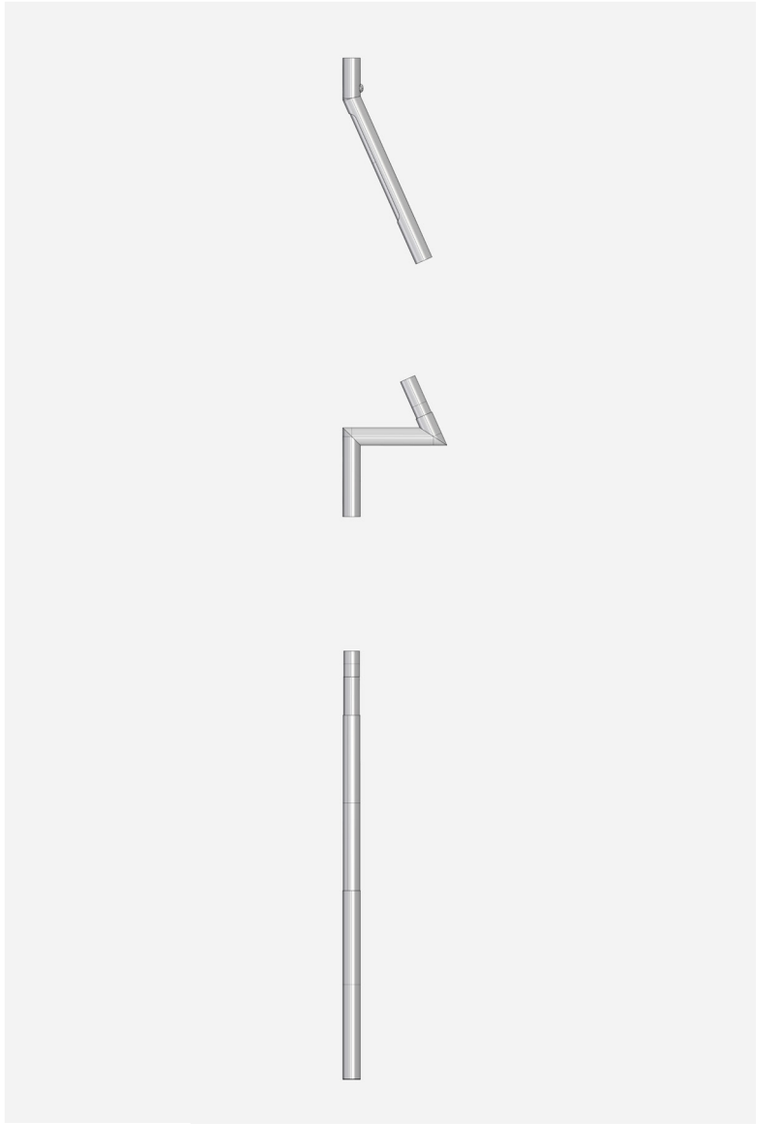
LED stripe.

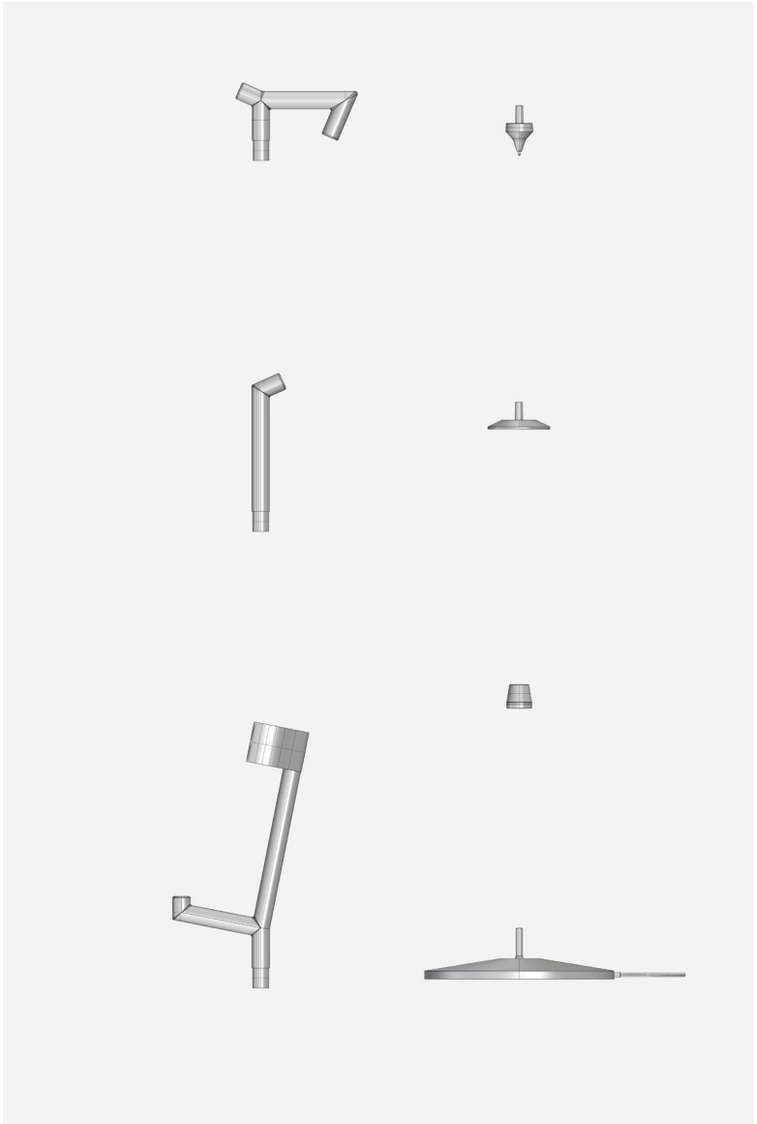


3D models.

Once prototyping with plastic materials has begun, it is possible to start designing the components on a CAD software programme. This, in parallel with freehand sketches and the production of initial prototypes, allows the creation of more defined and geometric shapes that make more sense from a structural and aesthetic point of view. Another great advantage of this design development method is the unlimited margin for error, thus giving the possibility of recreating different models until the desired result is achieved. Although 3D design is an excellent tool, even if it seems to give rise to more defined models, it can in no way replace and eliminate other types of processing, since despite the real appearance of the models developed, it cannot give a definitive idea of dimensions and impacts in the dimensional world in which the user will use the product. The designer therefore has a duty to use this fascinating virtual process in addition to all the other processes already listed and which will be listed again in this documentation. 3D modelling is also indispensable for the creation of 3D printed models. This design development will be explored further in the following section.







3D print prototype.

3D printing is a fundamental process in the realisation of the cane. It makes it possible to reproduce objects designed on CAD programmes into accurate models in hard (PLA) and soft (TPU) plastic materials. Components that require a certain rigidity, such as the handles, are made of PLA, proving to be resistant to large strain. The foot and other similar components, on the other hand, are made of TPU, whose elastic properties favour easy assembly through secure joints and in the specific case of the foot give the product significant friction against the ground.
3D printing therefore not only proves to be an important method of prototyping, but also presents itself as an excellent method of customising individual components. The user who needs variations in the design of feet and handles will have no great difficulty in replacing them, creating or having new components created to his liking and to his size. Even in the event of a hypothetical breakage, 3D printing could be the first candidate to overcome the problem.

Aluminium prototype.

The production of aluminium prototypes is placed temporally after the production of plastic (PVC) prototypes. Aluminium is known to be a surprisingly light material as well as strong. It is not an expensive metal in economic terms, but the labour required to process it, especially if it is handcrafted, can be quite costly. The thin walls of the tubes used here prove to be difficult to weld by manual means and to achieve precise tolerances in the construction of joints. These procedures, although difficult, do not irreparably hinder the production of prototypes. In industrial production, error is reduced to a minimum, almost non-existent, just consider how many everyday objects are made from aluminium within mass production. This phase is the last design phase before the prototype is assembled and finished, making the shape, function, use and structure of the final product possible and imaginable.

Final Considerations.

My view towards Design during my years of academic studies to date has undergone certain changes. What I recognise in this profession today is an enormous sense of responsibility, which can be frightening at times. Our society, our world, nowadays is constantly bombarded by innovation. Although it seems that novelty also creates sudden changes, I realise that on the contrary, society and the market it reflects is rather stale. This is due to the fact that what makes a difference, because of this capitalist approach are few projects, while the rest, floats in an ocean of futility. Given this consideration, it is easy for me to say, but a little more difficult to do, that the role of the designer, my role, is to continually ask myself whether what I am doing is actually useless, and that it is not yet another object, to be added to the endless list of the unnecessary. By these words I do not mean that for a product to be a fine product it must be successful, but that it must have ethical motivations.
For this reason, in this project as well, I gave time to the development of my research, and although I am convinced that with more time I would have achieved different (not necessarily better) results, I had to make a virtue of necessity and extrapolate the most useful and motivating product possible from my long investigation process. I therefore believe I have complied with this rule, with the design of BASTO. In fact, beginning from a fairly vague and noble starting point, such as helping the elderly user who today represents a large proportion of the world's consumers, I managed to create something that is actually useful for them and above all something that is not useless in its mere existence. In fact, its very modularity, materials and functions give it a lasting and functional life for its user's needs. I therefore consider myself satisfied with my work, although I am conscious that this idea could be developed even further in some directions that have not been reached due to time constraints.
The studies I have undertaken during these years have certainly taught me a lot, sometimes leaving me surprised both positively and negatively about the dynamics that unfolded around me. Looking back, as cliché as it sounds, I would not alter my choices, which have allowed me to reach this point where I am drawing conclusions and can firmly stipulate these thoughts. I am grateful to my family who have allowed me to live such a formative experience as I thank the people around me who have spurred me on to live the environment I find myself in today with the mindset that writes these words.
To conclude, I would like to expand the role of the utility from that of the designer to that of the citizen and finally to that of the human being. We live in times when the greatest uncertainty is that of a healthy future, conditioned by the only certainty that what we do for ourselves and especially for others is not enough. As hard as it is to admit, I myself sometimes find pleasure in lulling myself into a bland indifference and sporadic disregard. But I can safely say that change is relentless and need not always be seen as an enemy as long as we are willing to make it as useful as possible.

Stativi good e mantinitivi strong.

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