

ANTONINO X

Opener of water-gel container

December 2018



**POLITECNICO
DI TORINO**

Department
of Architecture and Design

Advisor :

Prof. Cristian Campagnaro

Candidate:

LIU TONG

CHEN YUQUN



**POLITECNICO
DI TORINO**

Department
of Architecture and Design

Master's degree in Systemic Design
Department of Architecture and Design
Graduated in December 2018
Master Thesis

ANTONINO X

Opener of water-gel container

Advisor :
Prof. Cristian Campagnaro

Candidate:
LIU TONG
CHEN YUQUN

Contents

Part I II III IV VI V VII VIII :

About the workshop

1.The source of the design

1.1 Introduction of the AISM Center and Multiple Sclerosis.....	2
1.2 The process of the workshop.....	10
1.3 First product display.....	13

Part II :

The tranformation process

2.1 The evolution process	16
2.2 Renovation product display	19

Part III :

A new plan

3.1 Analysis of existing results	22
3.2 Our design positioning and Market research	24
3.3 The meaning of our design	27

Part IV :

Our design

4.1 Design analysis and creativity	30
4.2 Desktop production	39
4.3 Product material and color	43
4.4 Skech and rendering	47
4.5 Model test	62

Part IV :

New antonino

5.1 Engineering drawing	67
5.2 The composition of Antonino	72
5.3 Antonino's use steps	79

Part VI:

Actual use of new antonino	92
---	-----------

Conclusion	95
-------------------------	-----------

References	97
-------------------------	-----------

01.

THE SOURCE OF THE DESIGN

**SCLE
ROSi
MULT
iPLA**

ONLUS

1.1 Introduction of Multiple Sclerosis & AISM Center

What is multiple sclerosis?

Multiple sclerosis (MS) is a demyelinating disease in which the insulating covers of nerve cells in the brain and spinal cord are damaged. This damage disrupts the ability of parts of the nervous system to communicate, resulting in a range of signs and symptoms, including physical, mental, and sometimes psychiatric problems.

Specific symptoms can include double vision, blindness in one eye, muscle weakness, trouble with sensation, or trouble with coordination.

MS takes several forms, with new symptoms either occurring in isolated attacks (relapsing forms) or building up over time (progressive forms). Between attacks, symptoms may disappear completely; however, permanent neurological problems often remain, especially as the disease advances.



Fig. 1.1.1-In MS, the central nervous system is attacked, damaging the myelin covers of nerve cells.

While the cause is not clear, the underlying mechanism is thought to be either destruction by the immune system or failure of the myelin-producing cells. Proposed causes for this include genetics and environmental factors. MS is usually diagnosed based on the presenting signs and symptoms and the results of supporting medical tests. There is no known cure for multiple sclerosis. Treatments attempt to improve function after an attack

and prevent new attacks. Medications used to treat MS, while modestly effective, can have side effects and be poorly tolerated. Physical therapy can help with people's ability to function.

The long-term outcome is difficult to predict, with good outcomes more often seen in women, those who develop the disease early in life, those with a relapsing course, and those who initially experienced few attacks. Life expectancy is on average 5 to 10 years lower than that of an unaffected population.



Fig. 1.1.2-Multiple Sclerosis: Understanding the Patient's Information Navigation Journey

Multiple sclerosis is the most common immune-mediated disorder affecting the central nervous system.

In 2015, about 2.3 million people were affected globally with rates varying widely in different regions and among different populations. That year about 18,900 people died from MS, up from 12,000 in 1990.

The disease usually begins between the ages of 20 and 50 and is twice as common in women as in men. MS was first described in 1868 by Jean-Martin Charcot.

The name multiple sclerosis refers to the numerous scars (scler-ae—better known as plaques or lesions) that develop on the white matter of the brain and spinal cord.

A number of new treatments and diagnostic methods are under development.



Fig. 1.1.3- Images from the AISM photo archive

What are the symptoms of MS?

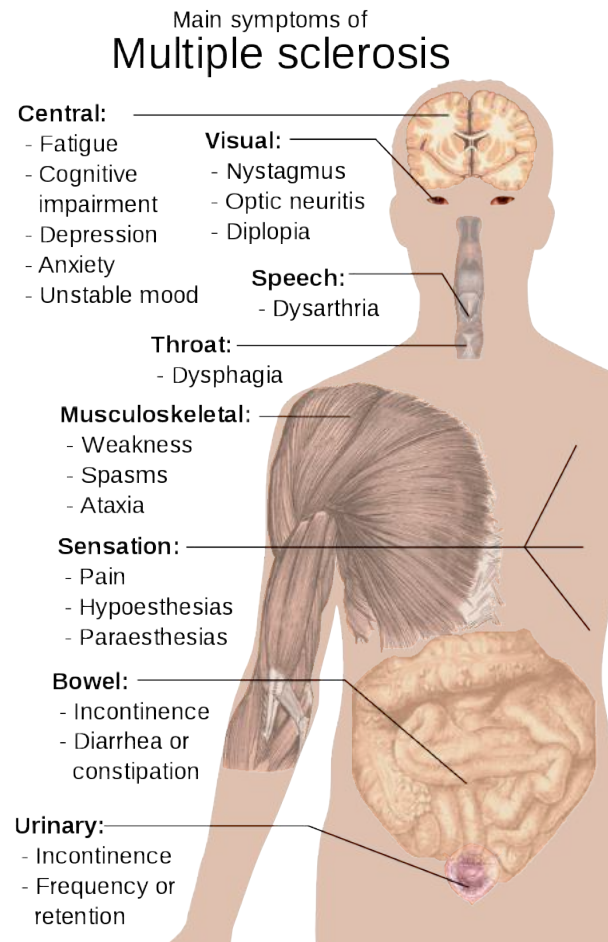


Fig. 1.1.4- Main symptoms of multiple sclerosis

A person with MS can have almost any neurological symptom or sign, with autonomic, visual, motor, and sensory problems being the most common.

The specific symptoms are determined by the locations of the lesions within the nervous system, and may include loss of sensitivity or changes in sensation such as tingling, pins and needles or numbness, muscle weakness, blurred vision, very pronounced reflexes, muscle spasms, or difficulty in moving; difficulties with coordination and balance (ataxia); problems with speech or swallowing, visual problems (nystagmus, optic neuritis or double vision), feeling tired, acute or chronic pain, and bladder and bowel difficulties, among others.

Difficulties thinking and emotion—due to exposure to higher than usual temperatures, and Lhermitte's sign, an electrical sensa-

tion that runs down the back when bending the neck, are particularly characteristic of MS. The main measure of disability and severity is the expanded disability status scale (EDSS), with other measures such as the multiple sclerosis functional composite being increasingly used in research.

These are the social, psychological, and job-related problems of life with MS.

- If MS makes it hard for you to walk or drive, you may not be able to do your job well.
- Because it's tough to get around and hard to talk to people about what life with a chronic disease is like, you may not be as social as you once were.
- You could get depressed. It's a byproduct of the changes MS makes in your brain and in your life.

The condition begins in 85% of cases as a clinically isolated syndrome (CIS) over a number of days with 45% having motor or sensory problems, 20% having optic neuritis, and 10% having symptoms related to brainstem dysfunction, while the remaining 25% have more than one of the previous difficulties. The course of symptoms occurs in two main patterns initially: either as episodes of sudden worsening that last a few days to months (called relapses, exacerbations, bouts, attacks, or flare-ups) followed by improvement (85% of cases) or as a gradual worsening over time without periods of recovery (10–15% of cases).

A combination of these two patterns may also occur or people may start in a relapsing and remitting course that then becomes progressive later on. Relapses are usually not predictable, occurring without warning. Exacerbations rarely occur more frequently than twice per year.

Some relapses, however, are

preceded by common triggers and they occur more frequently during spring and summer. Similarly, viral infections such as the common cold, influenza, or gastroenteritis increase their risk. Stress may also trigger an attack.

Women with MS who become pregnant experience fewer relapses; however, during the first months after delivery the risk increases. Overall, pregnancy does not seem to influence long-term disability. Many events have been found not to affect relapse rates including vaccination, breast feeding, physical trauma, and Uhthoff's phenomenon.

MULTIPLE SCLEROSIS

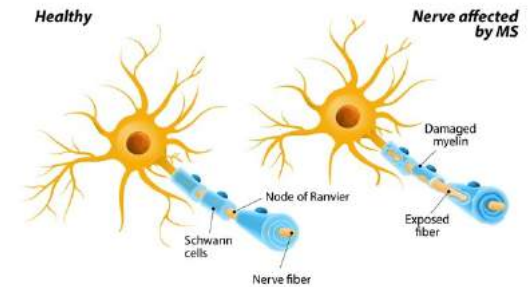


Fig. 1.1.5- Healthy nerve vs Nerve affected by MS



Fig. 1.1.6- Multiple sclerosis occurs in a ratio of three women per man

The Italian Multiple Sclerosis Society (AISM)



Fig. 1.1.7- The Italian Multiple Sclerosis Society (AISM) team and slogan

The Italian Multiple Sclerosis Society (AISM) is the only organization in Italy that addresses every aspect of multiple sclerosis (MS), through advocating for the rights of people with MS and providing services and through orienting, promoting, and financing scientific research.

MS is among the most common major diseases of the central nervous system. It is chronic, unpredictable, progressive and can lead to serious disability. MS is diagnosed in young adulthood, typically between 20 and 40 years of age and women are diagnosed nearly three times as often as men. The type and severity of symptoms as well as the disease course varies from one person to another. In Italy there is a person diagnosed with MS every 3 hours.

AISM was founded in 1968 with the objective of advocating for the rights of people with MS, and over time has become the principle resource not only for people with MS, but for families, healthcare professionals and anyone involved in the fight against this disease.



Fig. 1.1.8- Barometer of multiple sclerosis in 2018

AISM places great importance on the RIGHTS of people with MS in order to assure their full inclusion in society. Through a continual dialogue with key stakeholders, including government representatives and legislators.

AISM invests in a tangible advocacy plan that promotes programs and actions to improve the political, social and healthcare landscapes. The plan directly focuses on bettering legislation in order to improve the quality of life of people with MS and those with other illnesses and disabilities.

A commitment to providing information, increasing awareness and improving knowledge about MS is



Fig. 1.1.9-The celebrations of the 50th anniversary of the activities of AISM



Fig. 1.1.10-Activity logbook at AISM center

based on a continual dialogue with people living with the disease in order to understand their needs and expectations. This dialogue contributes to intensifying the MS Movement and has had not only an impact on the MS community, but on society as well.

Today the MS community, through collective action coordinated by AISM, is capable of drawing increasing attention to this complex disease that represents a social and health crisis for the country.

The challenges of MS can be faced and overcome together.

This is possible thanks to all of the women and men, young people, activists, volunteers, members, scientists, donors, healthcare professions and every other stakeholder who has chosen to be by our side.

The priceless amount of effort, time, expertise and commitment given every day are the ingredients that make the MS Movement great.

AISM center in TORINO



Fig. 1.1.11-Torino tower & AISM logo

The provincial section of Turin is located in the territories or for more than twenty years. Numerous volunteers have been historical thanks to whom AISM have achieved or obtained results in the Turin area. Results that have led to one of the largest centers in Italy. The AISM Center "Il Fortino" of Turin goes to implement a widespread network of services that the Italian Multiple Sclerosis Association provides throughout the Italian territory to improve the quality of life of people with MS.

The Center is an organizational structure with qualified operators and volunteers, offering guests a complete daily path where, in addition to being assisted, they can carry out educational, educa-



Fig. 1.1.12-Manual activities in AISM of torino



Fig. 1.1.13-The display Wall in AISM of torino

tional, rehabilitation, work, leisure and socialization activities.

A place, therefore, in which the citizen recovers a full dimension of life and in which he is put in a position to best express his individual abilities and potential.



Fig. 1.1.14-The volunteer activity in AISM of torino

1.2 The process of the workshop

Politecnico di torino & AISM center workshop

The workshops of polito provide an opportunity to address practical and extemporary design experiences. The main features of a workshop are the limited duration (one week) and the presence, as tutors, of professionals from atypical sectors that are close to the design area.

Active participation, sharing of ideas and the collective experimentation of new solutions in a short amount of time make the workshop an essential educational experience for young designers.

The collaboration with internationally renowned companies is also a professional opportunity for students to confront themselves with the world of work.



Fig. 1.2.1-Politecnico University design workshop logo

Master's workshops face the issues of social design, starting from users' needs, behaviours and cultural approaches, and the context they live in. Within the workshop, students will look for solutions to improve the quality of life of the people involved. They will experiment new ways and tools to provide answers to the analysed social challenges.



Fig. 1.2.2-"A guide to self-production" design workshop from Politecnico University

"DESIGN FOR EACH ONE" & AISM



Fig. 1.2.3-"Design For Each One" design workshop from Politecnico University

A creative and experiential "journey" through the world of motor disability. From the construction of the report to the conception (and co-construction) of assistive products, the path provides workshop experiences in a group with the aim of satisfying concrete needs and facilitating daily gestures.

2017 workshop in AISM center



Fig. 1.2.4-“Design For Each One” design workshop

- 01Day **Relationship Creation**
Learn about multiple sclerosis and the AISM Center
Observing the living conditions of patients in the center and discovering the difficulties in their lives
- 02Day **Difficulty Analysis**
Find out more about their needs through activities and communication with patients, find difficulties, and come up with ideas
- 03Day **Co-construction/Co-design**
Establish a design concept and production plans, discuss and collaborate in small groups, and prepare materials
- 04Day **Prototype Construction**
Make product models with materials and tools and let patients have a trial with final model
- 05Day **Workshop Presentation**



Fig. 1.2.5

Design user:

Antonio Cataldi

Design reasons:

Because of the special diet, Antonio needs someone to help to tear the food-gel container lid and eat.

Design goal:

Design a tool to help Antonio open the lid of the food-gel independently.



Fig. 1.2.6-11- 2017 our workshop design process record

1.3 First product display

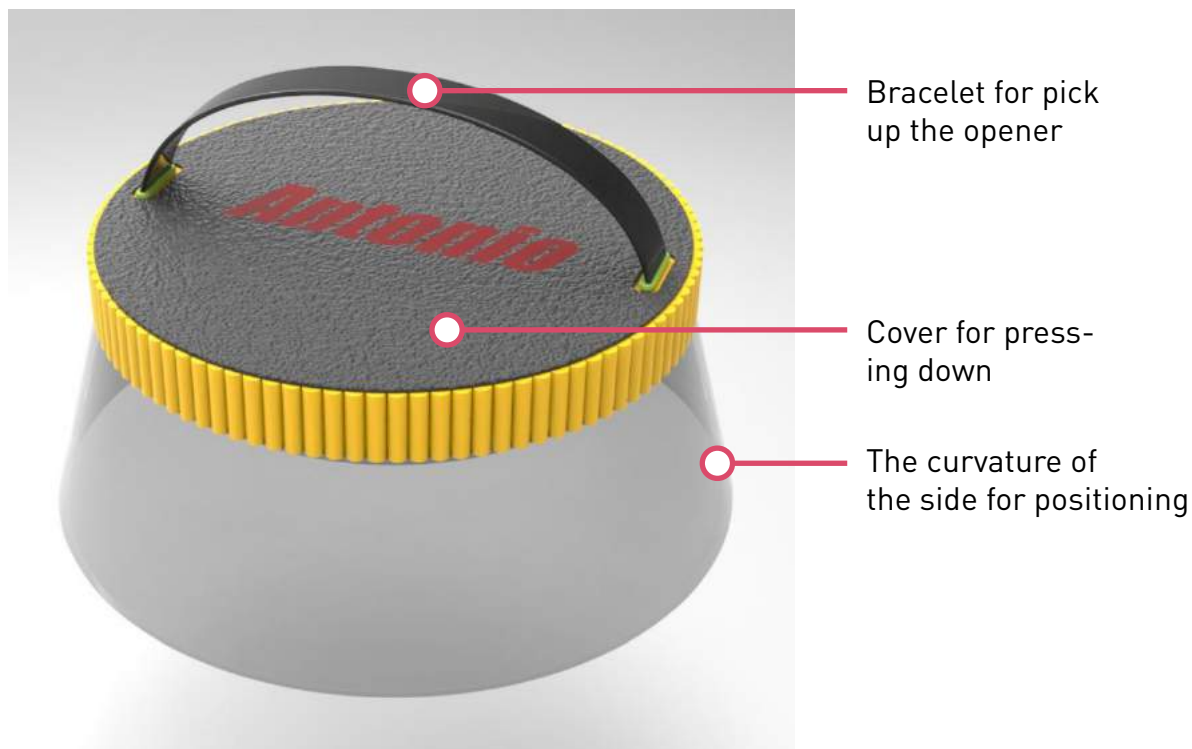


Fig. 1.3.1-Frist 3D model of water-gel opener

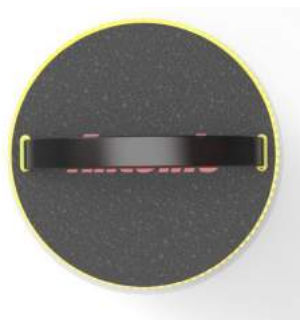


Fig. 1.3.2-Top view

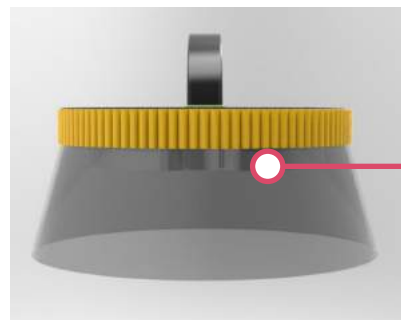


Fig. 1.3.3-Left view

Sawteeth for cutting the container lid

The initial idea of our workshop design is to create an effortless and easy-to-open water-gel opener based on Antonio's condition. The circular cutting method of the traditional bottle opener is not suitable for muscleless users, so we use the method of pressing to cut water-gel container lid.

Place the sawteeth inside the opener, which is safe to use and can be easily cut out lid with the weight of the hand.

The water-gel opener has a small above and big below shape, and the lower circular opening is larger than the container diameter for positioning and the opener can be placed around the container.

The upper circular cover has the same diameter as the container lid, and is easy to use when going down by hand pressure, the top bracelet can put your hand into the gap between it and the round cover, making it easier to take.



Fig. 1.3.4-7-First handmade opener model

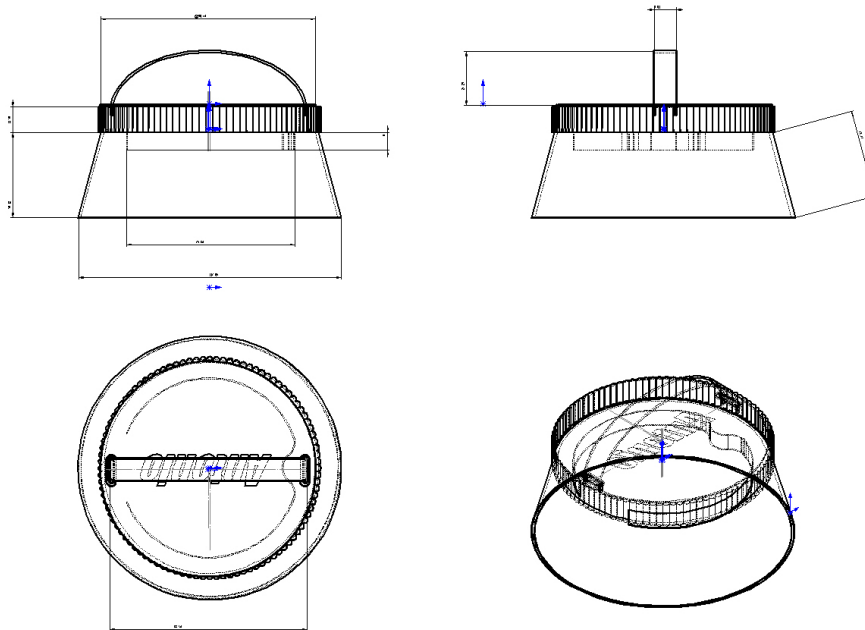


Fig. 1.3.8-First model dimensions

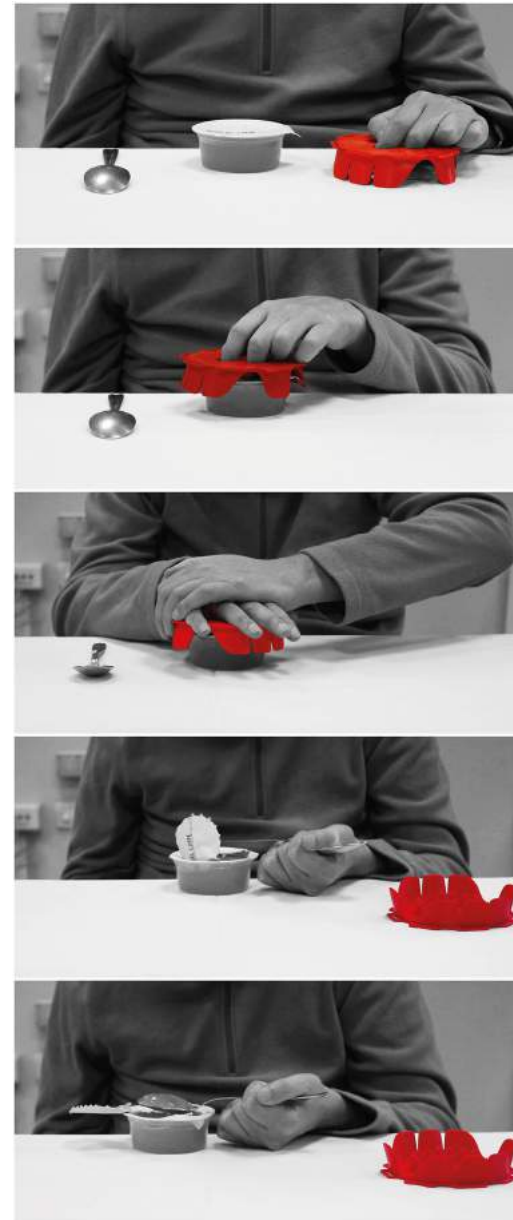
The time of the workshop is limited. We used the pvc board, Velcro, glue gun and other tools to complete the water-gel opener in one and a half days.

In the later experiments, the model also achieved the expected effect, with positioning and cutting function

Regarding the size of the model, its overall height is shorter than the height of the container, which is convenient for the hand to apply downward pressure, and the height of the sawteeth is shorter than the distance between the water surface and the lid, so that the serrated sawteeth touch water can be avoided, and the circular lid on the opener is the same size with container lid.

02.

THE TRANSFORMATION PROCESS



2.1 Evolution process

Project scope

Development of the concepts produced by the "Design for each one" workshop.
To provide an inclusive and participatory design for people with limited mobility.

By:

Cristina Navone, Animation Cooperative Valdocco Onlus

Cristian Campagnaro, Department of Architecture and Design, Polytechnic University of Turin

Tutor:

Enrico Giunta, Animation Cooperative Valdocco Onlus
Andrea Vairo,
Animation Cooperative Valdocco Onlus





Guidelines

Socket

The object must take into account the reduced capacity of the user and the further and progressive reduction over time.

Position

The geometries must prevent slippage or incorrect positioning during the support of the container on the container.
With the consequent failure to open the can.

Cut

The aid must accurately drill the protective film of the gel water container, preventing any material falling into the container.

Affordance

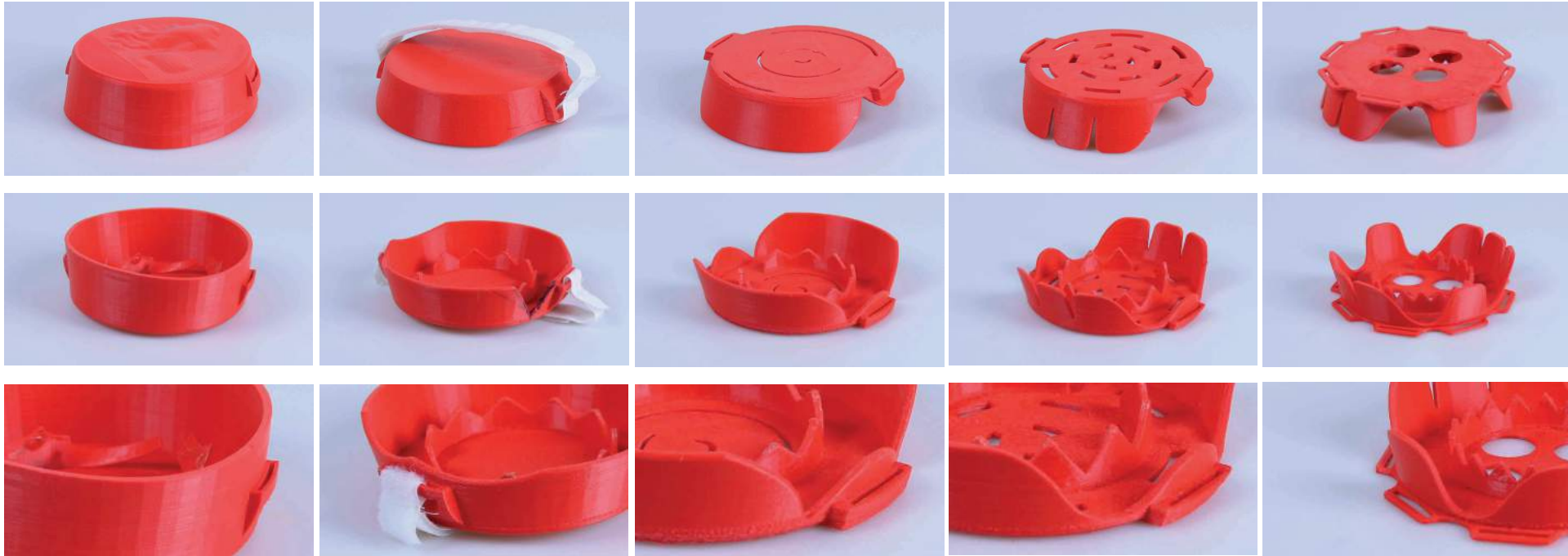
The use of the aid must be immediately comprehensible to the user.

Concept

Creation of an object capable of facilitating the opening action of the containers of gel water, for the periodic hydration of the person suffering from dysphagia.

The aim of the aid is to restore self-sufficiency in an action that the user with motor disability performs numerous times in the course of his day.

ANTONINO: design development



Model 1

Model 2

Model 3

Model 4

Model 5

July

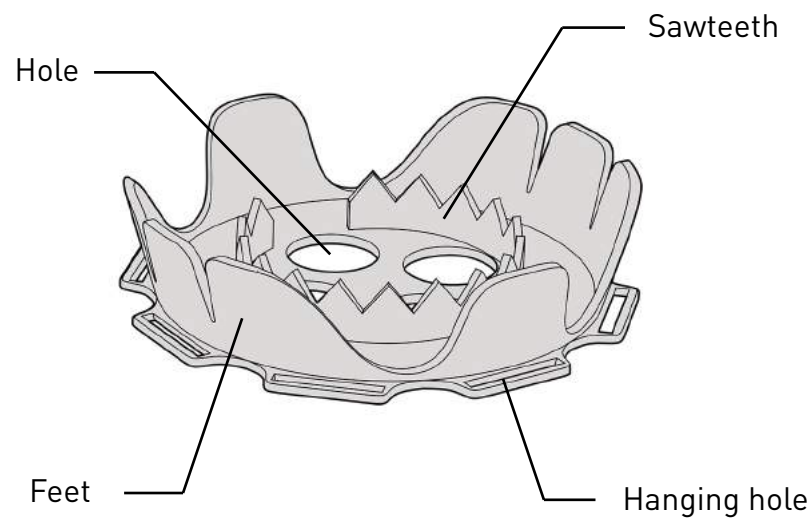
November

December

January

March

2.2 Improved display



Front



Back



Hole

Easy to take antonino by hand.

Sawteeth

Perfect cutting the lid of water-gel container.

Feet

Help people locate in use and place antonino.

Hanging hole

Hanging holes make it easy to fix people's handswith antonino with straps



TAKE IT



LOCATION



CUT THE LID



BRING IT



PLACE IT

03.

A NEW PLAN



3.1 Analysis of existing results

Model 1



Disadvantages

- Difficult to hold
- Difficult to positioning (easy to crush)
- High material costs
- Sawtooth not durable
- Hook shape difficult to print
- Low body visibility

Advantages

- Good body stability

Model 3



Disadvantages

- Not simple enough grip and positioning system
- Sawtooth isn't sharp enough
- Hook shape difficult to print
- Body shape isn't simple enough

Advantages

- Good body size

Disadvantages

- Shape can't reach the need to reduce costs
- Difficult to positioning (Sawtooth and inner wall too close)
- Hook shape difficult to print

Advantages

- Perfect sawtooth penetration

Disadvantages

- Printing defects affect disengagement
- Poor stability

Advantages

- Increased visibility at the top

Model 2



Model 4



STRENGTHS

- ① Light weight material, portable
- ② Simple use (press)
- ③ From tearing to cutting, reduce the need for force
- ④ Help patients to improve their self-worth

WEAKNESSES

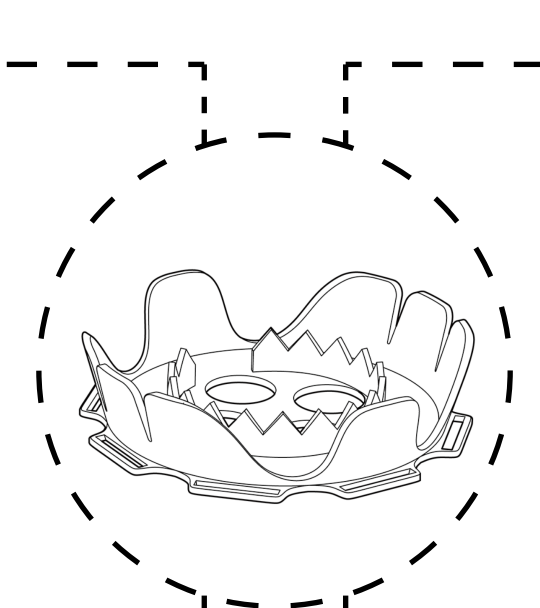
- ① Only suitable for single-size containers
- ② Can only to cut, need another tool to open the lid
- ③ Cleaning (not easy to dry)

OPPORTUNITIES

- ① Basically no similar product on the market
- ② Applicable for almost all people who lack strength (patient/elderly)
- ③ Reduce price of production material

THREATS

- ① Manufacturing price is too high (Hard to be accepted by people)
- ② Food safety (Different foods have different requirements for contact materials)



Front



Back

3.2 Our design positioning and Market research

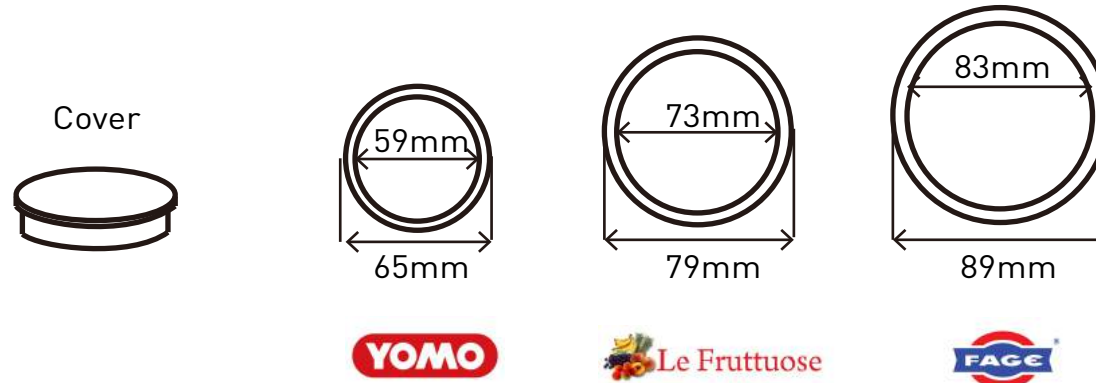
Market research

The collection of different sizes of yogurt containers on the market to replace the different sizes of food gel containers that patients consume. Their main feature is that they are made of plastic containers and lids made of plastic or tin foil. In general, A normal person needs to tear the lid away from a corner before eating.



Fig. 3.2.1-Different sizes of yogurt on the market

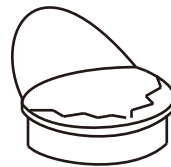
Through the collection, most of the yogurt container lids on the market can be roughly divided into three sizes: small, medium and large. The three yogurt brands represented by YOMO, FRUTTOSI and FAGE are respectively.






Our design positioning

Why choose **circular cutting**?

- Cutting round objects, the same perimeter, the largest circular cutting area.
- The height of the food can is not important because the food container can withstand the pressure of cutting.



3 types of traditional cutting can openers

	Names	Instructions	Advantages	Disadvantages
	Lever-type can opener	<ol style="list-style-type: none"> 1. Place the blade of the can opener on the edge of the lid and press firmly 2. Keep the blade down as parallel as possible to contact the edge of the can 3. Push the blade down and gently open another hole. 4. Align the groove on the can opener with the raised thin edge on the edge of the can 5. Cutting up and down, ring propulsion 	<p>Low price</p> <p>Easy to carry</p>	<p>Easy to cut hands</p> <p>To complicated steps</p> <p>Need a lot of strength</p> <p>Not easy to cut a complete circle</p>
	Rotating wheel opener	<ol style="list-style-type: none"> 1. Place the can opener on top of the can. Depending on the can opener, some need to clamp the teeth on the underside of the can and clamp the teeth on the outside and inside of the can. 2. Make sure the can opener and the can end are tight before twisting the handle. 3. Twist the handle and turn around 	<p>Fair price</p> <p>Simple use steps</p> <p>Safe use method</p> <p>Easy to cut a complete circle</p>	<p>Slowly opening speed</p> <p>Need strength to make a circular cut</p>
	Electric opener	<ol style="list-style-type: none"> 1. Lift the flaps of the can opener and place the jar underneath. 2. The can will rotate and be cut open. Some can openers may require you to hold the can. 3. The magnet will hold the cut metal can v lid and lift it up. 4. Remove the cover. 	<p>The easiest use steps</p> <p>Safe use method</p> <p>Quickly to cut a complete circle</p>	<p>High price</p>

What do a traditional cutting can opener need users to do?

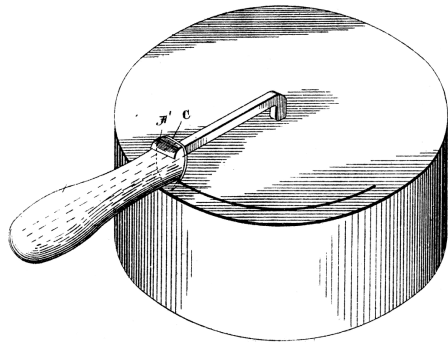


Fig. 3.2.2-Rotating Wheel Can Opening Tool



- Need to aim well at the outer circle of the food container lid.



- The cutting action requires a certain amount of effort (some openers use the principle of leverage)



- Most need to use other items or open the lid by hand.



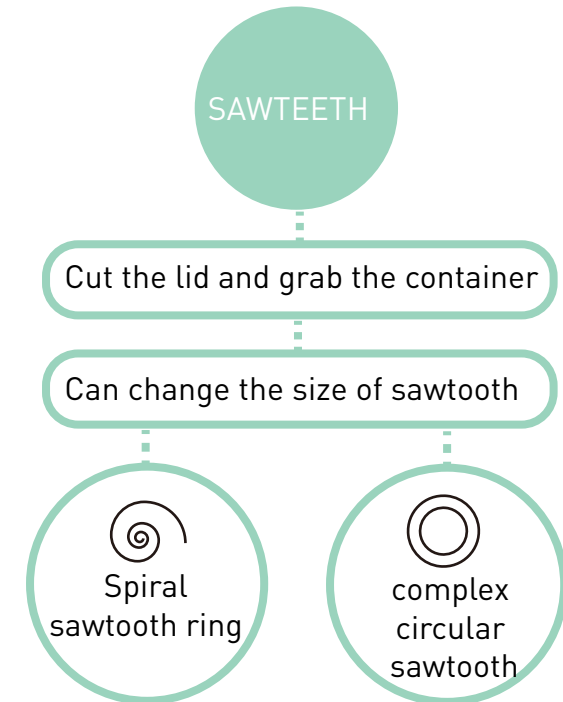
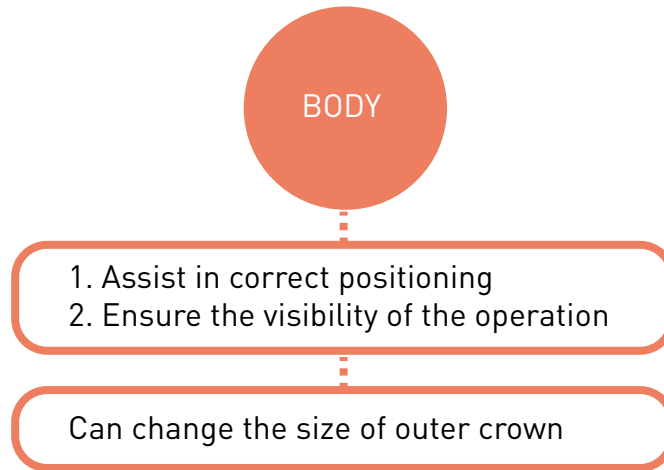
Fig. 3.2.3-Rotating Wheel Can Opening Tool

The existing cutting can openers on the market are designed for normal people with certain operational ability. They can easily make positioning, circular cutting and other actions, and have certain strength, which can be quickly opened.

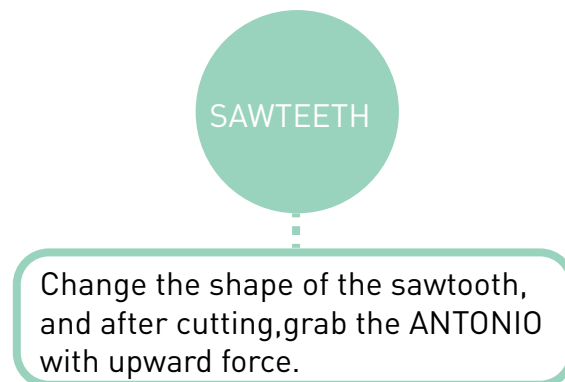
For parts of patients who with multiple sclerosis, it is necessary to minimize the use of force in the opening operation and shorten the time required to complete the movement.

Functional analysis of Antonino's body and sawteeth

1. Only suitable for single-size containers?



2. Can only do cut, need another tool to open the lid



ANTONINO

opener of the water-gel
container

About the user

About the product

Who is the target user?

Patients or elderly persons
who usually consumes food gels,
has insufficient strength or has
operational difficulties

What is the use of this prod-
uct for them?

Can independently open the lid
of the food container before eating.

According to this

What does this product
mean for users?

Satisfied with independent operation
Cultivate operational capabilities
Increase the affirmation of themselves
Improve confidence in life



How many components
does 'ANTONINO' have?

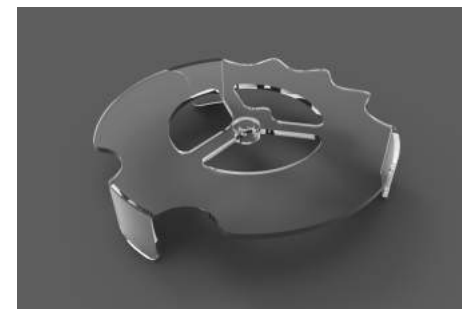
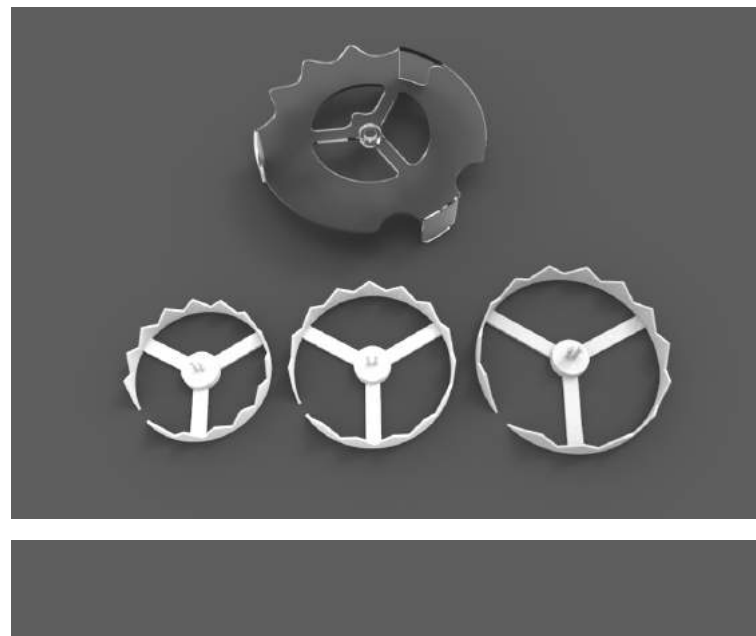
2
Body
Sawteeth

What are the goal functions
of the product?

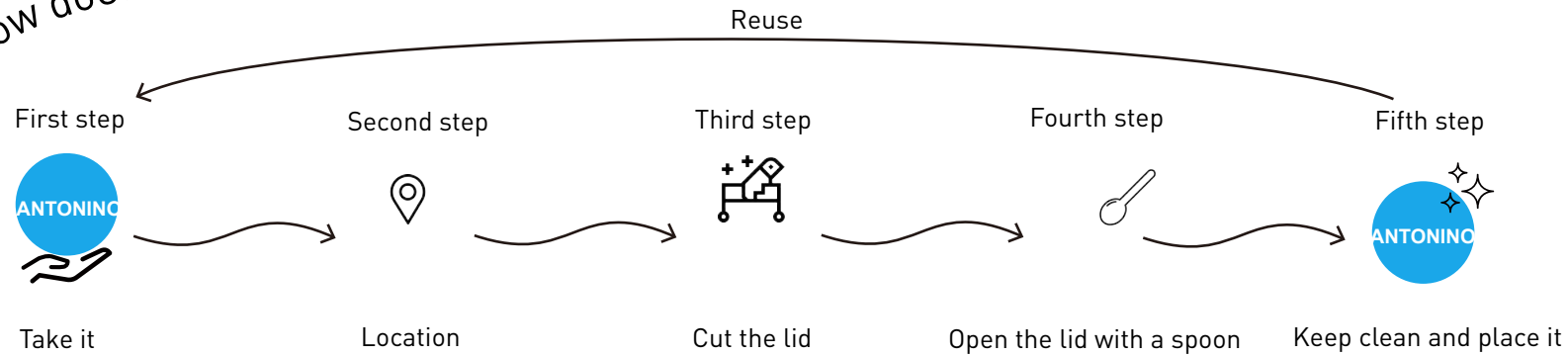
Suitable for multi-size food gel containers
Can be used to cut container lids
Can remove the lid

04.

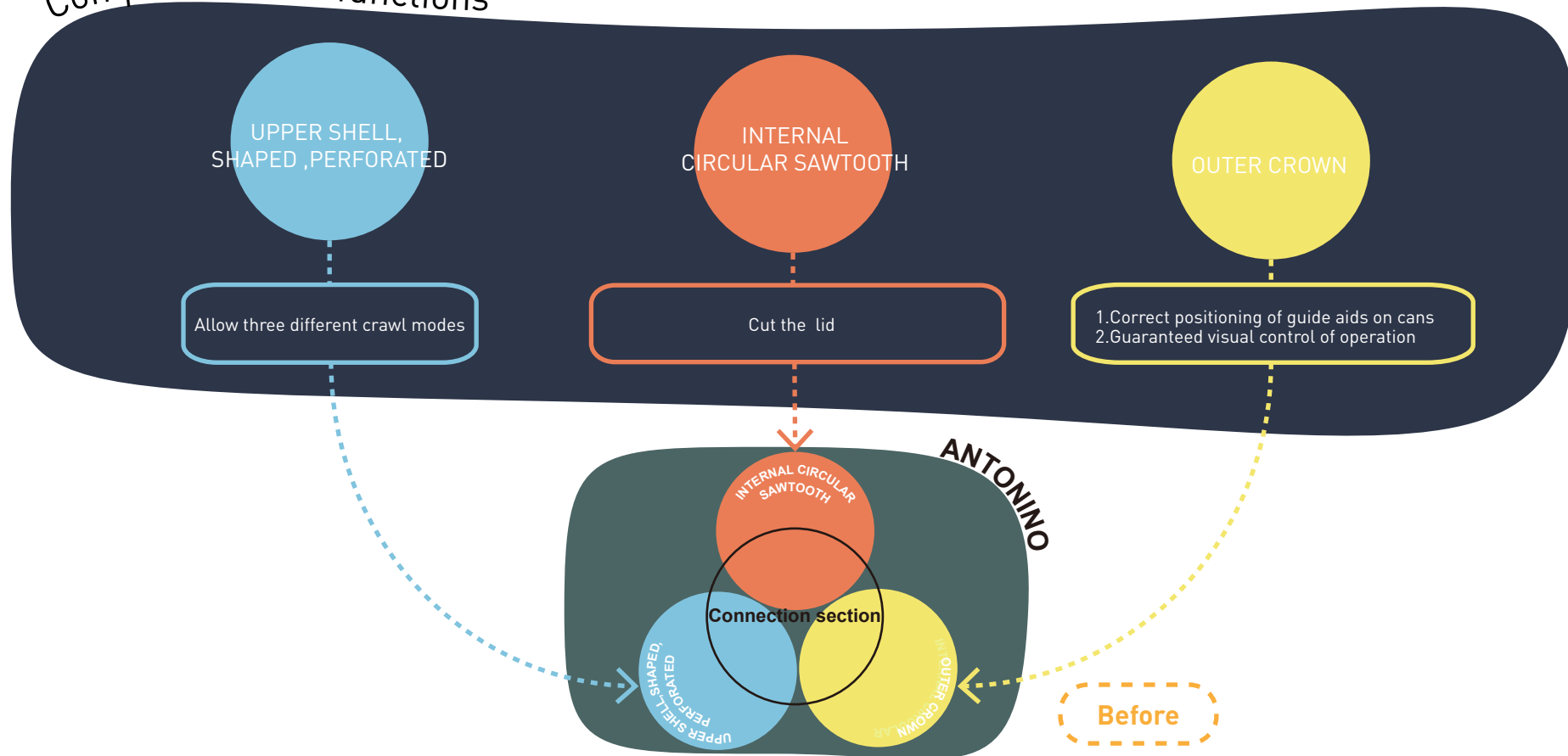
OUR DESIGN

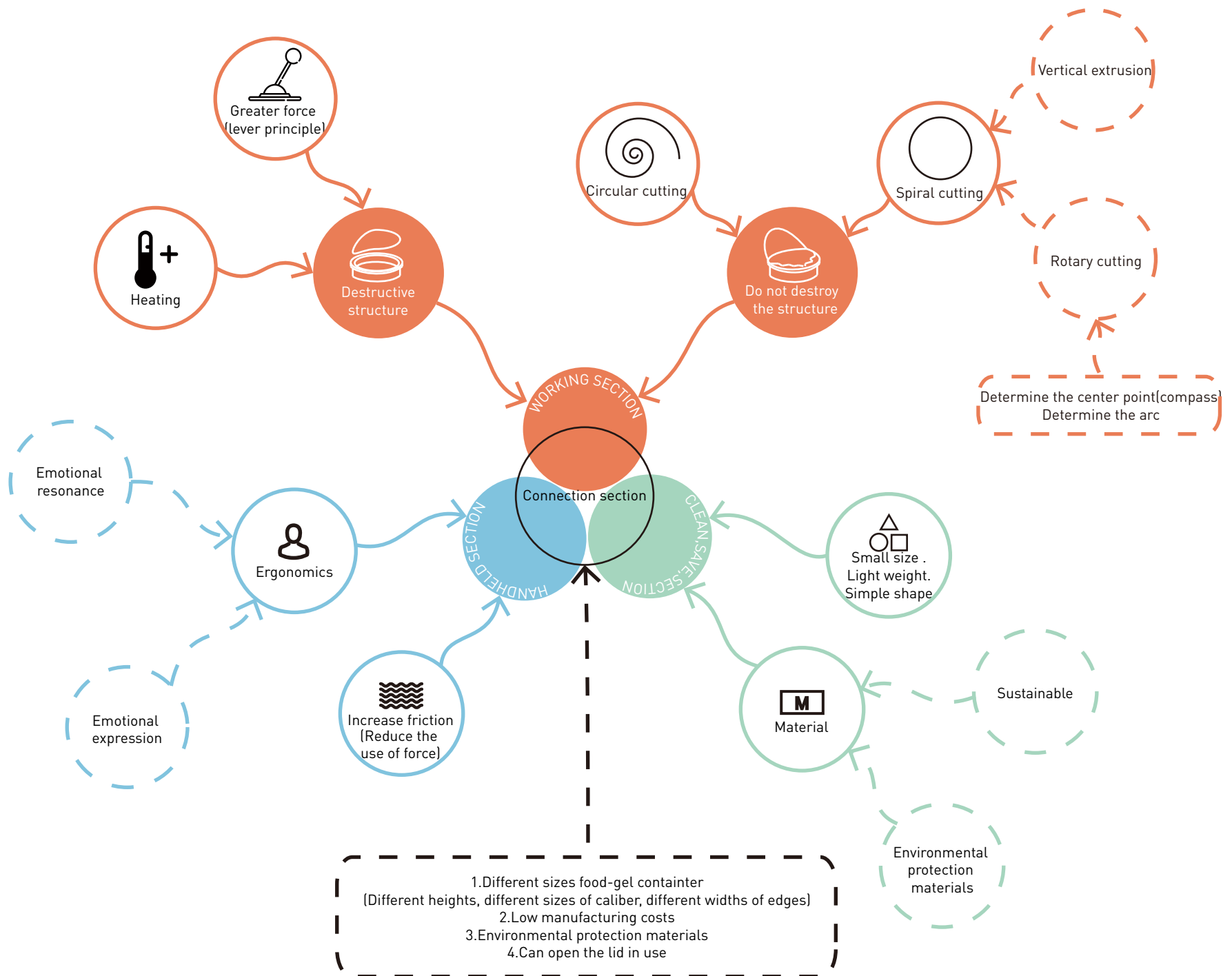


How does "ANTONINO" work?



Components and functions





How does "ANTONINO" work?

Reuse

First step



Take it

Second step



Location

Third step



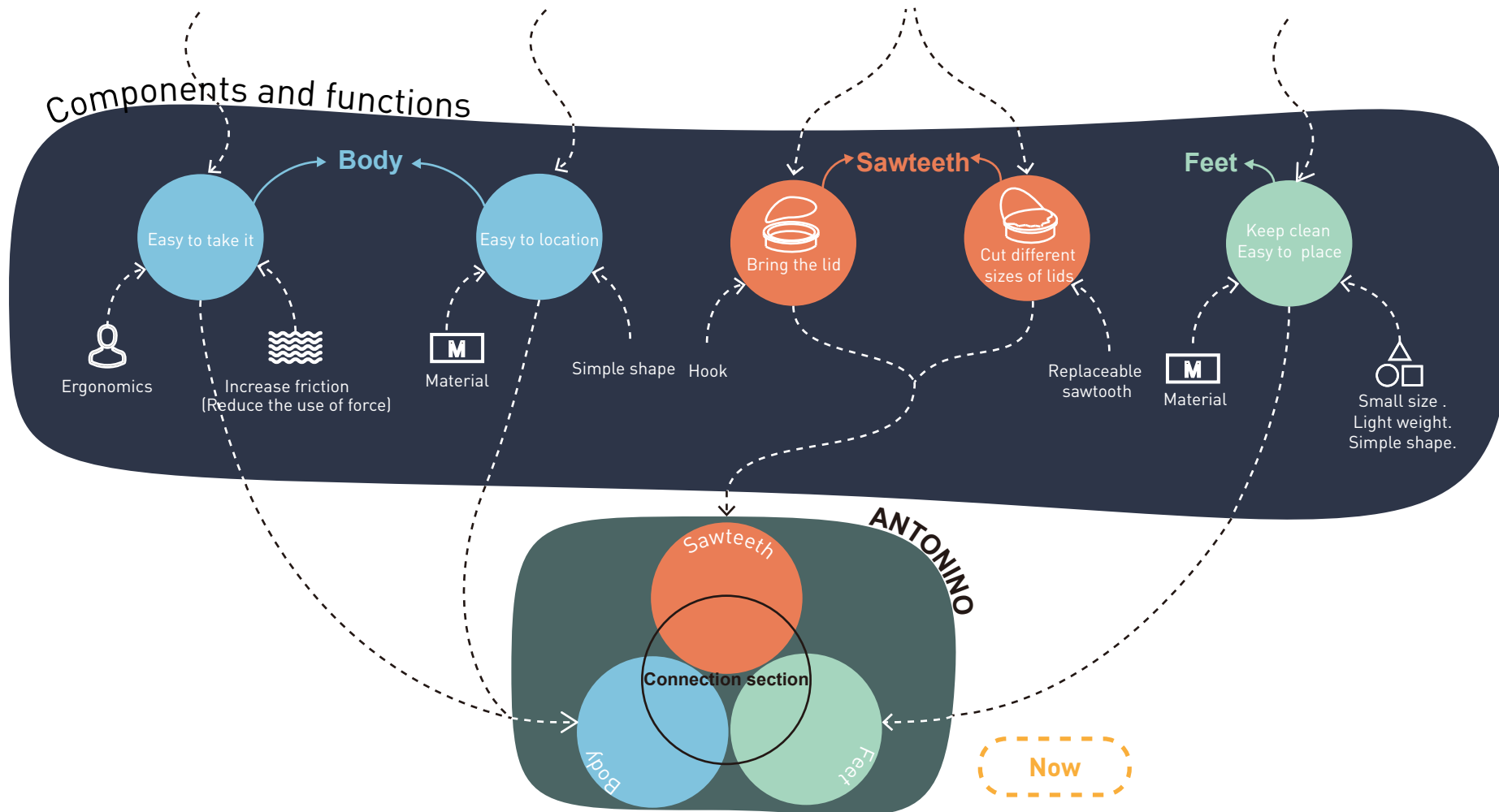
Cut and bring the lid

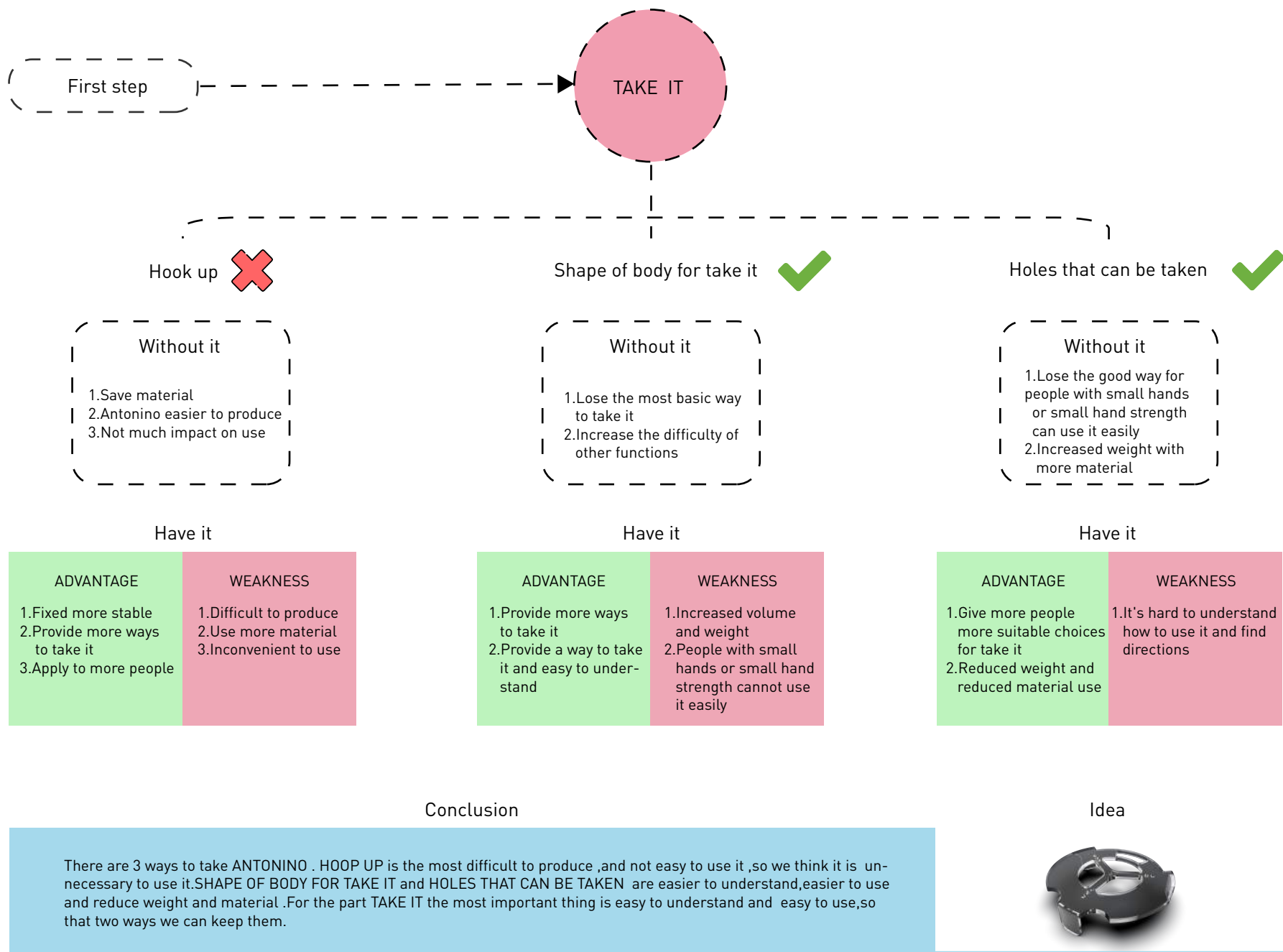
Fourth step

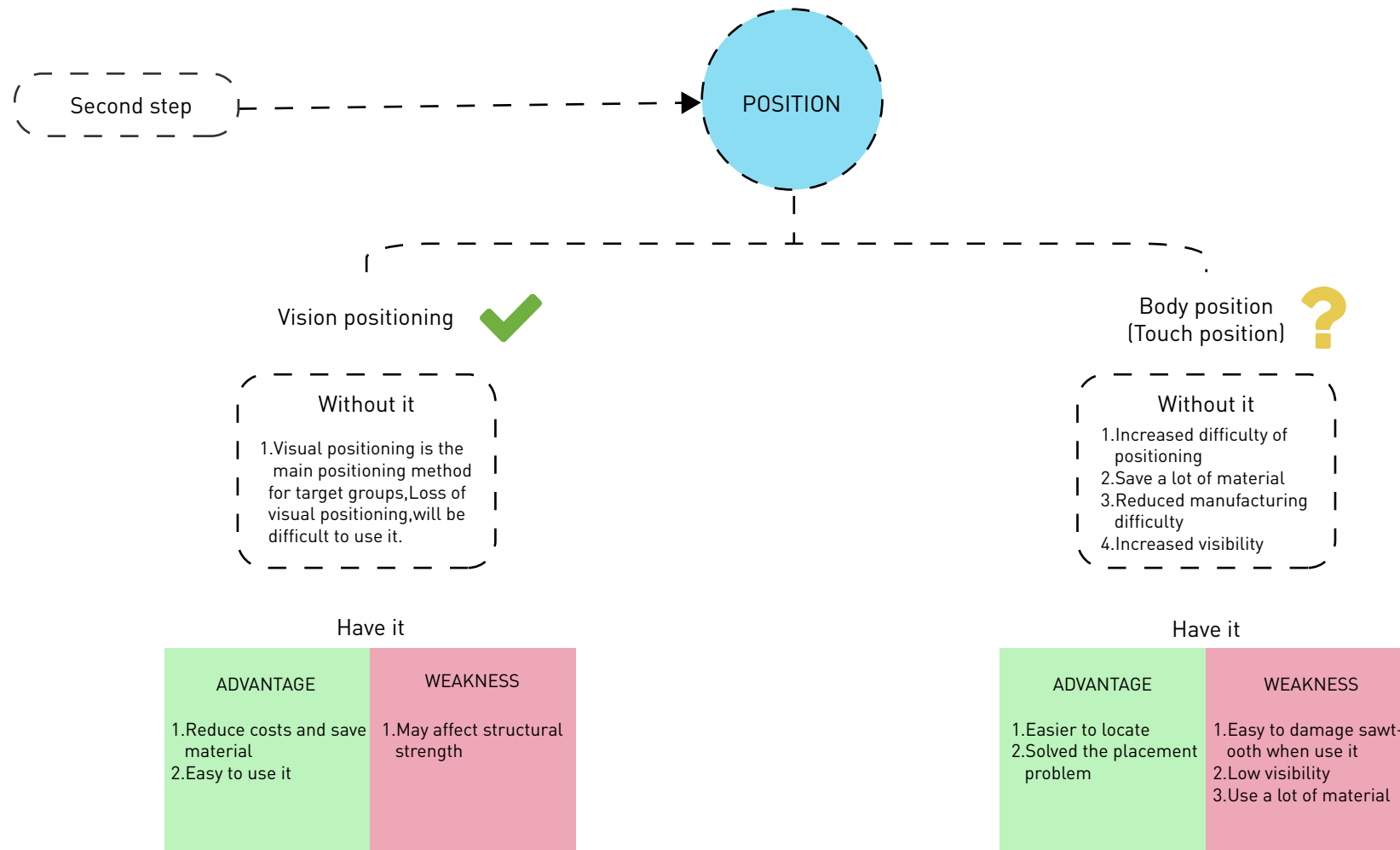


Keep clean and place it

Components and functions

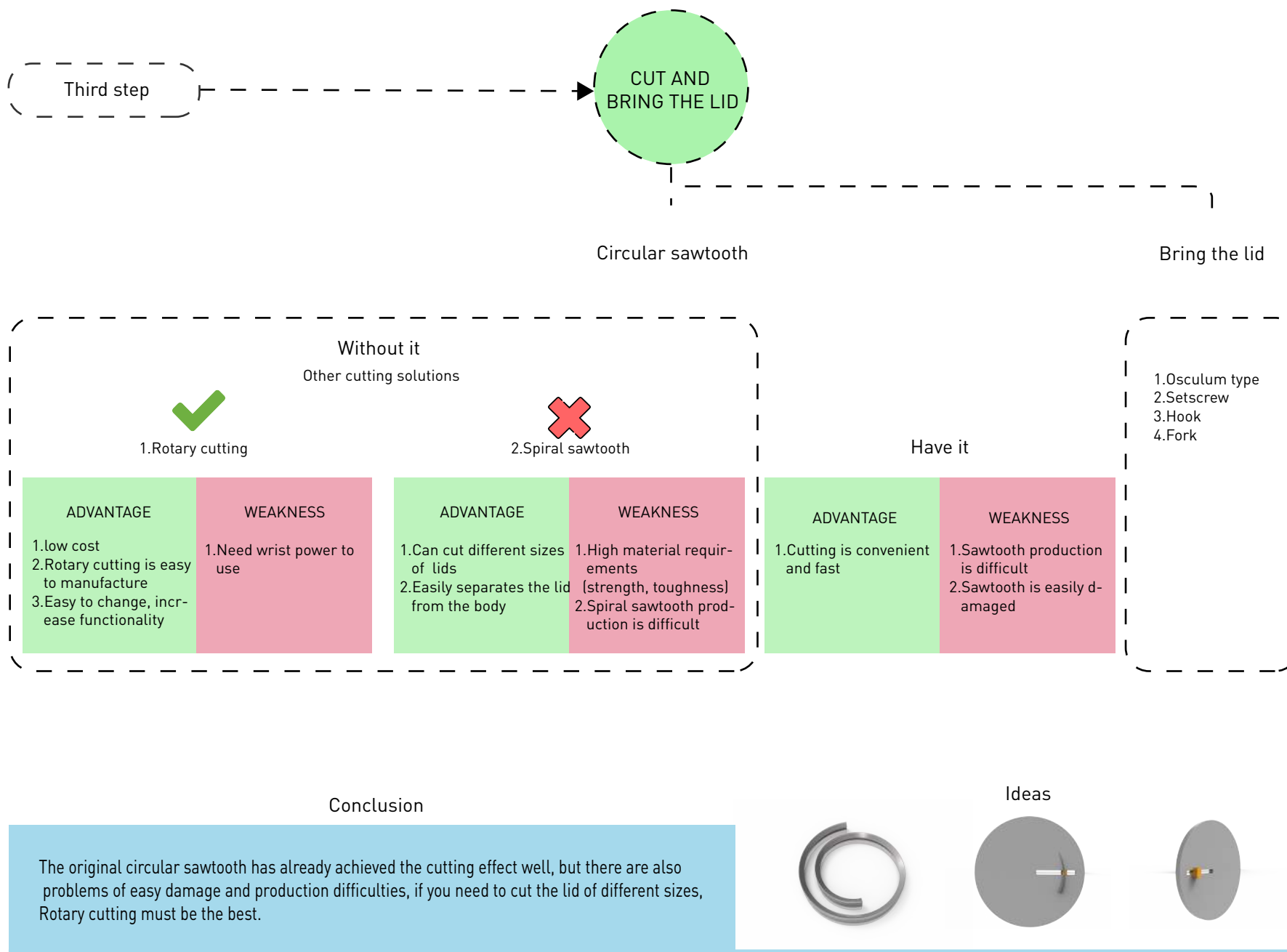


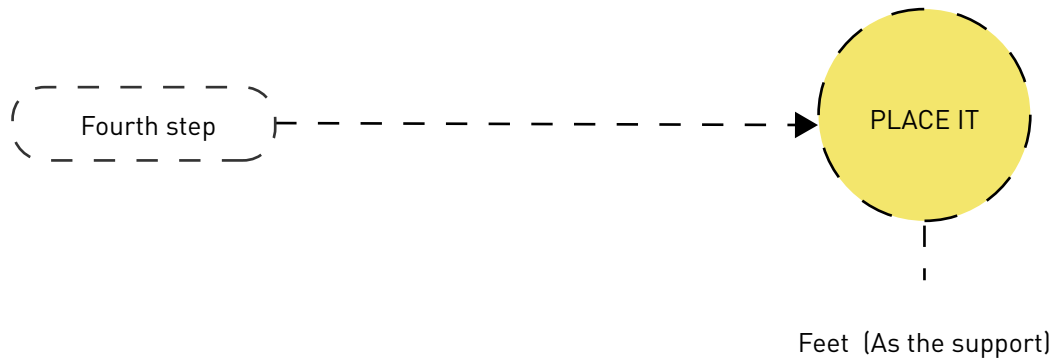






Conclusion

People have five senses and use visual and touch to achieve positioning, which are the most suitable methods for our target population. Visual positioning is the simplest, most effective, and most important positioning method. BODY POSITION is a method of assisting positioning. Now that BODY POSITION is difficult to make, it is easy to damage the sawtooth when it is used, so we need to simplify or eliminate BODY POSITION.





Without it	
Other placement methods	
Punching, hanging 	
ADVANTAGE	WEAKNESS
1. Save material 2. Easy to manufacture 3. Easy to fully ventilated	1. Need a hook 2. May affect structural strength

Have it 	
ADVANTAGE	WEAKNESS
1. Easy to place 2. Placed very stable	1. Difficult to manufacture 2. Use more materials

Conclusion

Hole in the ANTONINO so that it can hang on the hook (like many kitchen utensils), it is easier to make it dry and save space. Use the feet to place it, Feet are difficult to produce, waste a lot of material, but it is easy to use, we need to improve it.

ANTONINO

TAKE IT

Shape of body for take it ✓

ADVANTAGE

1. Provide more ways to take it
2. Provide a way to take it and easy to understand

WEAKNESS

1. Increased volume and weight
2. People with small hands or small hand strength cannot use it easily

Holes that can be taken ✓

ADVANTAGE

1. Give more people more suitable choices for take it
2. Reduced weight and reduced material use

WEAKNESS

1. It's hard to understand how to use it and find directions

CUT AND
BRING THE LID

Circular sawtooth ✓

ADVANTAGE

1. Cutting is convenient and fast

WEAKNESS

1. Sawtooth production is difficult
2. Sawtooth is easily damaged

Bring the lid ✓

1. Osculum type
2. Setscrew
3. Hook
4. Fork



I DO NOT CHOOSE IT



MY CHOICE



THERE IS A QUESTION THAT
NEEDS MODIFICATION



POSITION

Vision positioning



ADVANTAGE

- 1.Reduce costs and save material
- 2.Easy to use it

WEAKNESS

- 1.May affect structural strength

Body position (Touch position)



ADVANTAGE

- 1.Easier to position
- 2.Solved the placement problem

WEAKNESS

- 1.Easy to damage sawtooth when use it
- 2.Low visibility
- 3.Use a lot of material

DETAILED THINKING

- 1.HOLES THAT CAN BE TAKEN and Hanging hole we can mix them , one holes with two functions.
- 2.If we need BODY LOCALIZATION and FEET ,can we mix them become a simple structure.
- 3.The effective use of sawtooth is very important. Designing the specific shape of the sawtooth and achieving the function of separating the lid from the can will be our next thinking.

PLACE IT

Punching, hanging



ADVANTAGE

- 1.Save material
- 2.Easy to manufacture
- 3.Easy to fully ventilated

WEAKNESS

- 1.Need a hook
- 2.May affect structural strength

Feet (As the support)



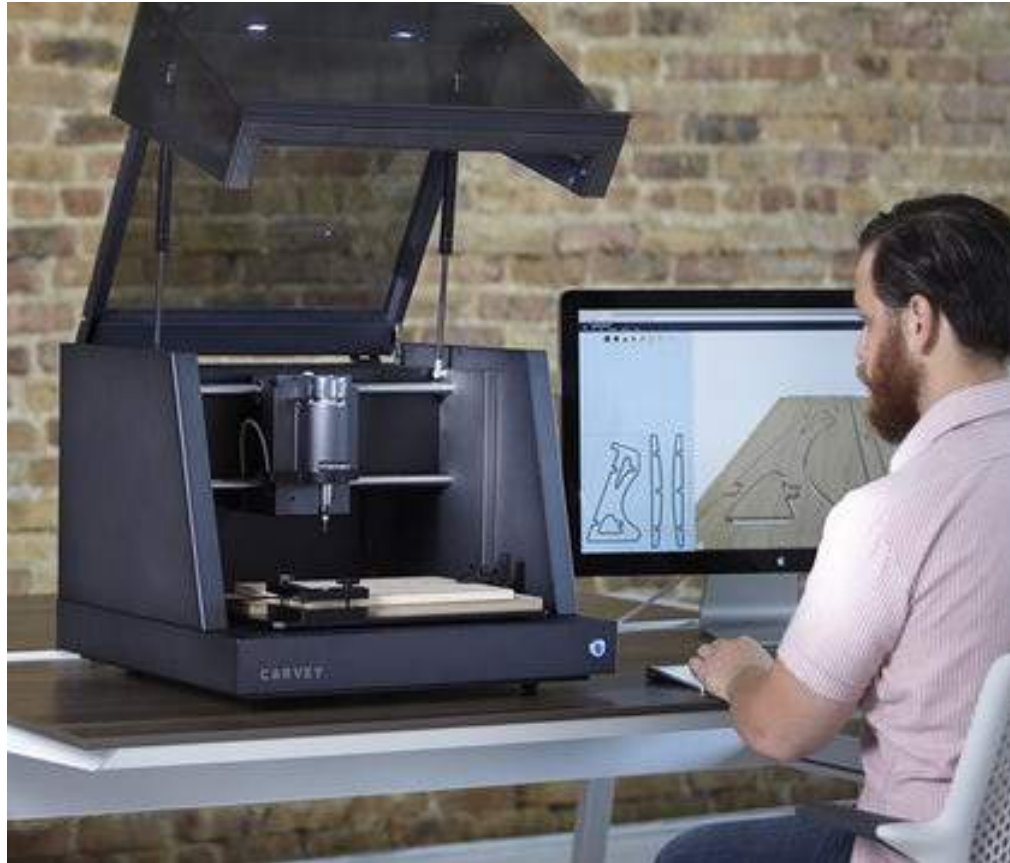
ADVANTAGE

- 1.Easy to place
- 2.Placed very stable

WEAKNESS

- 1.Difficult to manufacture
2. Use more materials

4.2 Desktop production



What is desktop production?

Desktop molding tools such as 3D printers are equivalent to digital cameras and music editing tools, and anyone can use them to create one-off products for their own use.

The advantages of mass production are repetitive manufacturing and standardization, while 3D printing is beneficial for personalization and customization. One of the big wins in the digital manufacturing era is that we can choose between mass production and customization without paying expensive hand-made costs. Both have now become viable automated manufacturing methods

Four desktop factories

We can imagine something, draw it on a computer, and a machine can make it real. We can push a button and an object will appear (eventually). As Arthur C. Clarke put it, “any sufficiently advanced technology is indistinguishable from magic.” This is getting close.

1) 3-D printer.

A 3-D printer and the paper printer you’ve probably already got on your desktop play similar roles. The traditional laser (or inkjet) printer is a 2-D printer: it takes pixels on a screen and turns them into dots of ink or toner on a 2-D medium, usually paper. A 3-D printer, however, takes “geometries” onscreen (3-D objects that are created with the same sort of tools that Hollywood uses to make CG movies) and turns them into objects that you can pick up and use.

Some 3-D printers extrude molten

plastic in layers to make these objects, while others use a laser to harden layers of liquid or powder resin so the product emerges from a bath of the raw material. Yet others can make objects out of any material from glass, steel, and bronze to gold, titanium, or even cake frosting. You can print a flute or you can print a meal.

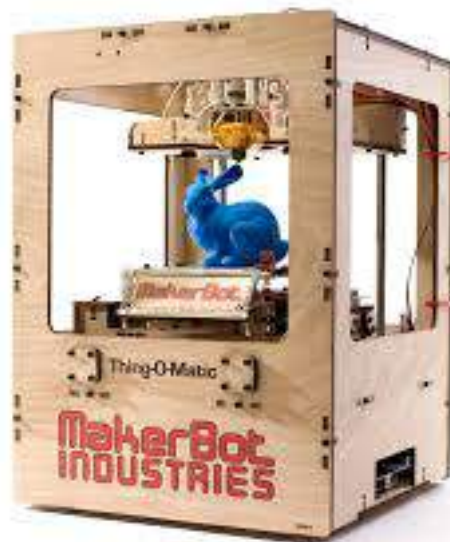


Fig.4.2.1-MakerBot Thing-O-Matic

You can even print human organs out of living cells, by squirting a fluid with suspended stem cells onto a support matrix, much as your inkjet printer squirts ink onto paper.

2) CNC machine

While a 3-D printer uses an “additive” technology to make things (it builds them up layer by layer) a CNC (“computer numerical control”) router or mill can take the same file and make similar products with a “subtractive” technology, which is a fancy way of saying that it uses a drill bit to cut a product out of a block of plastic, wood or metal. There are countless other specialty

CNC machines: CNC quilters and embroidery machines, CNC sign and vinyl cutters (for silk-screening), and CNC paper and fabric cutters for crafters, to name a few.



Fig.4.2.2-Laguna's IQ benchtop CNC router

Some CNC machines are the size of a large table and are designed to make furniture out of wood (industrial CNC machines can be as big as a warehouse and can carve out objects as big as an airplane fuselage).

3) Laser Cutter

One of the most popular of the new desktop tools is the laser cutter, which is mostly a 2-D device. It uses a powerful laser to cut a precise pattern of any complexity into sheets of whatever material you feed it, from plastics and woods to thin metal.

Many CAD programs can break a 3-D object into 2-D parts so they can be fabricated with a laser cutter, and then neatly slotted together like one of those plywood dinosaur kits.



Fig.4.2.3-Epilog Zing laser cutter

4) 3-D Scanner

This device, which can be as small as a breadbox, allows you to do "reality capture." Rather than having to draw an object from scratch, you can put an existing object in the scanner. It then uses lasers or other light sources and a camera to image the object from all sides, and then turns it into a 3-D image made up of tens or hundreds of thousands of polygons,

just like a videogame character or CG movie set. The software can simplify it and let you modify any part you want. A common first experiment is to scan your head, then exaggerate your features and 3-D print a bobble-head of yourself.



Fig.4.2.4-Roland Picza 3-D scanner

Why choose the 3D printing?



Cost reduction

The 3D printing process allows the creation of parts and/or tools through additive manufacturing at rates much lower than traditional machining.



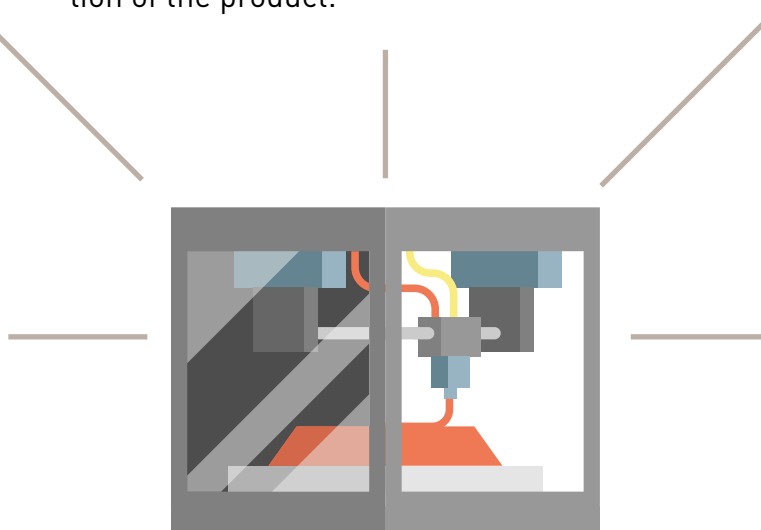
Prototyping

A conceptual picture of the product is better than the description since it is worth 1,000 words, but with 3D Printing, a model speaks 1,000 pictures, so, getting to hold the tangible product-to-be, in hand, clears all lines of communication. There is no ambiguity when holding the exact, or at least a very close, representation of the product.

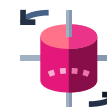


Increased efficiency

3D printing allows ideas to develop faster than ever. Being able to 3D print a concept the same day it was designed shrinks a development process from what might have been days to a matter of hours, helping users stay one step ahead of the competition.



Product development



Being able to test ideas quickly and discover what doesn't work accelerates discovery leading to an ideal solution. 3D printing allows a product developer to make breakthroughs at early stages that are relatively inexpensive.

Innovation



With standard mass-production, all parts come off the assembly line or out of the mold the same. With 3D printing, one can personalize, customize and tweak a part to uniquely fit their needs, which allows for custom fits in every aspect.

4.3 Product material and color

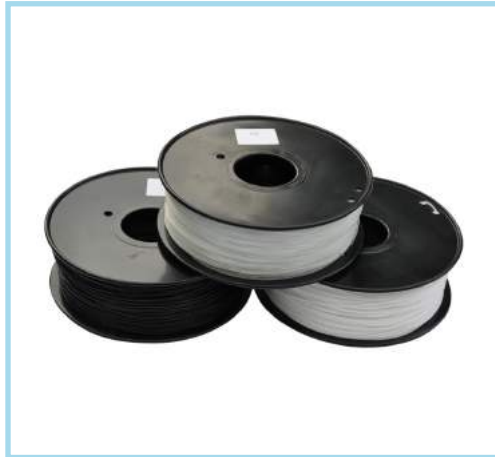


Fig.4.3.1

MATERIAL NAME : NYLON (PA)

PRICE : 15€/KG

DIAMETER : 1.75mm/3.00mm±0.05mm

PRINTING TEMPERATURE : 250-280 °C

COLOUR : WHITE ,BLACK,TRANSPARENT

MATERIAL CHARACTERISTICS :

HIGH ELASTICITY,HIGH TOUGHNESS,HIGH PURITY,HIGH STRENGTH.

(Elevata elasticità, elevata tenacità, elevata purezza, elevata resistenza)



Fig.4.3.2

MATERIAL NAME : PC

PRICE : 13€/KG

DIAMETER : 1.75mm/3.00mm±0.05mm

PRINTING TEMPERATURE : 250-280 °C

COLOUR : WHITE ,BLACK,TRANSPARENT...

MATERIAL CHARACTERISTICS :

HIGH TEMPERATURE RESISTANCE,UV RESISTANCE,GOOD LIGHT TRANSMISSION,HIGH GLOSS,HIGH HARDNESS.

(Resistenza alle alte temperature, resistenza ai raggi UV, buona trasmissione della luce, alta brillantezza, elevata durezza)

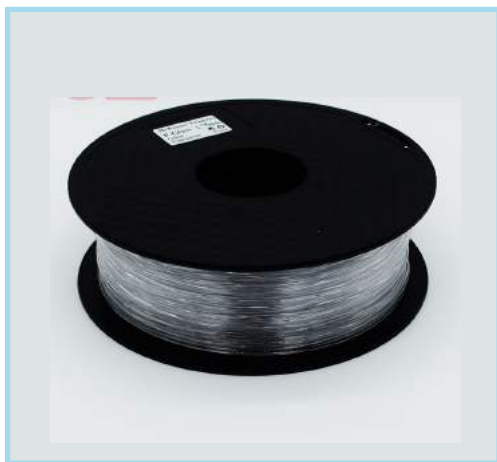


Fig.4.3.3

MATERIAL NAME : P-GLASS(Composites of PC and PETG)
PRICE : 21€/KG

DIAMETER : 1.75mm/3.00mm±0.05mm

PRINTING TEMPERATURE : 200-220 °C

COLOUR : TRANSPARENT

MATERIAL CHARACTERISTICS :

HIGH TRANSPARENCY , GOOD RIGIDITY , GOOD TOUGHNESS,
OPTICAL PROPERTIES OVER GLASS.

(Elevata trasparenza, buona rigidità, buona tenacità, proprietà
ottiche sul vetro)



Fig.4.3.4

MATERIAL NAME : PETG
PRICE : 15.5€/KG

DIAMETER : 1.75mm/3.00mm±0.05mm

PRINTING TEMPERATURE : 250-280 °C

COLOUR : WHITE ,BLACK,TRANSPARENT...

MATERIAL CHARACTERISTICS :

HIGH TEMPERATURE RESISTANCE,GOOD GLOSS,GOOD LIGHT
TRANSMISSION,GOOD TOUGHNESS.

(Resistenza alle alte temperature, buona lucentezza, buona
trasmissione della luce, buona tenacità)



Fig.4.3.5

MATERIAL NAME : Photosensitive resin/Resina fotosensibile (liquid)

PRICE : 0.78€/g (Material and Processing)

COLOUR : WHITE ,TRANSPARENT, TRANSLUCENT

MATERIAL CHARACTERISTICS :

High transparency, good light transmission, smooth surface, high precision.

(Elevata trasparenza, buona trasmissione della luce, superficie liscia, alta precisione)

OTHER MATERIALS : PLA and ABS Poor visibility,TPU Hardness difference.
These materials do not meet the needs of our design.



Fig.4.3.6

MATERIAL NAME : PLA



Fig.4.3.7

MATERIAL NAME : ABS



Fig.4.3.8

MATERIAL NAME : TPU

Why we choose resin ?

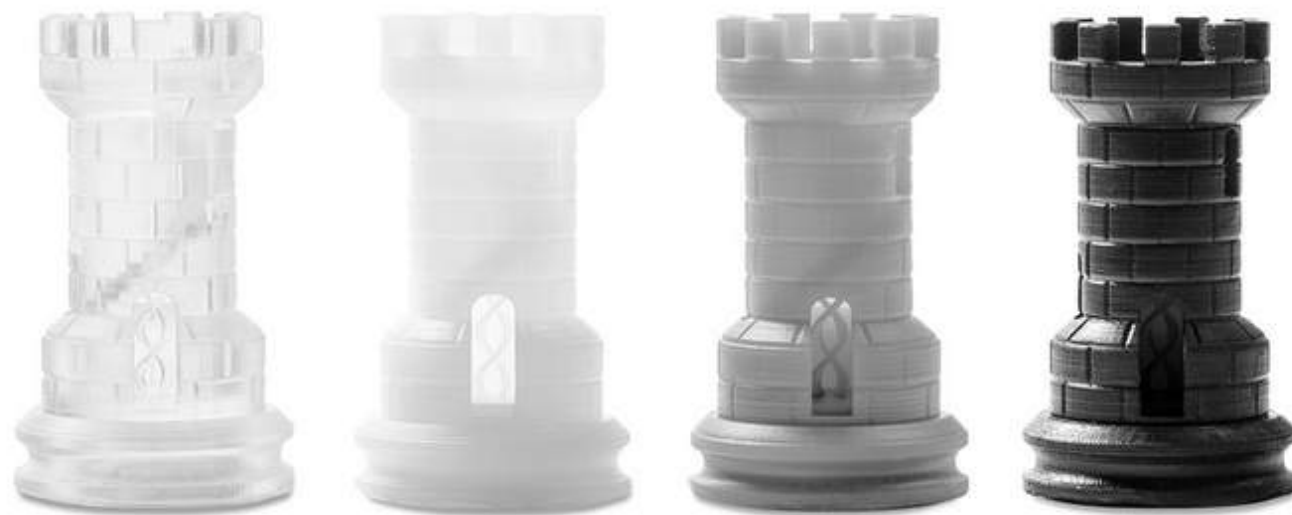


Fig.4.3.9



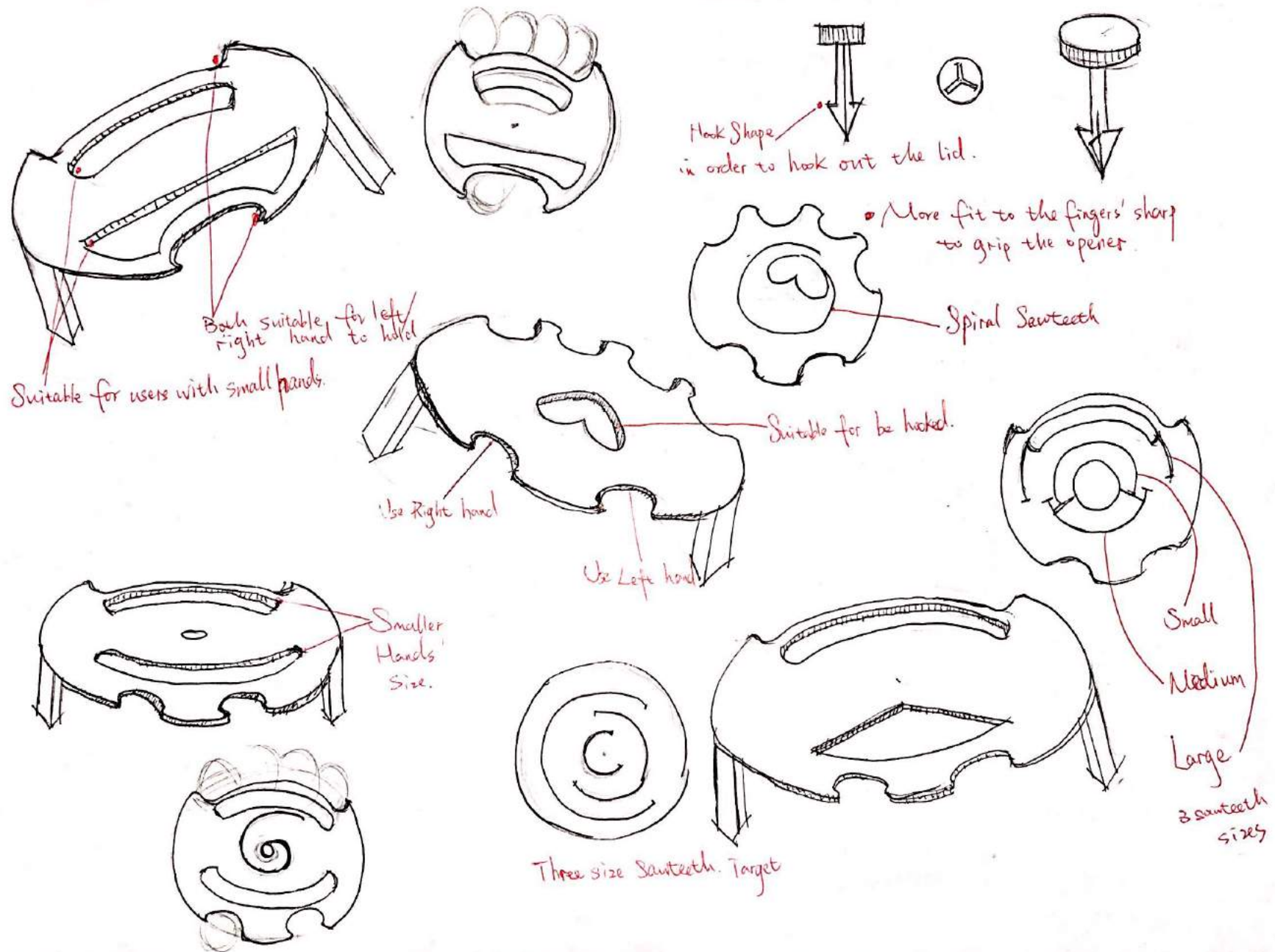
Resin

In polymer chemistry and materials science, resin is a solid or highly viscous substance of plant or synthetic origin that is typically convertible into polymers.

Conclusion

- 1.White resin is very cheap, can be used as a sawtooth .
- 2.Photosensitive resin has a transparent material to facilitate positioning.
- 3.Resin extracted from plants, can be used to make fake teeth, in line with food safety.
- 4.Photosensitive resin has high transparency, good light transmission, smooth surface, high precision.

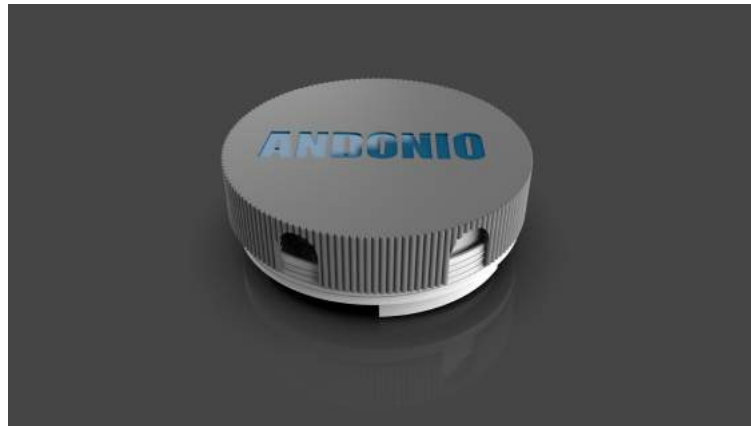
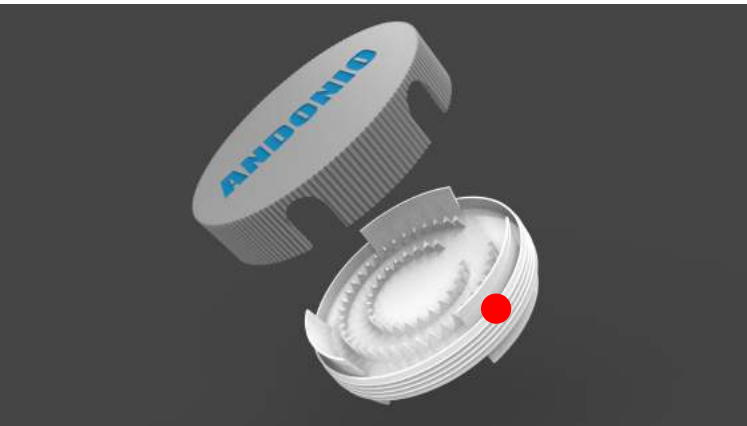
4.4 Sketch and rendering



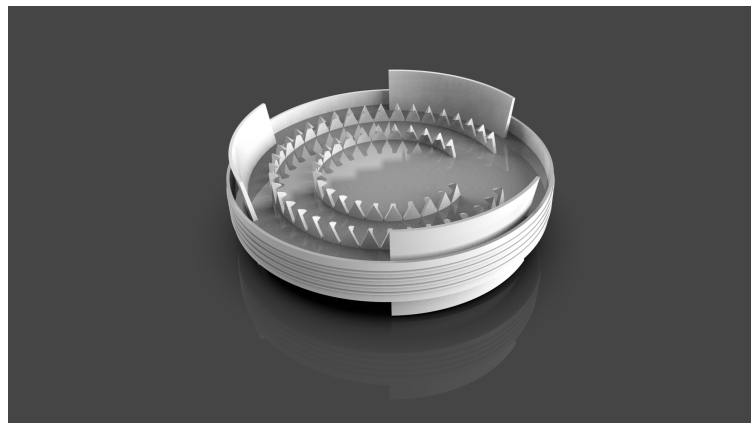
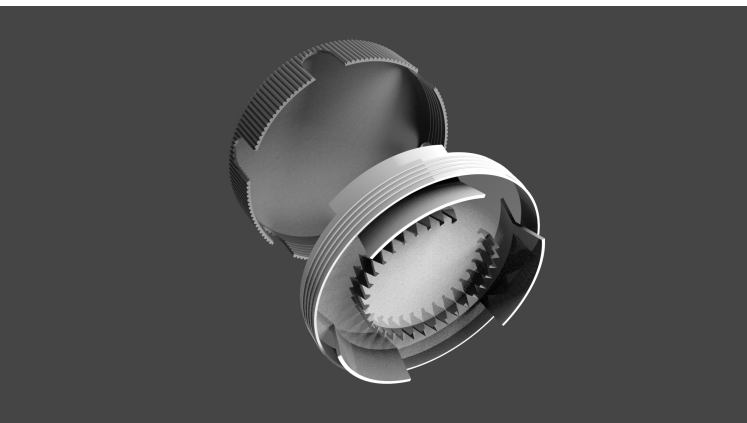
Time April

Model 1st

Rendering



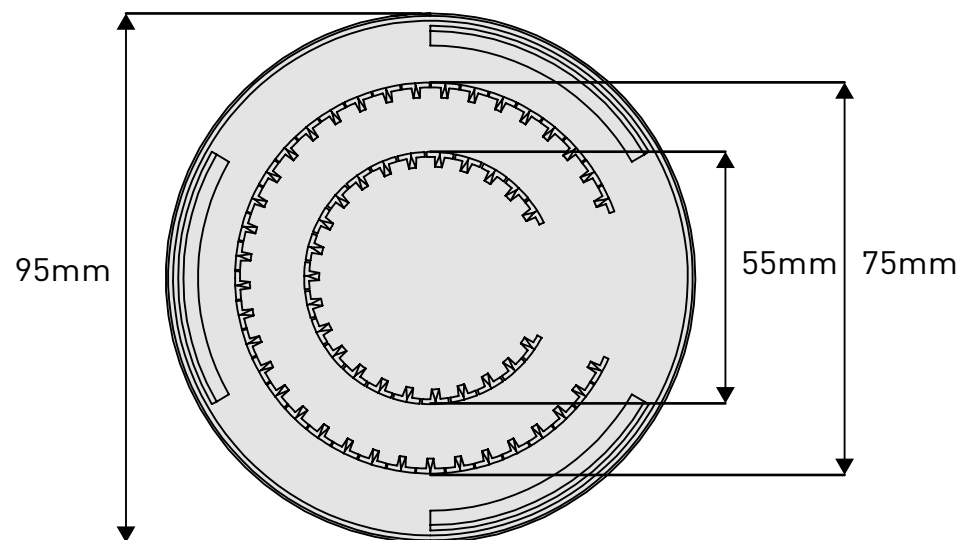
- White
- Plastic material
- Body +sawtheeth
cost 35€



Time April

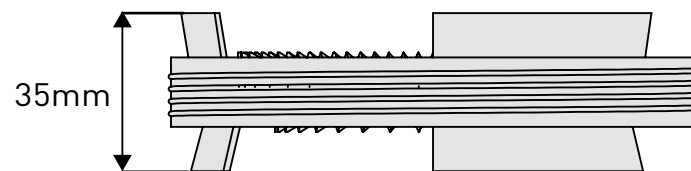
Model 1st

Dimensions

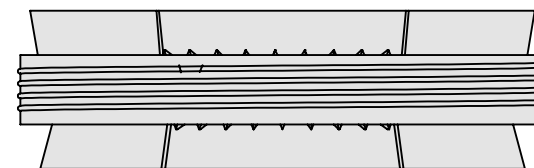


Top View

Proportion: 1.5 : 1



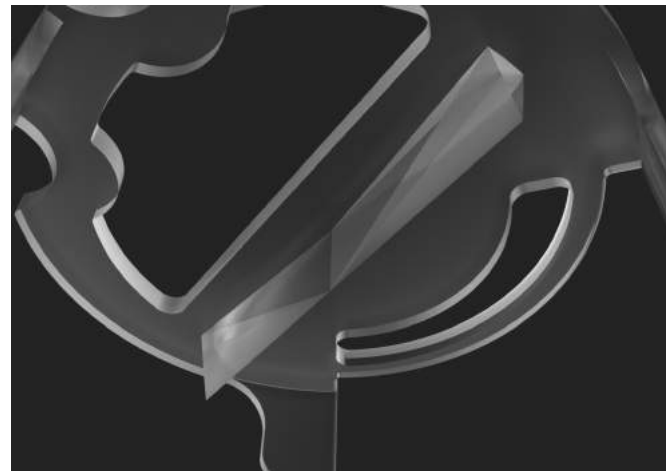
Front View



Left View



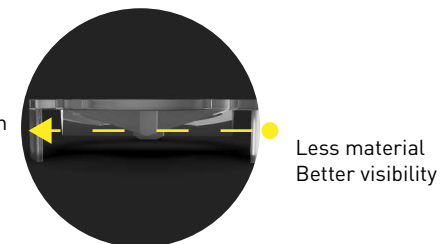
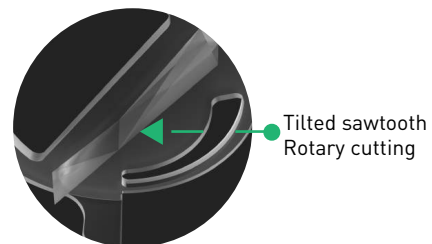
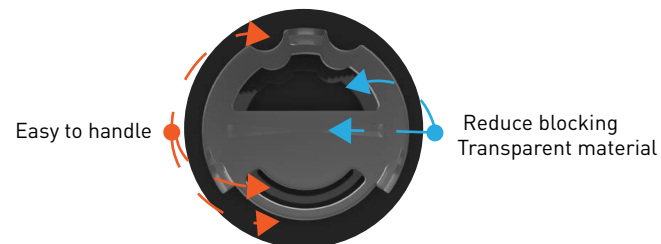
Rendering



● Transparent

Resin material

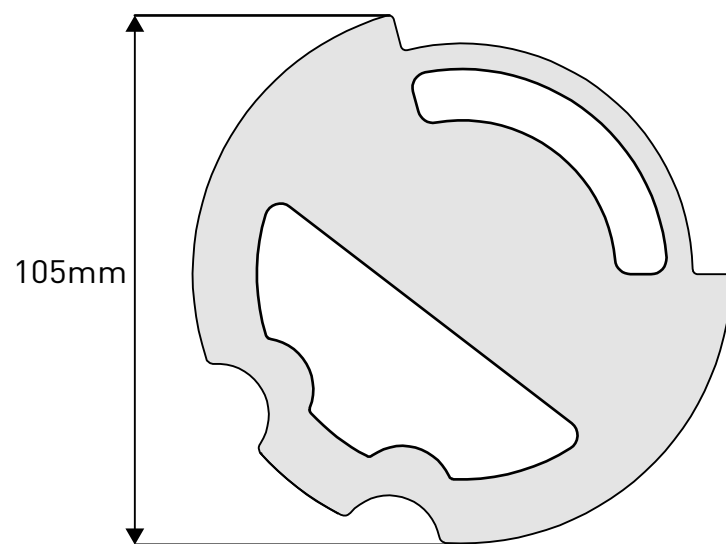
● Body +sawtheeth
cost 33€



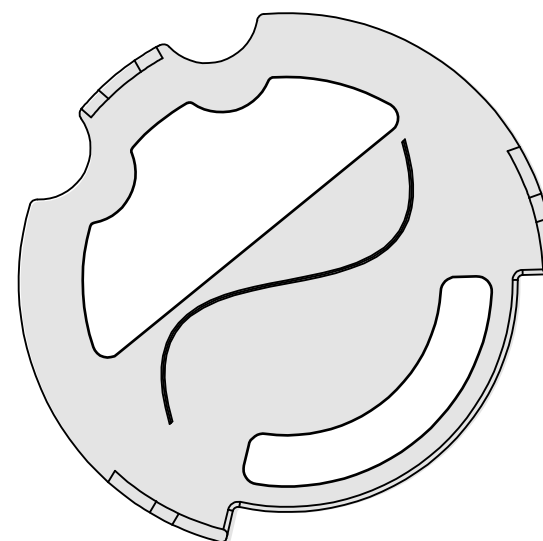


Dimensions

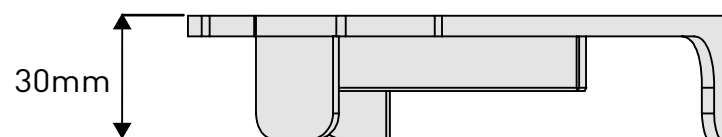
Proportion: 1.5 : 1



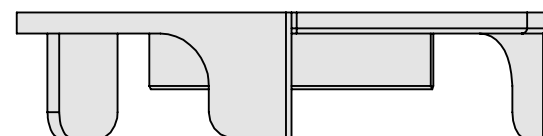
Top View



Bottom View



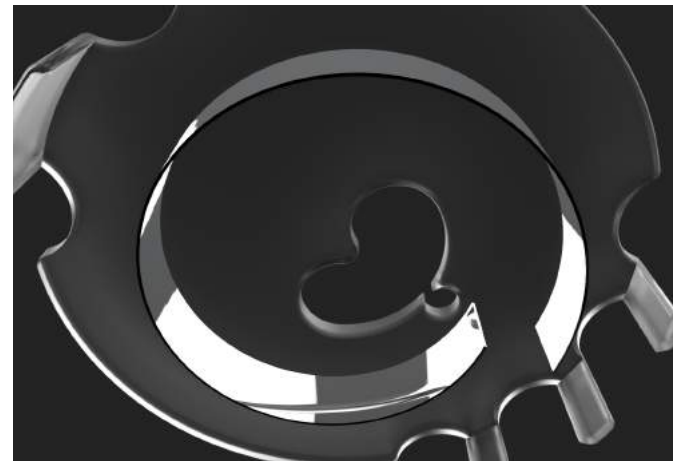
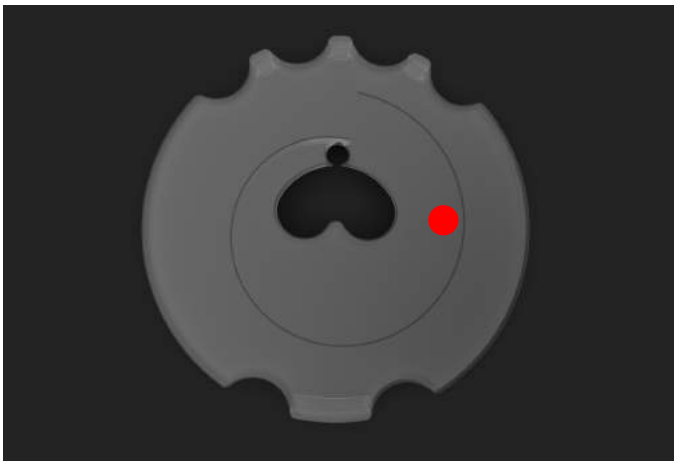
Front View



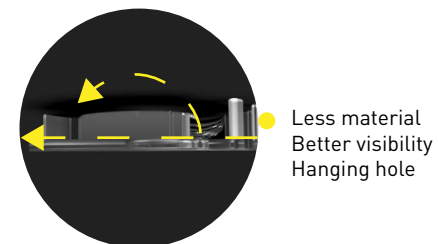
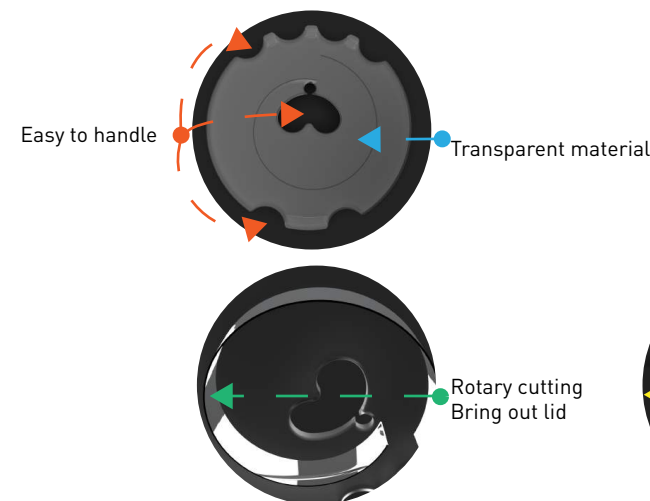
Left View

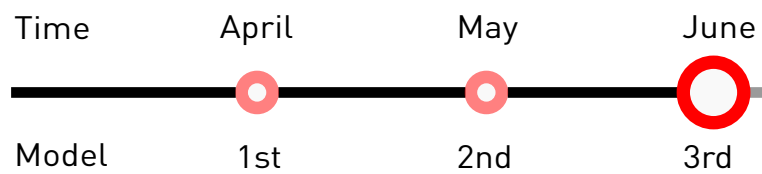


Rendering

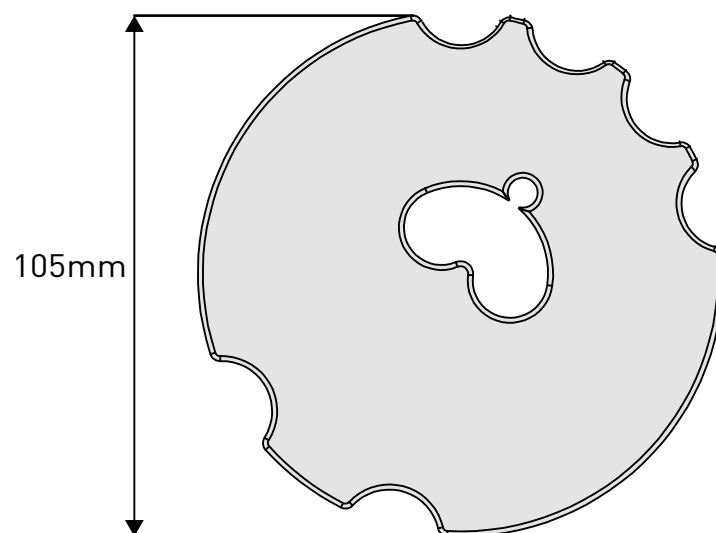


- Transparent
- Resin material
- Body +sawtheeth
cost 31€



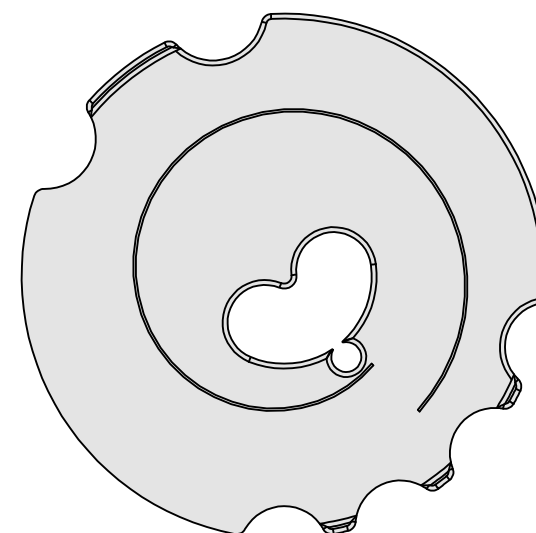


Dimensions

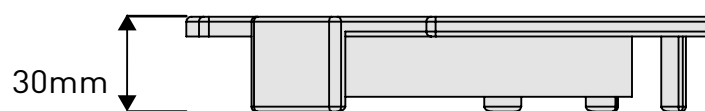


Top View

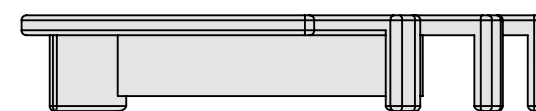
Proportion: 1.5 : 1



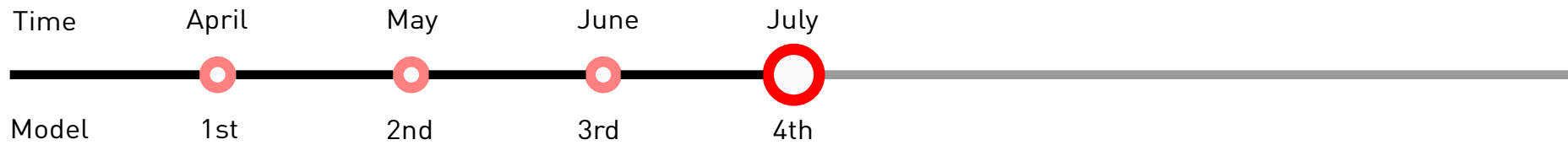
Bottom View



Front View



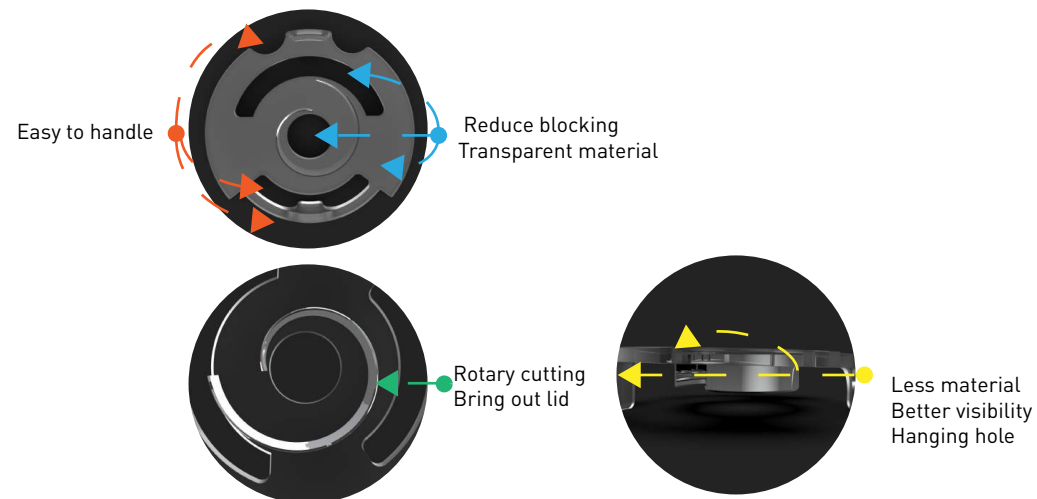
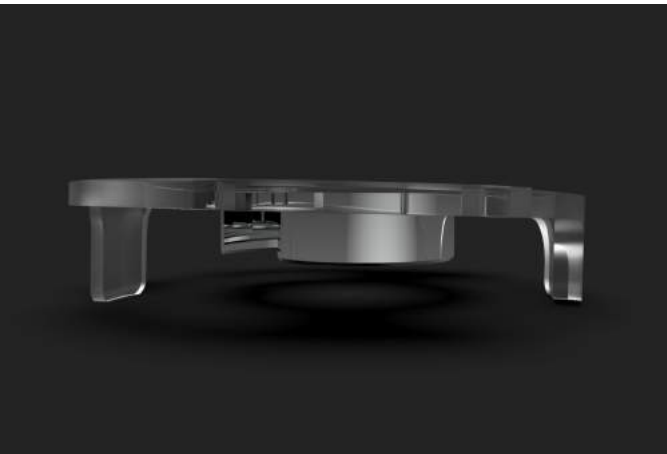
Left View

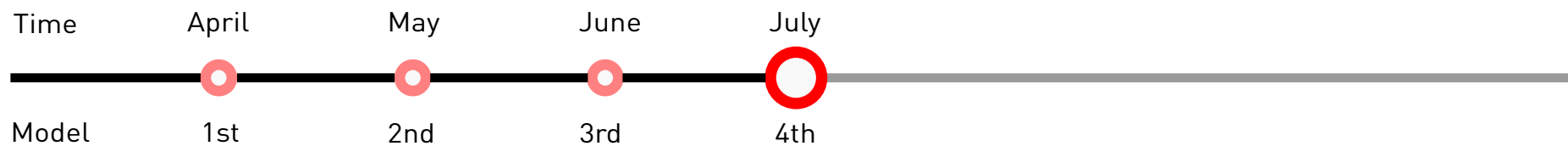


Rendering

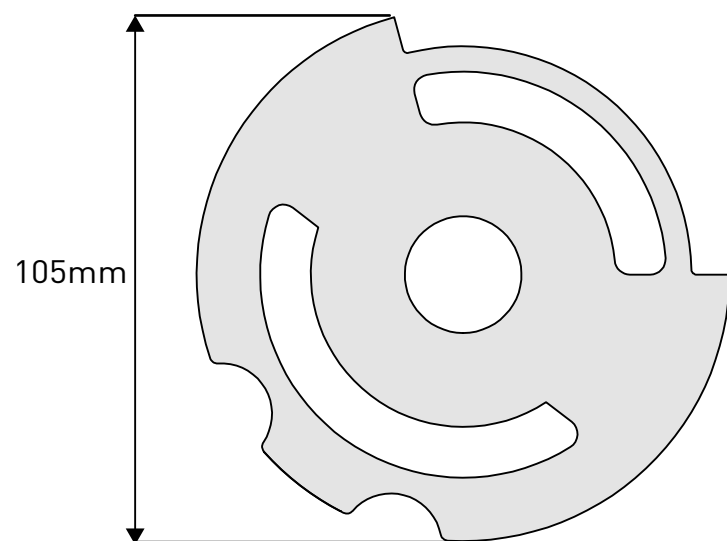


- Transparent
- Resin material
- Body +sawtheeth
cost 28.5€

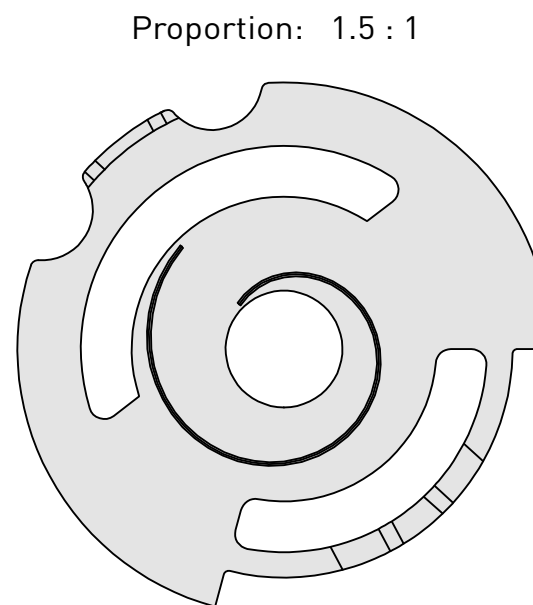




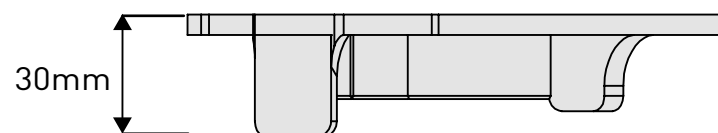
Dimensions



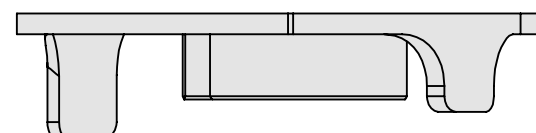
Top View



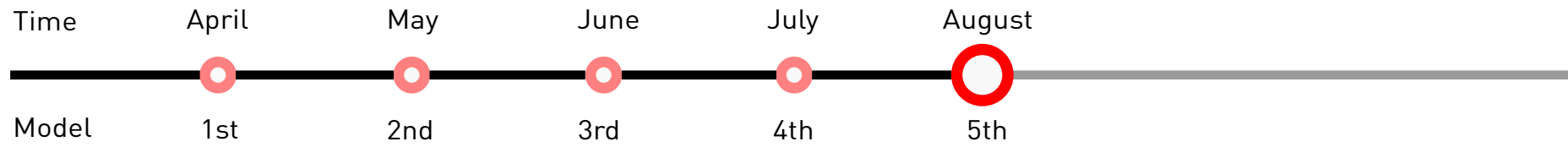
Bottom View



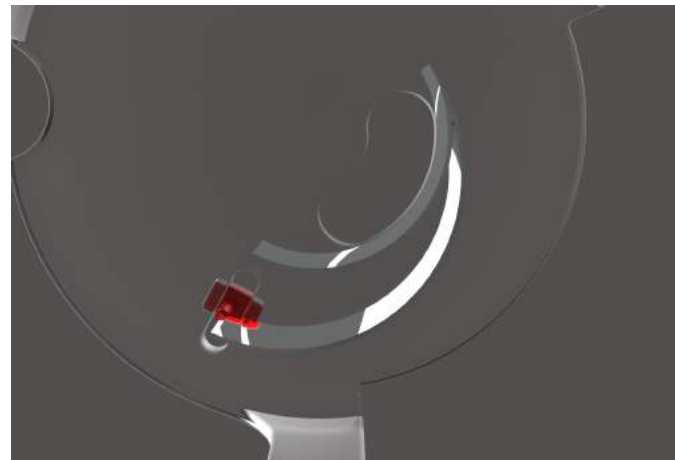
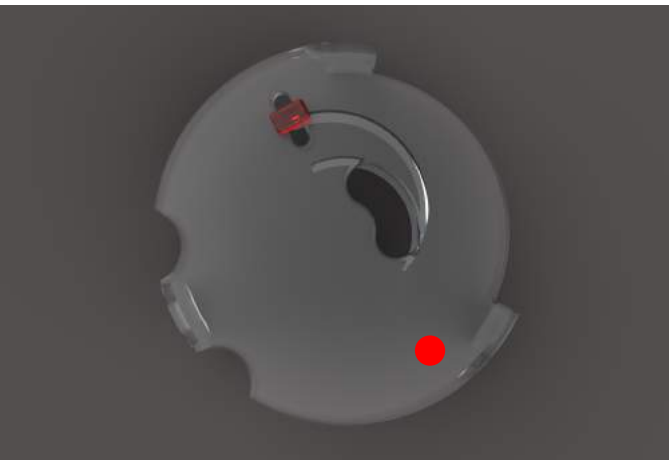
Front View



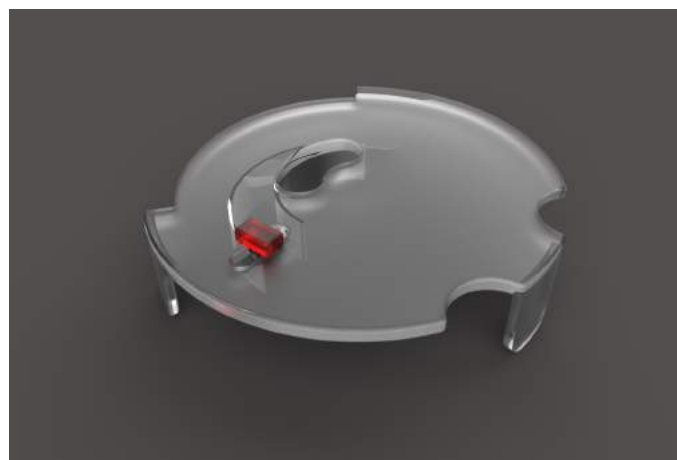
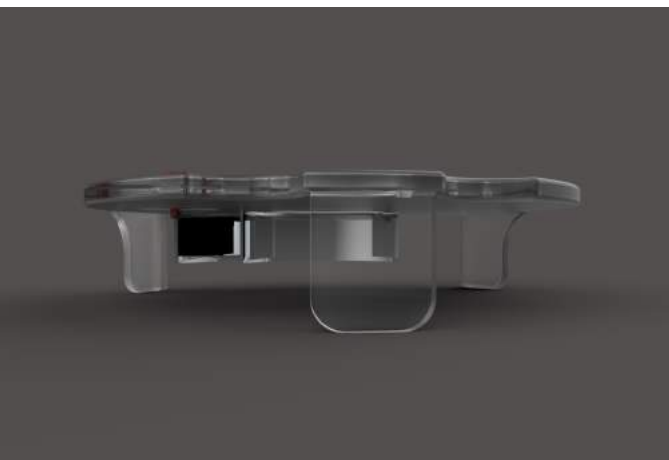
Left View

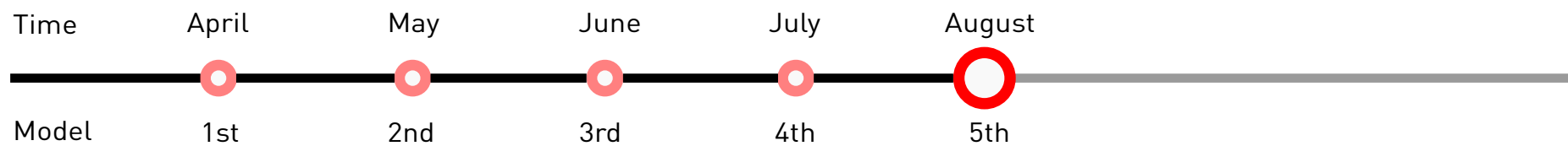


Rendering



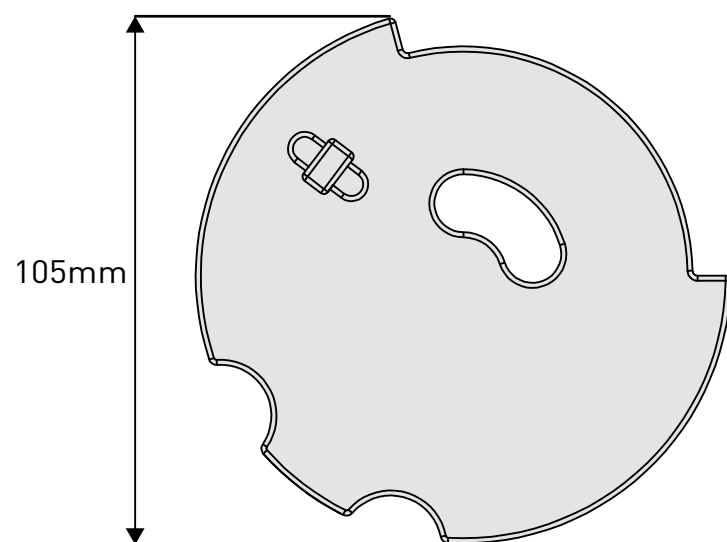
- Transparent
- Resin material
- Body +sawteeth
cost 27€



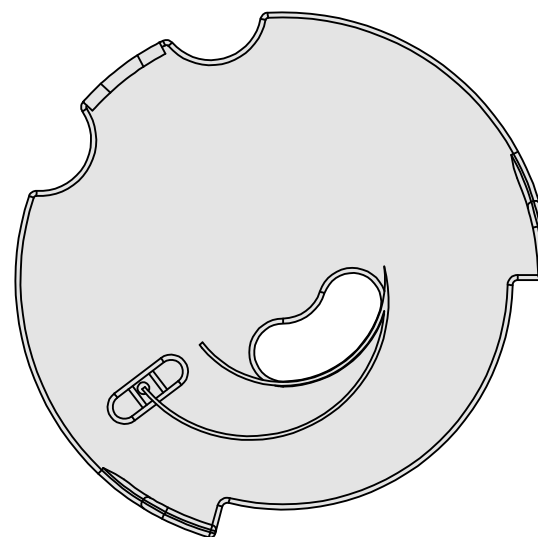


Dimensions

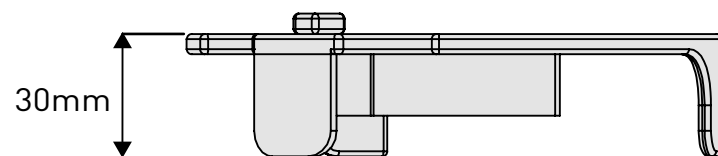
Proportion: 1.5 : 1



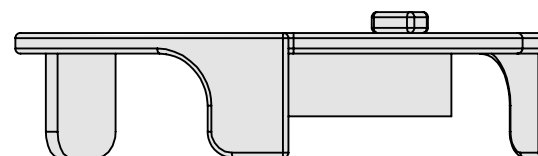
Top View



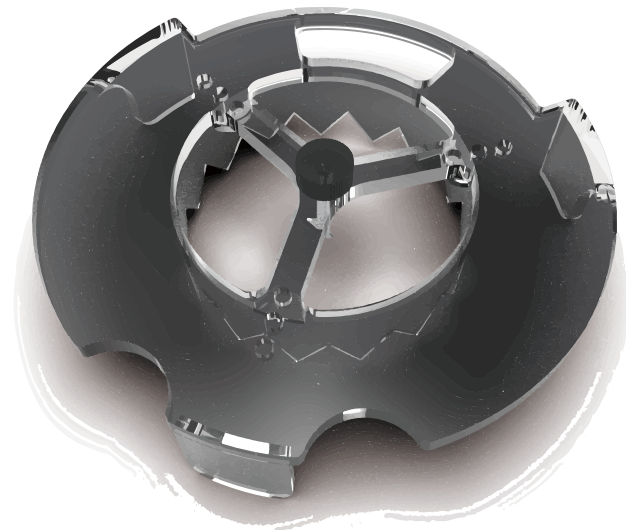
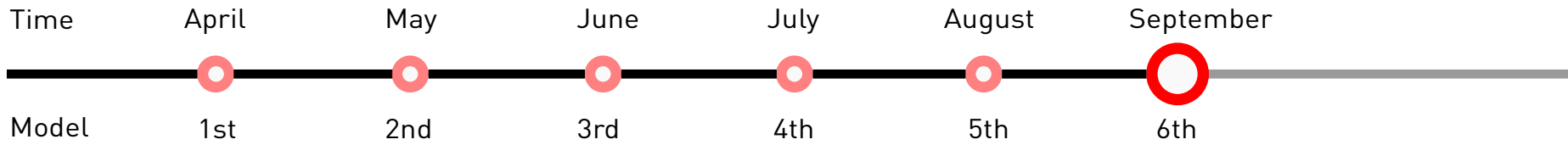
Bottom View



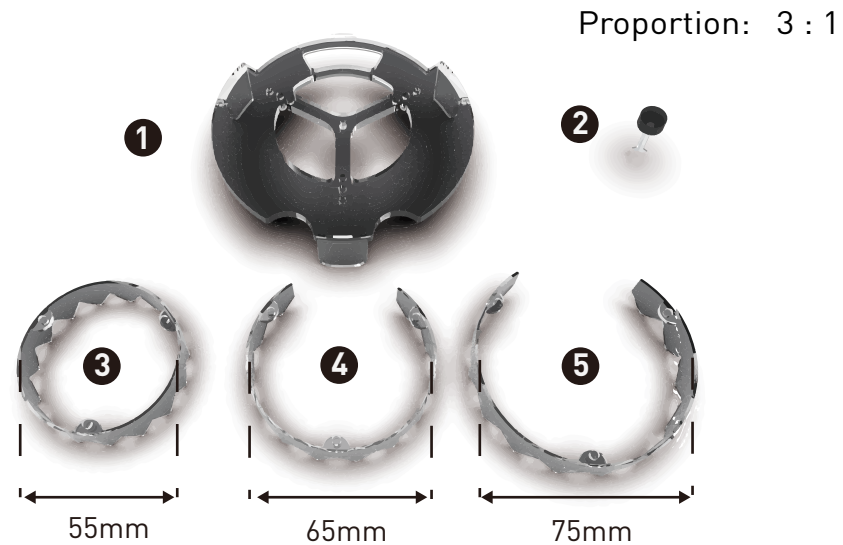
Front View



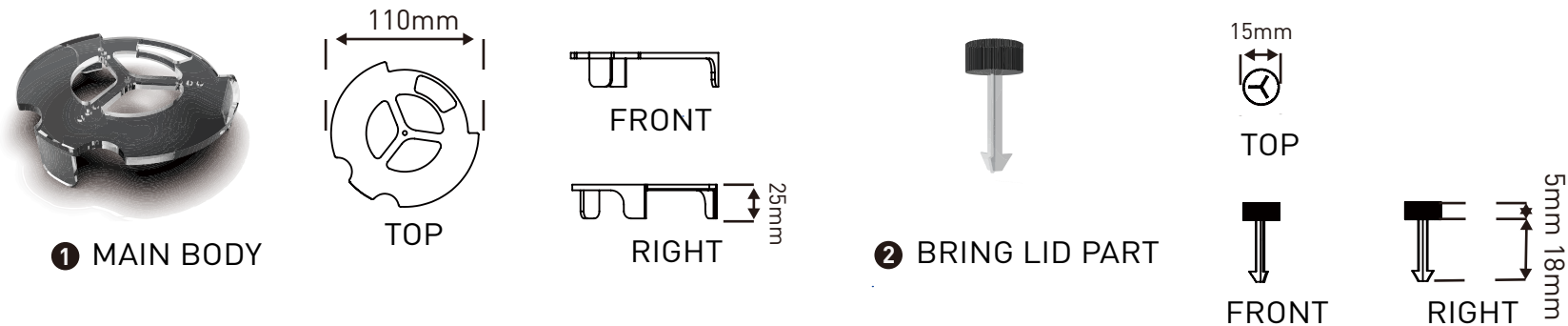
Left View

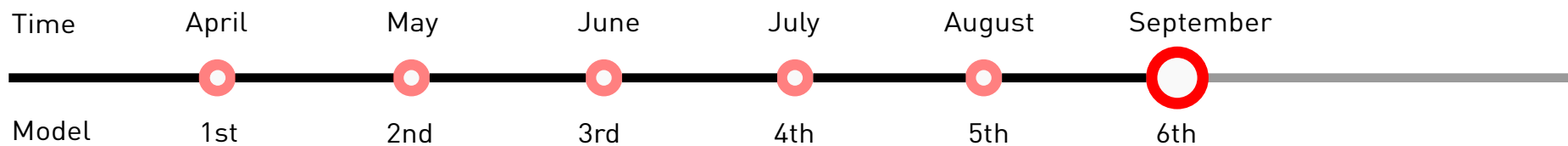


Proportion: 1.5 : 1

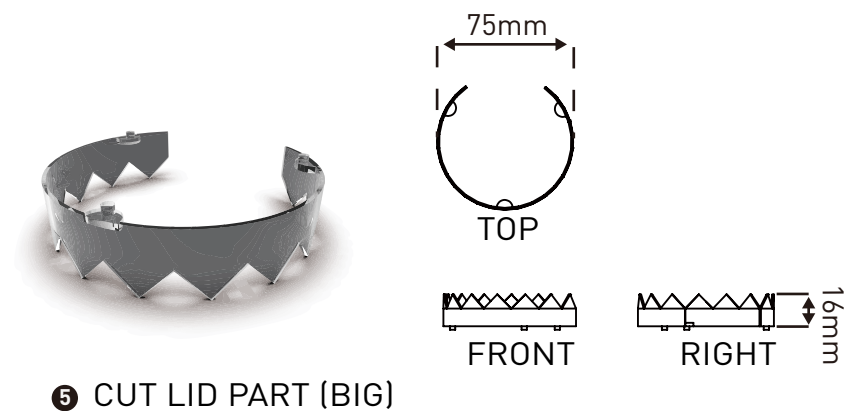
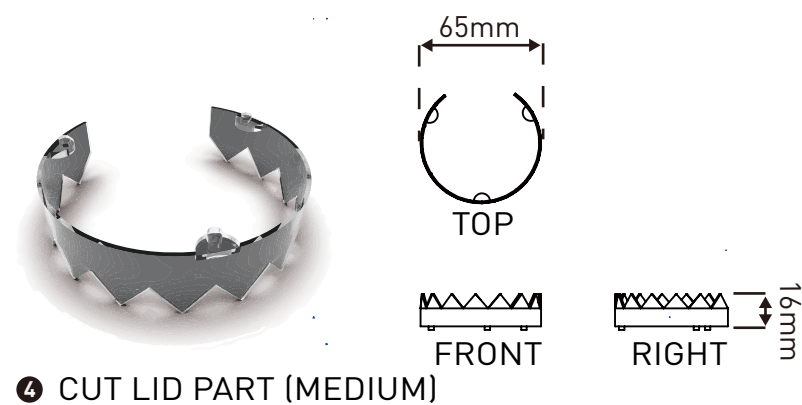
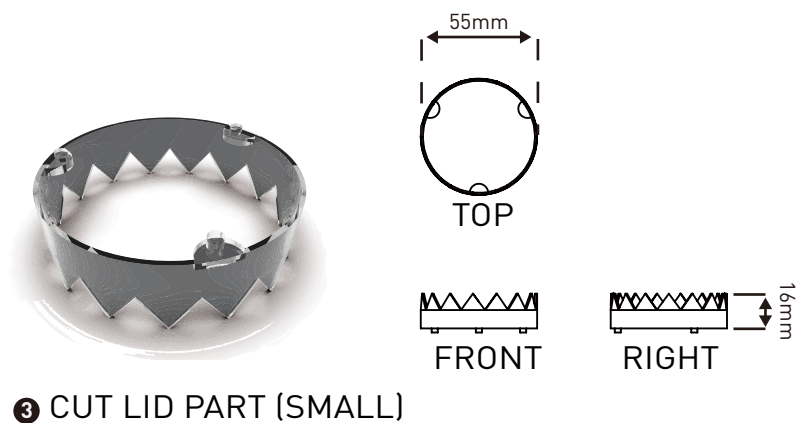


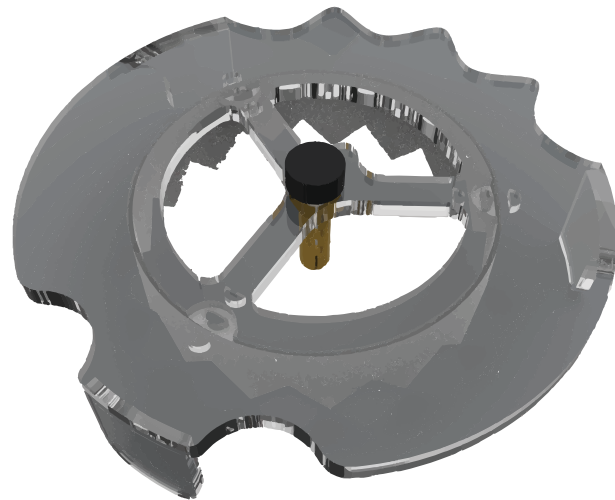
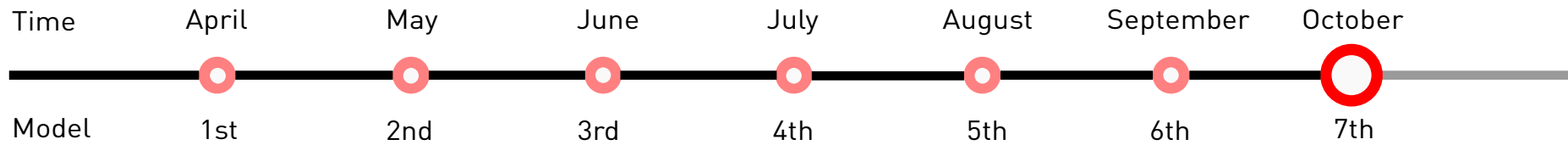
ANTONINO has one main body and four optional combination parts.





Proportion: 3 : 1



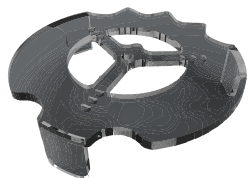
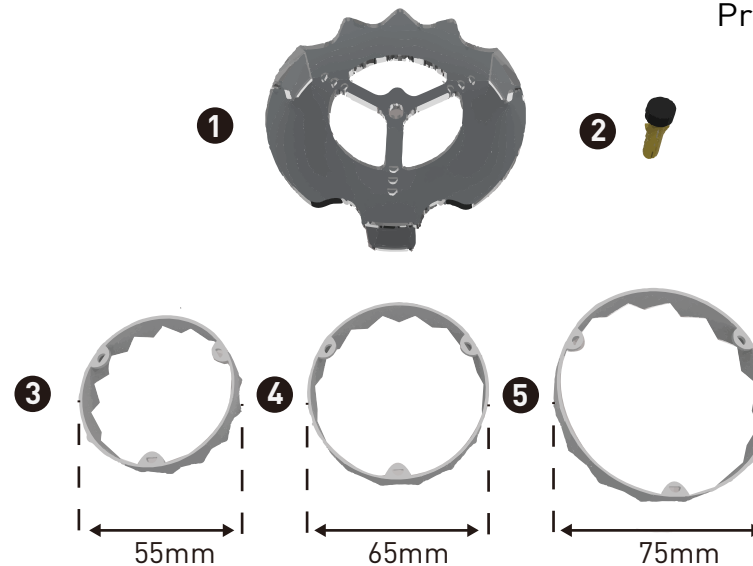


Proportion: 1.5 : 1

TOTAL PRICE : 27.5€

THE PRICE OF PRODUCING A HUNDRED IS 15€

Proportion: 3 : 1

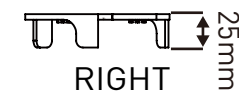
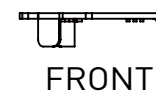


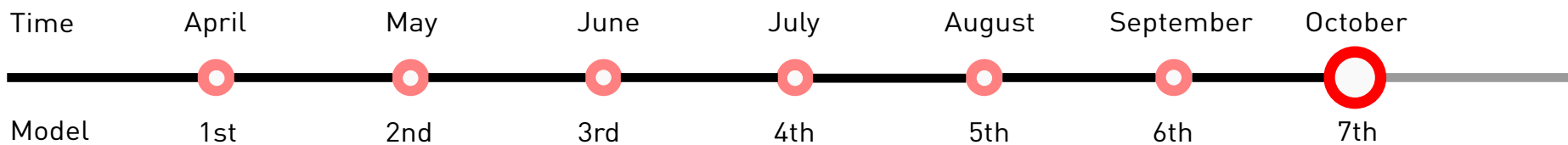
1 MAIN BODY



MATERIAL:
PHOTOSENSITIVE RESIN (TRANSPARENT)

PRICE:
THE PRICE OF PRODUCING ONE IS 25€
THE PRICE OF PRODUCING FIFTY IS 18€
THE PRICE OF PRODUCING A HUNDRED IS 12.5€





Proportion: 3 : 1

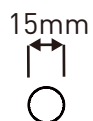


2 BRING LID PART

MATERIAL:
PLASTIC

PRICE:
THE PRICE OF PRODUCING ONE IS 0.5€

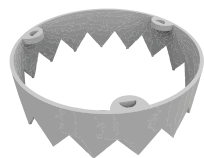
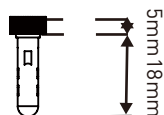
TOP



FRONT



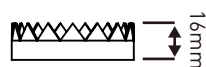
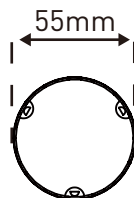
RIGHT



3 SAWTEETH (SMALL)

MATERIAL:
PHOTOSENSITIVE RESIN(WHITE)

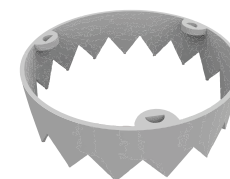
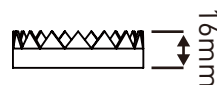
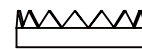
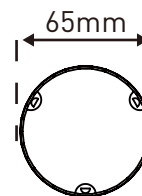
PRICE:
THE PRICE OF PRODUCING ONE IS 2€



4 SAWTEETH (MEDIUM)

MATERIAL:
PHOTOSENSITIVE RESIN(WHITE)

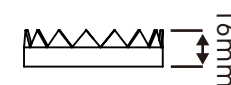
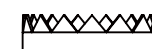
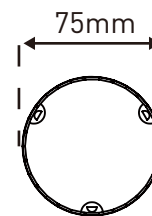
PRICE:
THE PRICE OF PRODUCING ONE IS 2€



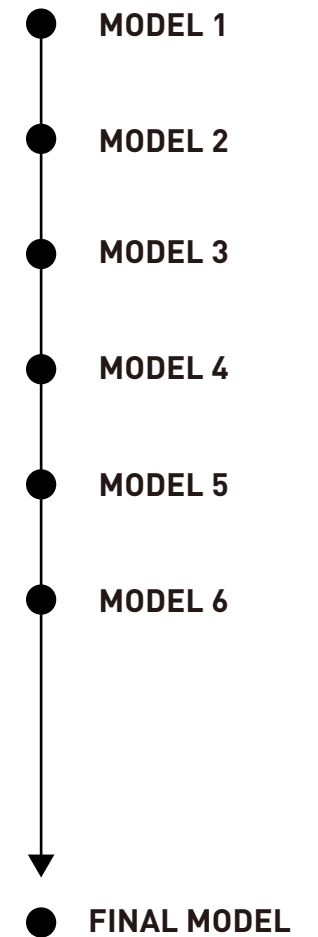
5 SAWTEETH (BIG)

MATERIAL:
PHOTOSENSITIVE RESIN(WHITE)

PRICE:
THE PRICE OF PRODUCING ONE IS 2€



4.5 Model test



MODEL 1



Top View



Bottom View



Close-up

OPERATION

Difficult positioning
Sawtooth cutting effort
Does not work well for different sizes of water-gel
Modify the sawtooth and body

MATERIAL

Can reduce material usage
Save 3D printing costs

COMPONENTS

Sawtooth: Sawtooth requires stronger penetration and controls the spacing of the serrations
Body: Make the subject easier to grip

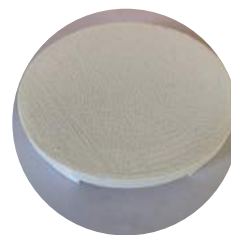
GEOMETRIES

Control the distance between the sawteeth
Make the shape easier to grip
Need to be easy to place.

AFFORDANCE

Make the shape easier to understand how to use,
so that the sawteeth can work easily.

MODEL 2



Top View



Bottom View



Close-up

OPERATION

Difficult positioning
Sawtooth can work but the length is not enough to easily cut the lid
Water-gel does not work perfectly for different sizes

MATERIAL

Can reduce material usage
Save 3D printing costs

COMPONENTS

Sawtooth: Sawtooth can penetrate the lid, need to make penetration easier
Body: Increase visibility and be understandable how to use

GEOMETRIES

Easy to place
Need to increase the visibility and select different sizes of sawteeth and assemble them as needed

AFFORDANCE

Increase visibility
Easy to understand how to use it
Designed as a removable sawtooth to meet different needs

MODEL 3



Top View



Bottom View



Close-up

OPERATION

Sawtooth perfectly cuts the lid
Easy to pick it up with left or right hands. For people with small hands or weak hands, need to improve the hole need bring the lid

MATERIAL

Less material use
Try transparent materials for easy positioning

COMPONENTS

Sawtooth: Sawtooth perfectly cuts the lid
Body: Improve visibility, can be placed very well, can easily understand how to use. Need to further improve visibility, making it easier to locate

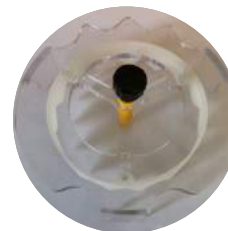
GEOMETRIES

Improve the connection between the serrations
The main body to make the overall shape more sleek

AFFORDANCE

Further improve visibility and make the overall style consistent

MODEL 4



Top View



Bottom View



Close-up

OPERATION

Easy to pick it up
Easy to cut the lid
Can bring the lid
Easy to place it

MATERIAL

Less material use
Transparent material makes positioning easy

COMPONENTS

Sawtooth: Sawtooth perfectly cuts the lid
Different sizes of sawtooth can be selected for different needs
Body: The body is suitable for different hands to get it

GEOMETRIES

Very good visibility
Easy to take it

AFFORDANCE

The hook for bring the lid must be simple

MODEL 5



Top View



Bottom View



Close-up

OPERATION

Easy to pick it up
Easy to cut the lid
Difficult to take it off smoothly
Easy to place it

MATERIAL

Less material use
Transparent material makes positioning easy

COMPONENTS

Sawtooth: Sawtooth perfectly cuts the lid
Different sizes of sawteeth are not tight enough to install
Body: The body is suitable for different hands to get it

GEOMETRIES

Very good visibility
Easy to take it

AFFORDANCE

Need to modify the size of the hook to open the lid

MODEL 6



Top View



Bottom View



Close-up

OPERATION

Easy to pick it up
Not very easy to cut the lid
Different sizes of sawteeth are installed tightly
Easy to place it

MATERIAL

Less material use
Transparent material makes positioning easy

COMPONENTS

Sawtooth: Sawtooth cutting is not smooth
Different sizes of sawtooth can be selected for different needs
Body: The body is suitable for different hands to get it

GEOMETRIES

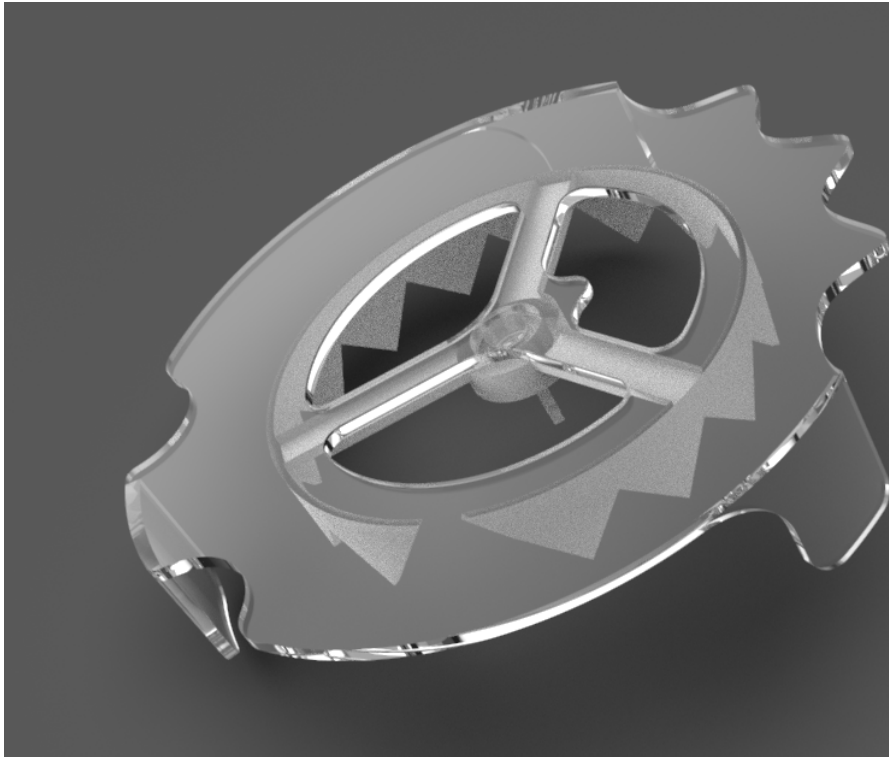
Very good visibility
Easy to take it

AFFORDANCE

Hook shape can pull out the lid

05.

ANTONINO X

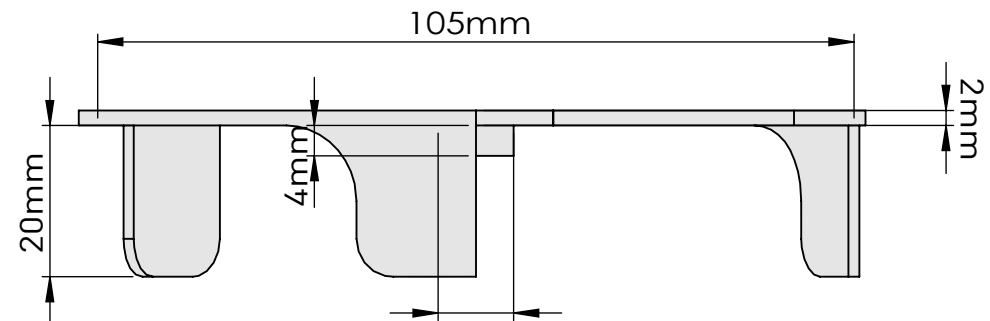
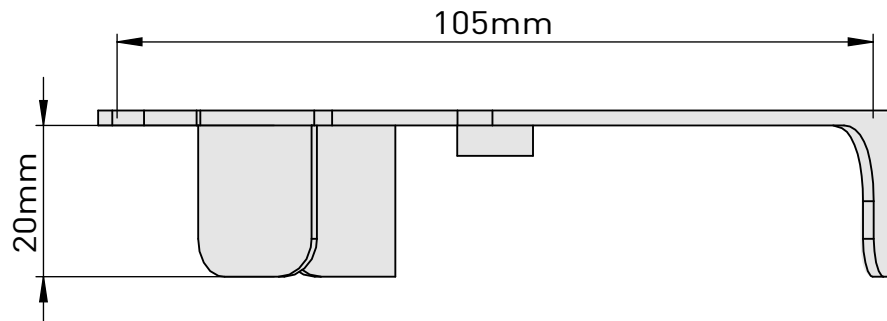
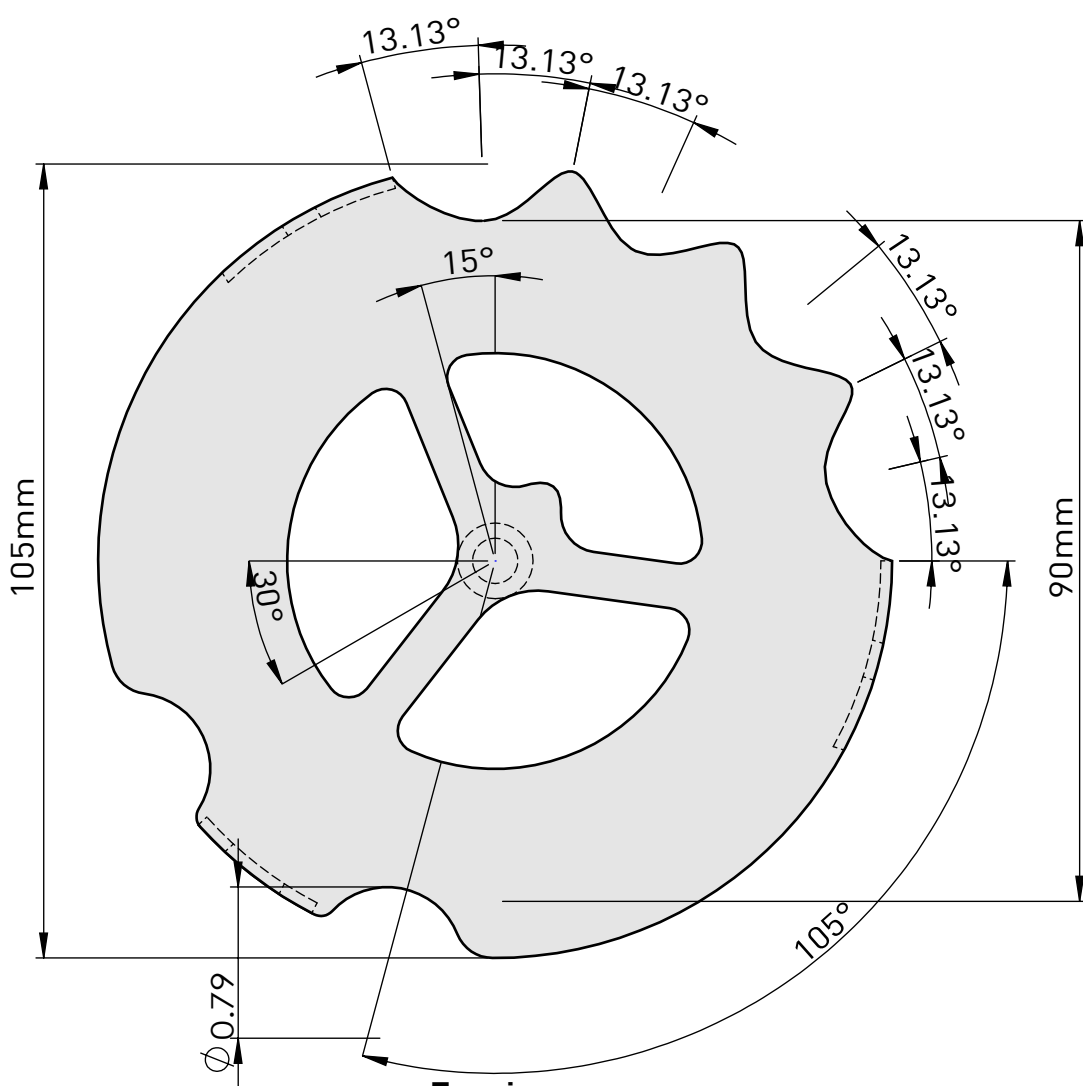


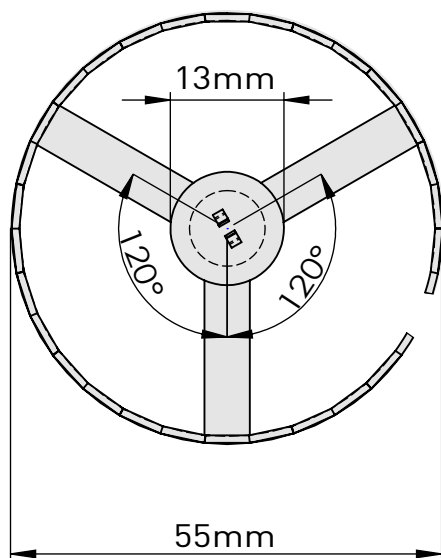
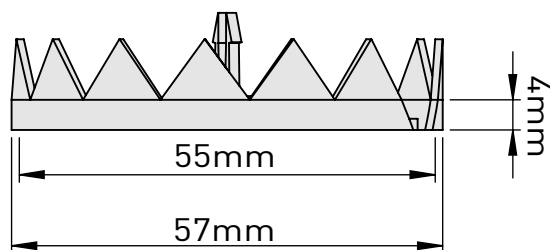
ANTONINO X

Opener of water-gel container

December 2018

Name : Three views of body part of Antonino X
Units : mm
Proportion : 1:1
Material : Photosensitive resin (transparent)



**Top view****Front view**

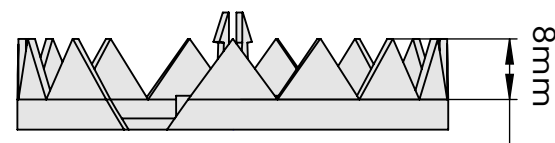
Name : Three views of sawtooth part of Antonino X

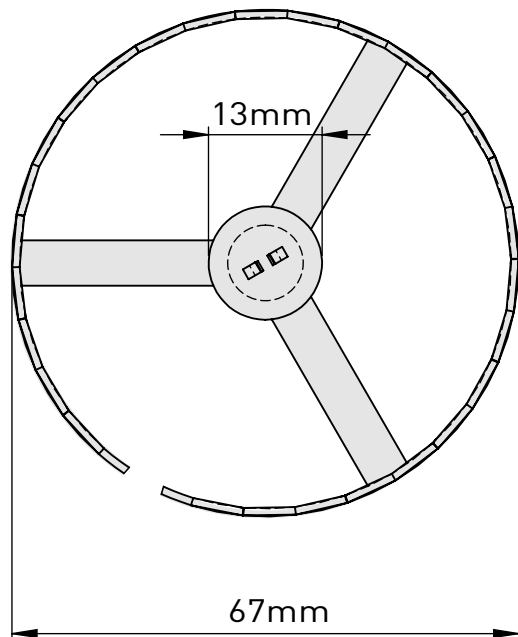
Units : mm

Proportion : 1:1

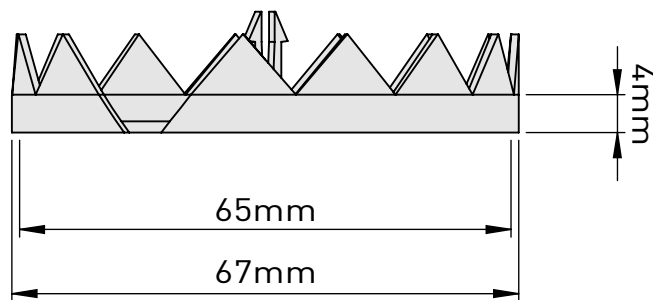
Material : Photosensitive resin (white)

Size : Small

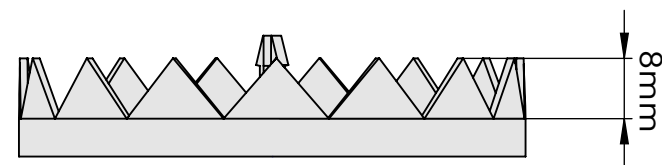
**Left view**



Top view

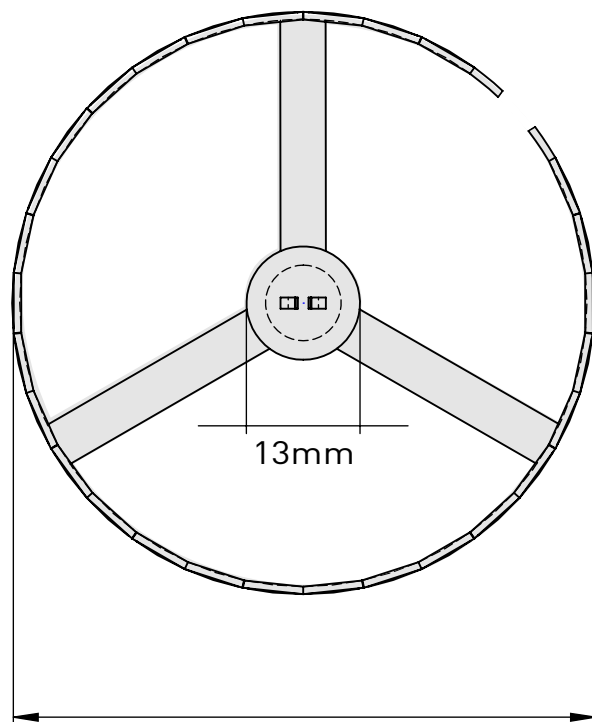


Front view

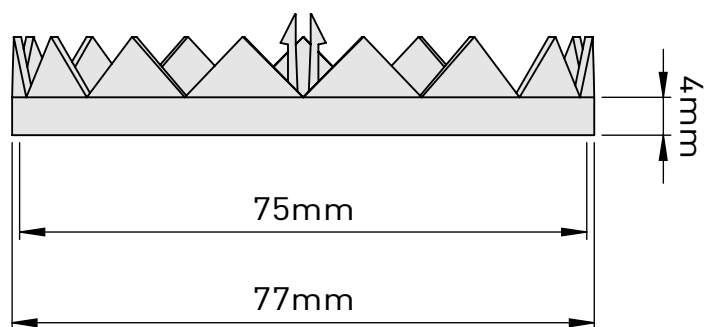


Left view

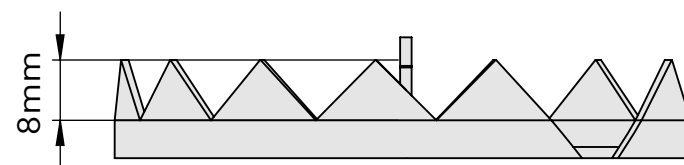
Name : Three views of sawtooth part of Antonino X
Units : mm
Proportion : 1:1
Material : Photosensitive resin (white)
Size : Medium



Top view



Front view



Left view

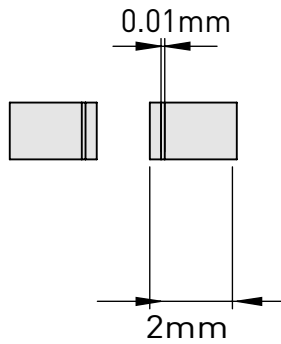
Name : Three views of sawtooth part of Antonino X

Units : mm

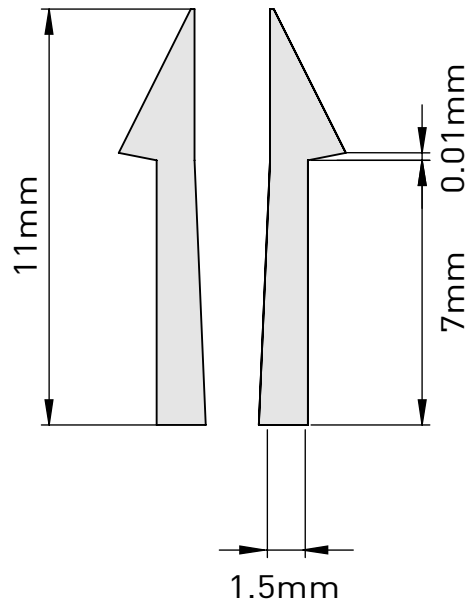
Proportion : 1:1

Material : Photosensitive resin (white)

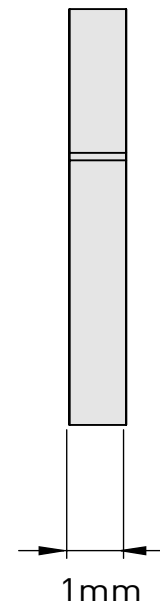
Size : Large



Top view



Front view



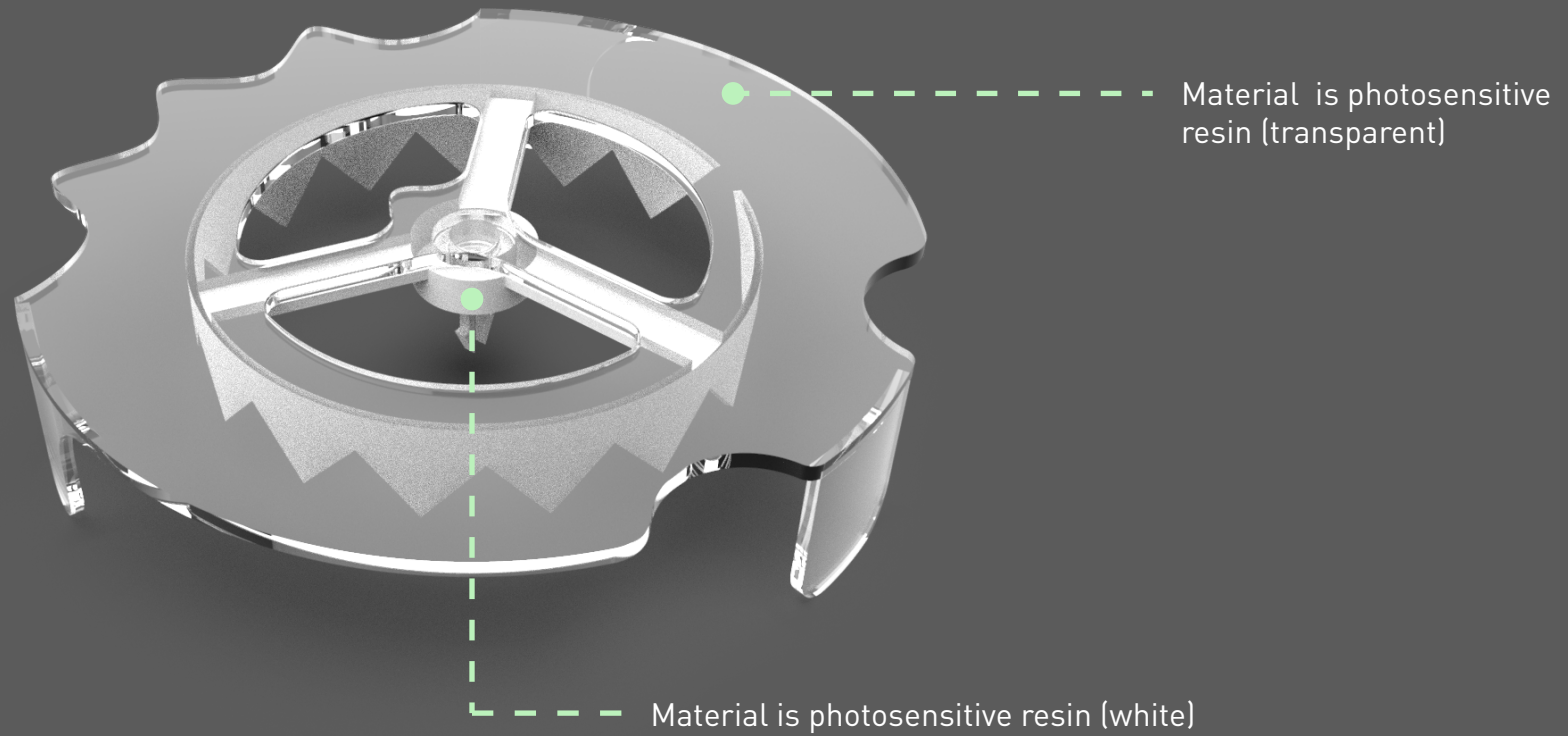
Left view

Name : Three views of hook of Antonino X
Units : mm
Proportion : 5:1
Material : Photosensitive resin (white)

The composition of Antonino X

Name : Antonino X

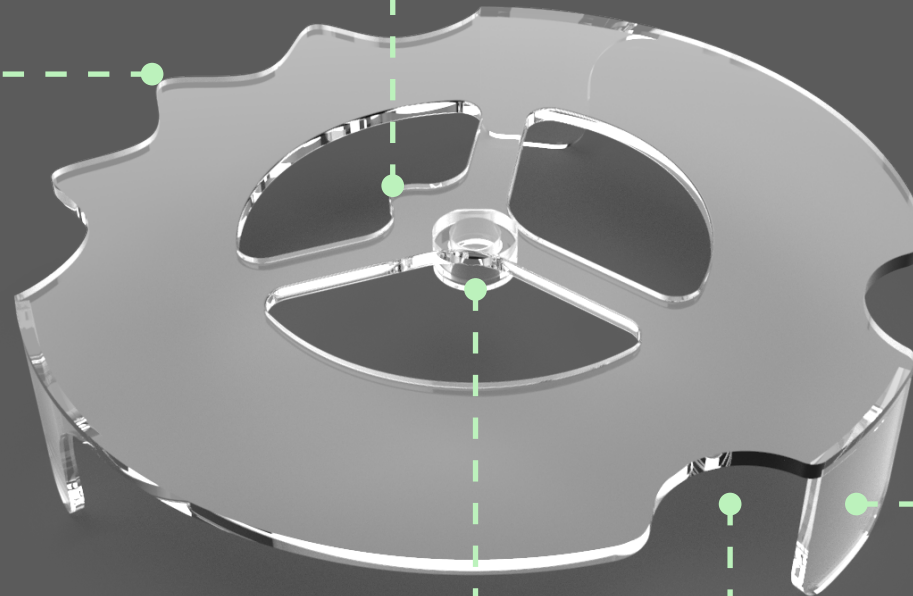
Proportion : 1:1



Body part of Antonino X

This hole is easier for the weak hand to take it.

The shape is easy to take Antonino X for both right and left hands.



Name : Body part of Antonino X

Proportion : 1:1

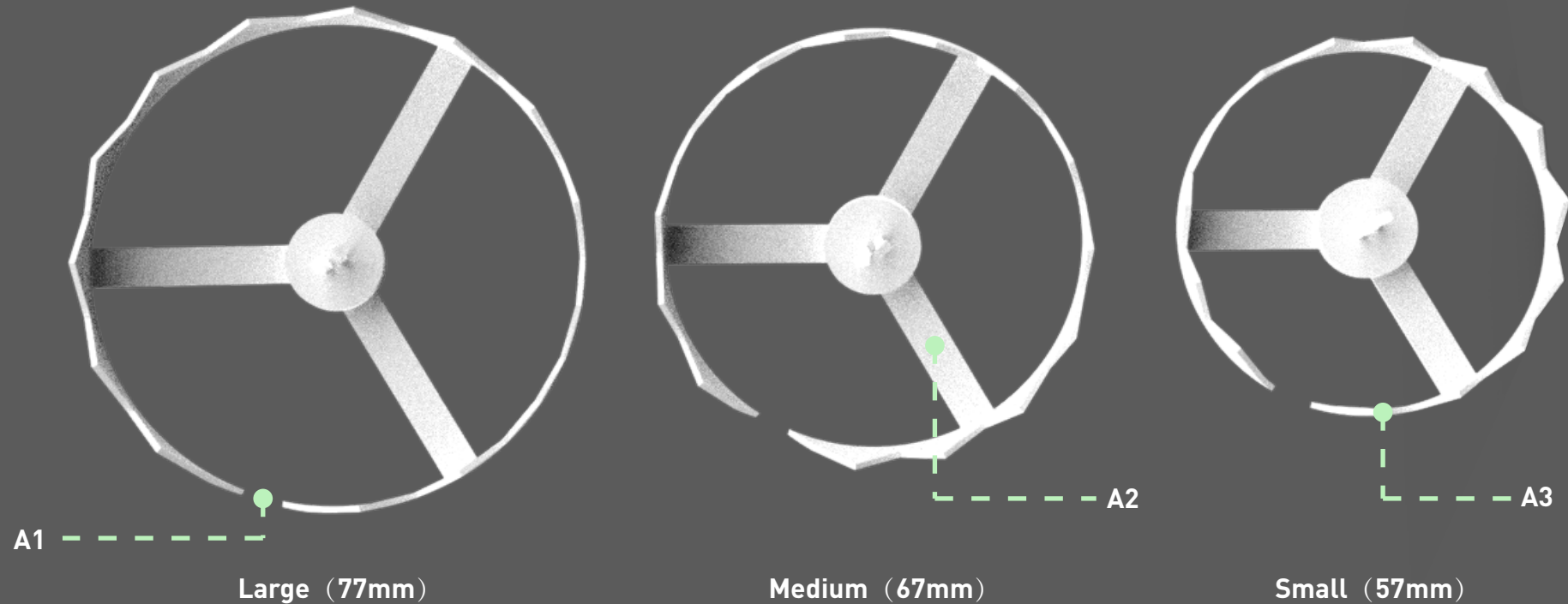
Material : Photosensitive resin (transparent)

This shape is for connecting the body and the sawtooth.

The feet for place Antonino.

The shape is easy to take Antonino for both right and left hands.

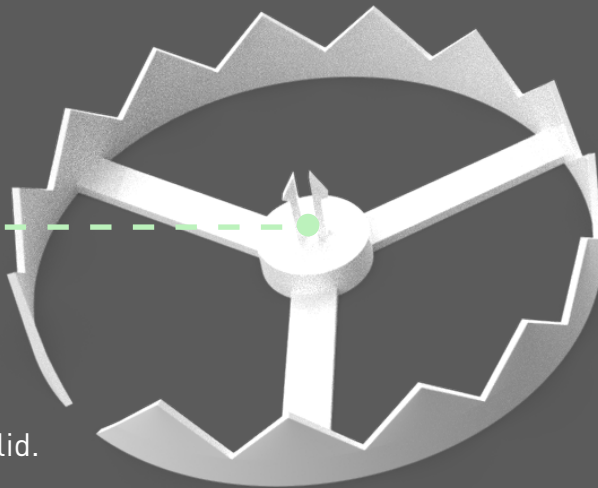
Sawteeth part of Antonino X



Name : Body part of Antonino Plus
Proportion : 1:1
Material : Photosensitive resin (white)

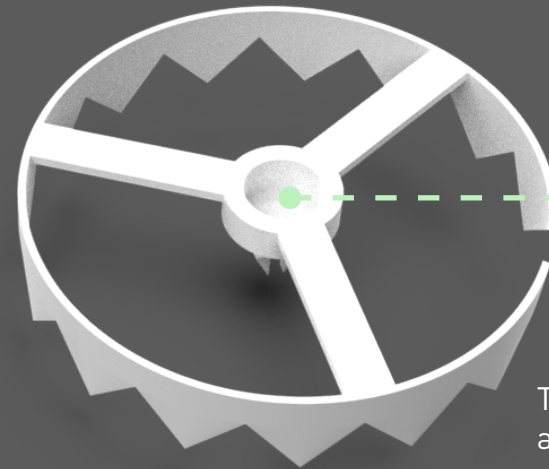
A1 : After the sawtooth cuts the lid, the notch makes the lid not fall off.
A2 : Connection sawtooth and hook.
A3 : Different sized serrations can cut different sizes lids.

Sawteeth part of Antonino X



Hook for bring the lid.

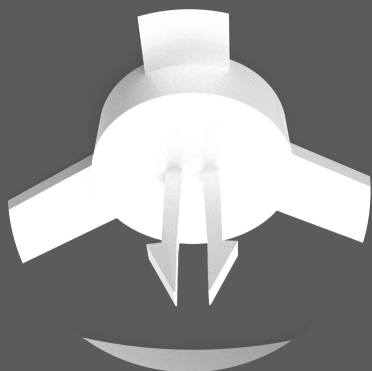
Front of sawteeth part



The hole for sawtooth
and body connection

Back of sawteeth part

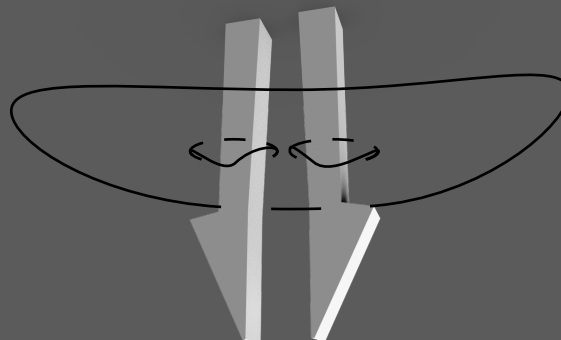
The hook of Antonino X



Name : The hook of Antonino Plus

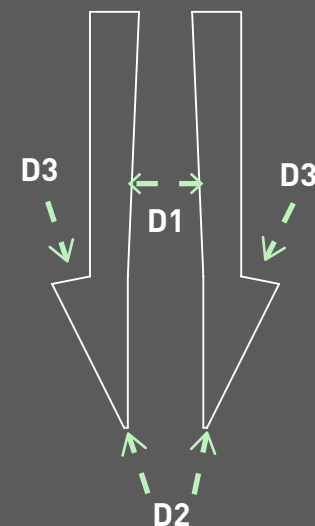
Proportion : 1:1

Material : Photosensitive resin (white)



1.The hook passes through the lid

2.The hook bring the lid

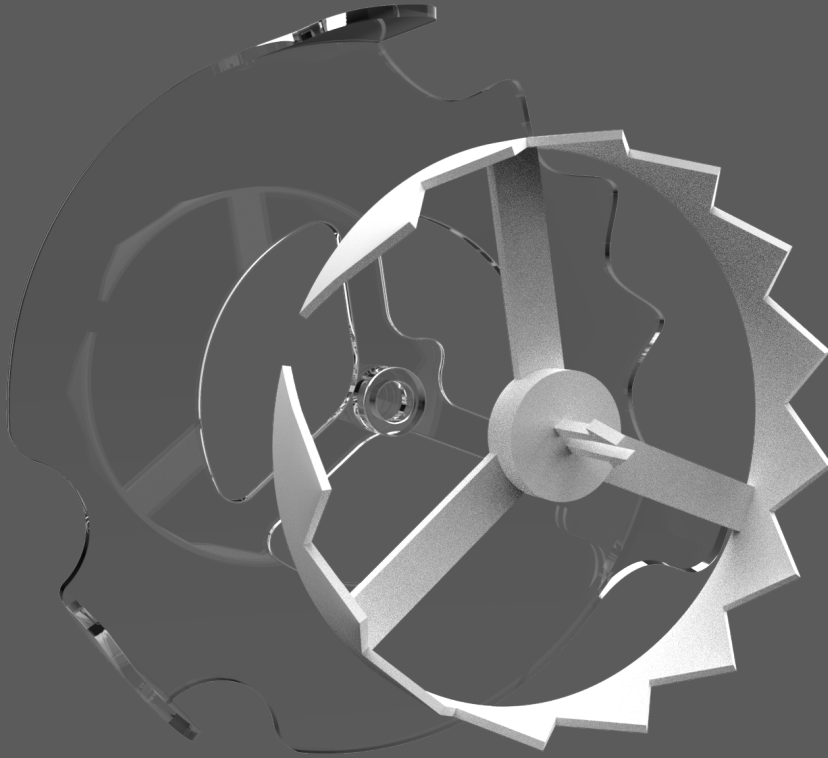


D1 : The spacing is gradually reduced, and the friction between lid and hook is increased.

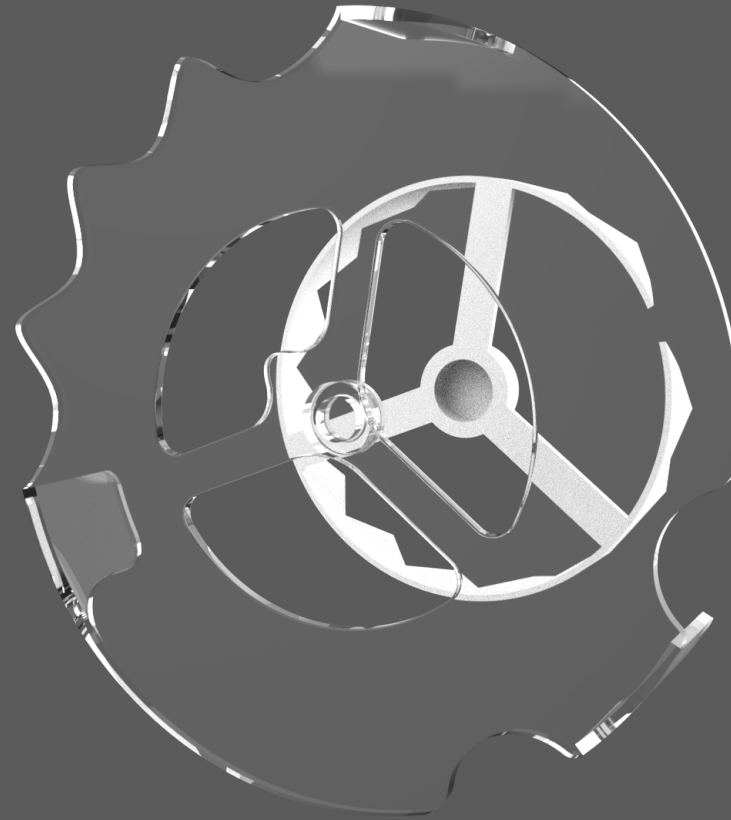
D2 : Take hook through the lid.

D3 : Hook the lid when bring the lid.

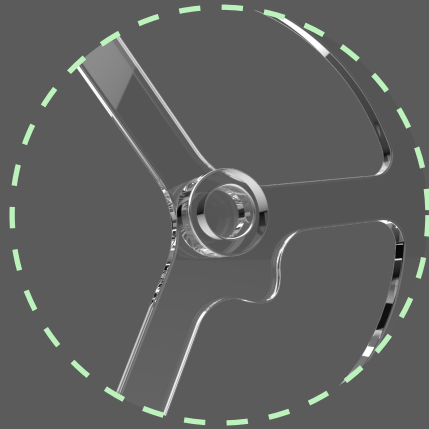
Sawtooth and body connection



F1



F2



F1 Partial enlargement

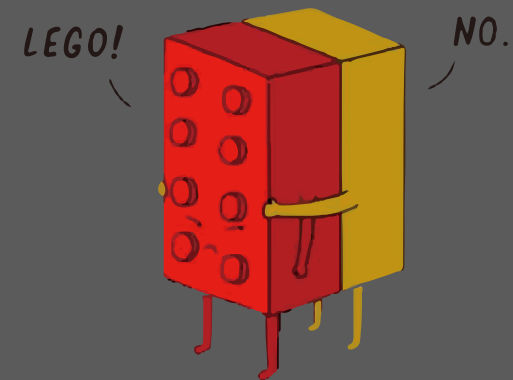


F2 Partial enlargement

Sawtooth and body connection

F1 and F2 :

F1 is the convex part on the body ,
F2 is the concave part on the sawteeth ,
F1 and F2 imitate the connection
mode of Lego, fixed by static friction
and connected.



How to use Antonino X?



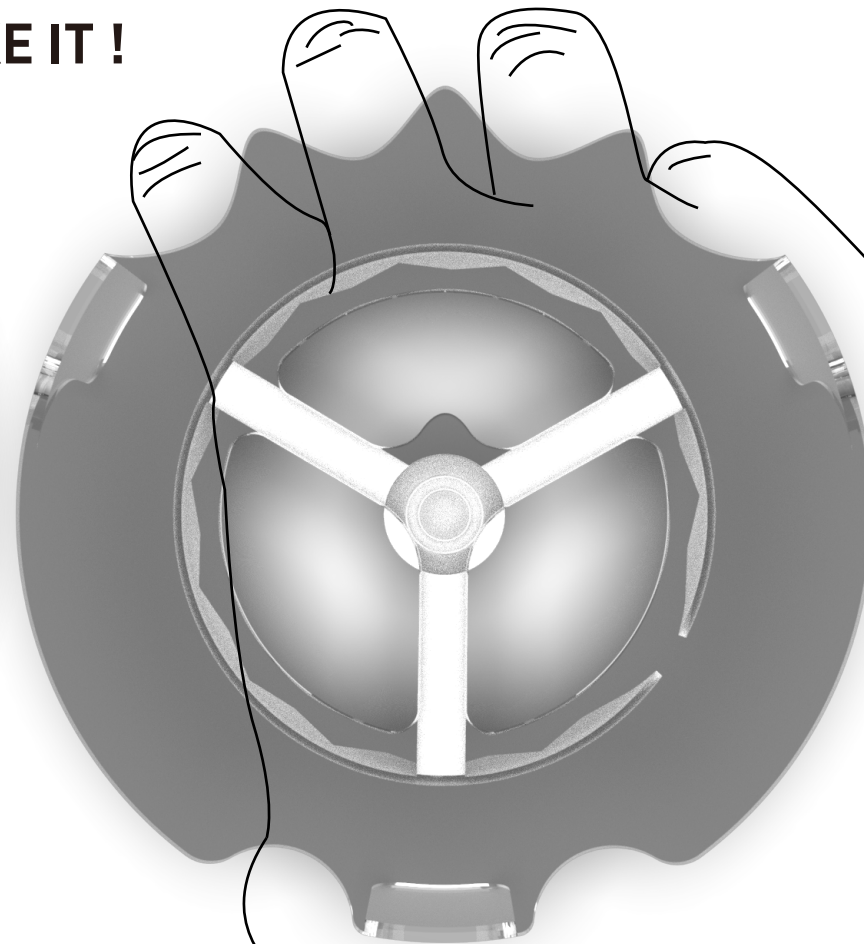
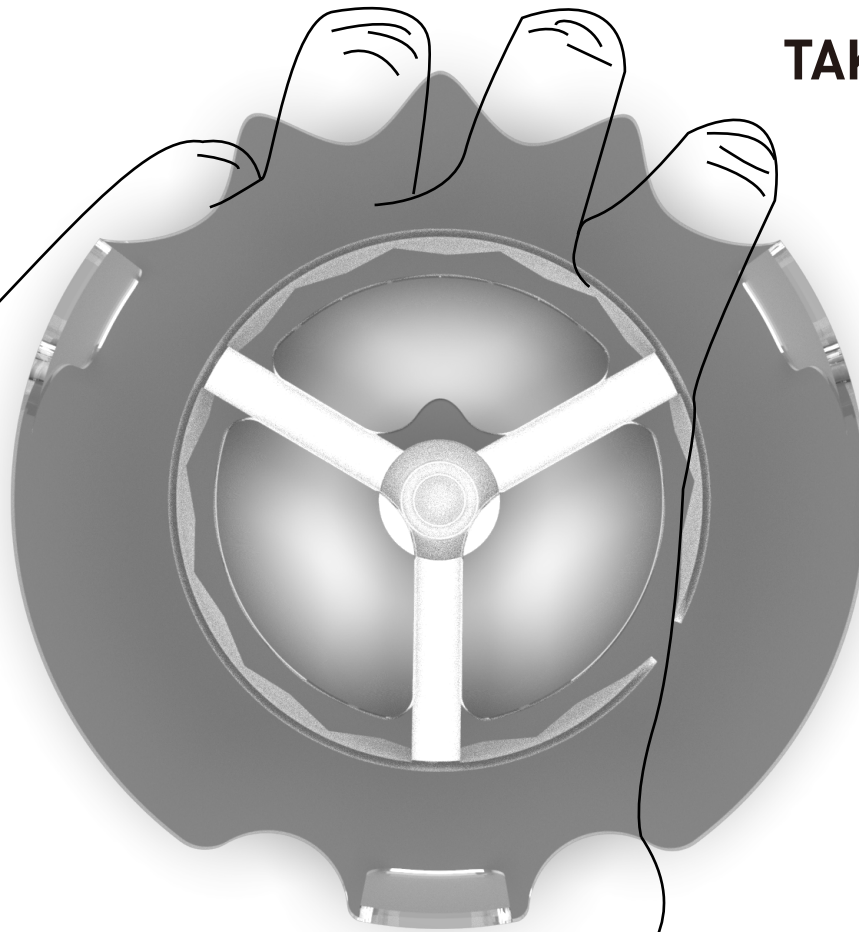
FIRST STEP

SECOND STEP

THIRD STEP

FOURTH STEP

TAKE IT !



use left hand ← - - - → use right hand



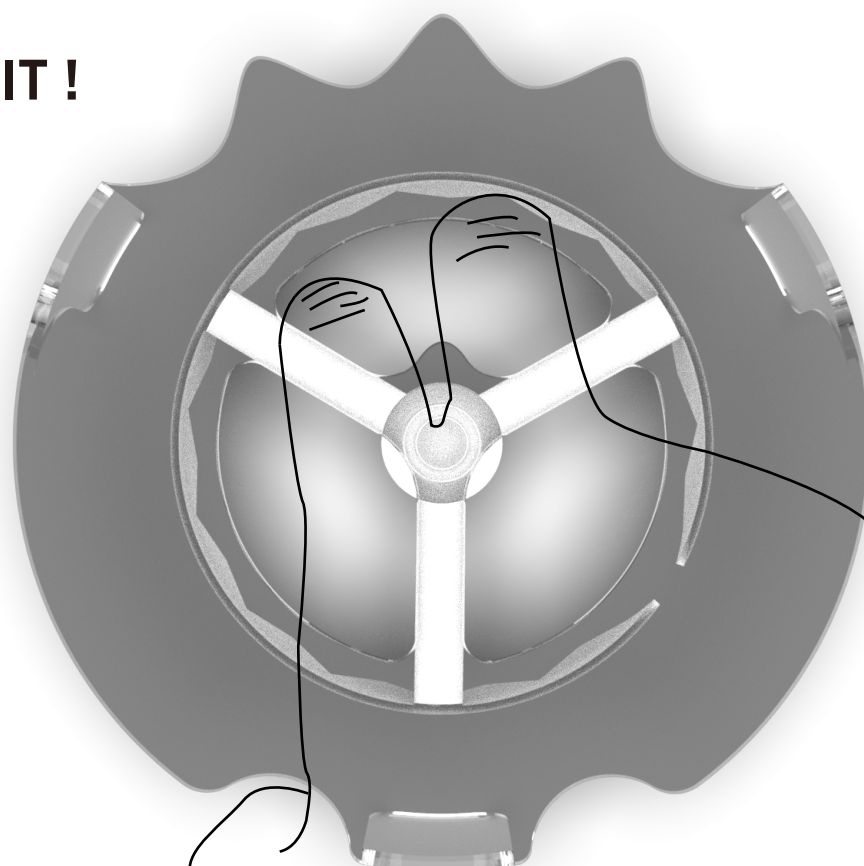
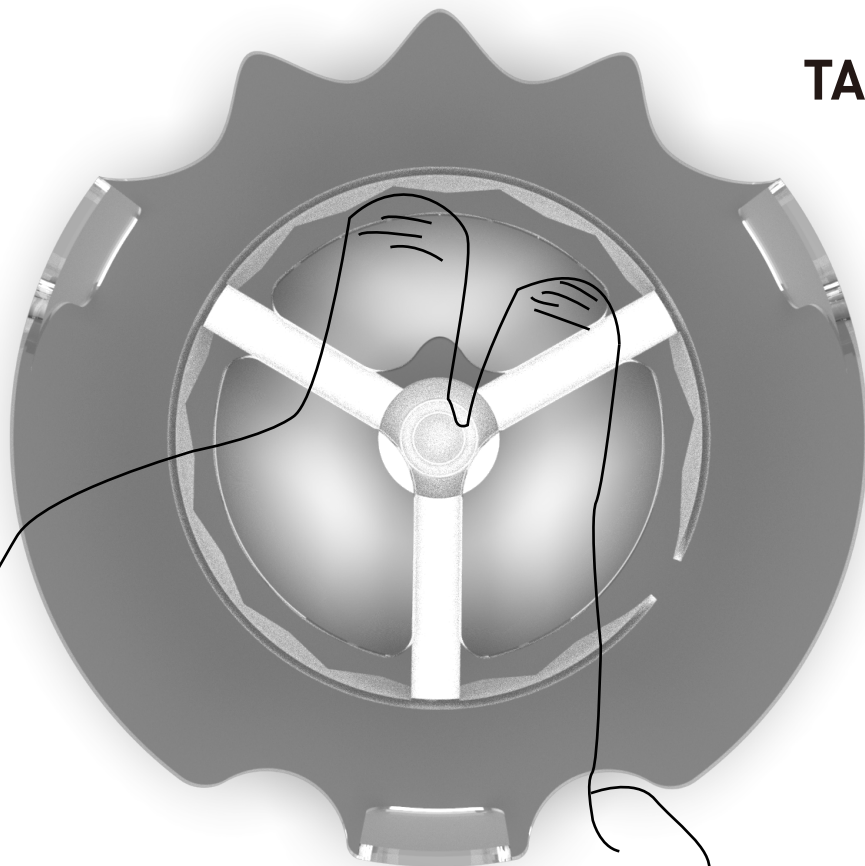
FIRST STEP

SECOND STEP

THIRD STEP

FOURTH STEP

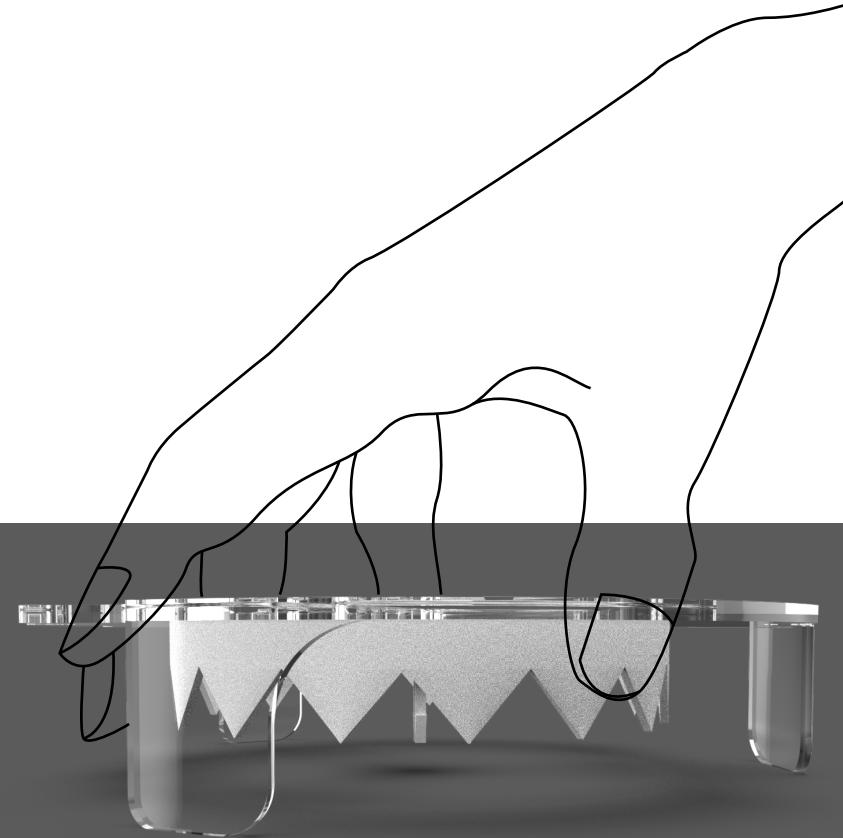
TAKE IT !



← - weak hand or small hand use - →

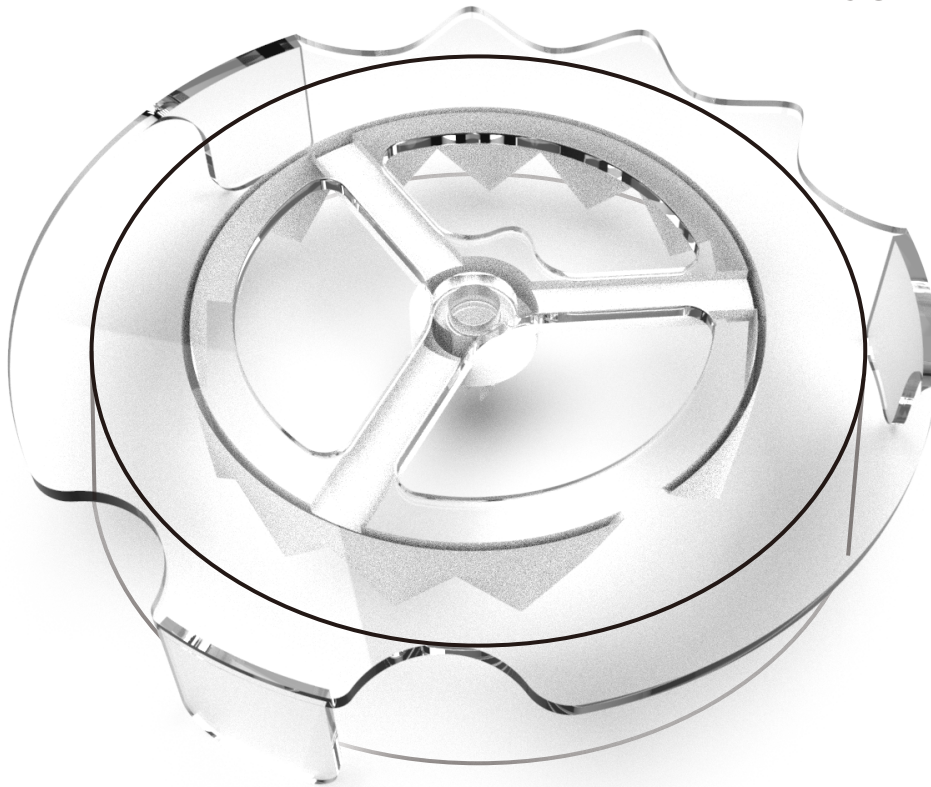


- 1. Convenient for people with left or right hands
- 2. Convenient for people with weak or small hands
- 3. Ergonomic design
- 4. Easy to understand how to use





POSITIONING !



Transparent materials will help us easily position with the eyes.

The feet : The feet of Antonino X will help us locate without deviation from the center



CUT AND BRING THE LID !



1.Take it down



2.Cut the lid



3.Take out

1.Take it down

2.Cut the lid

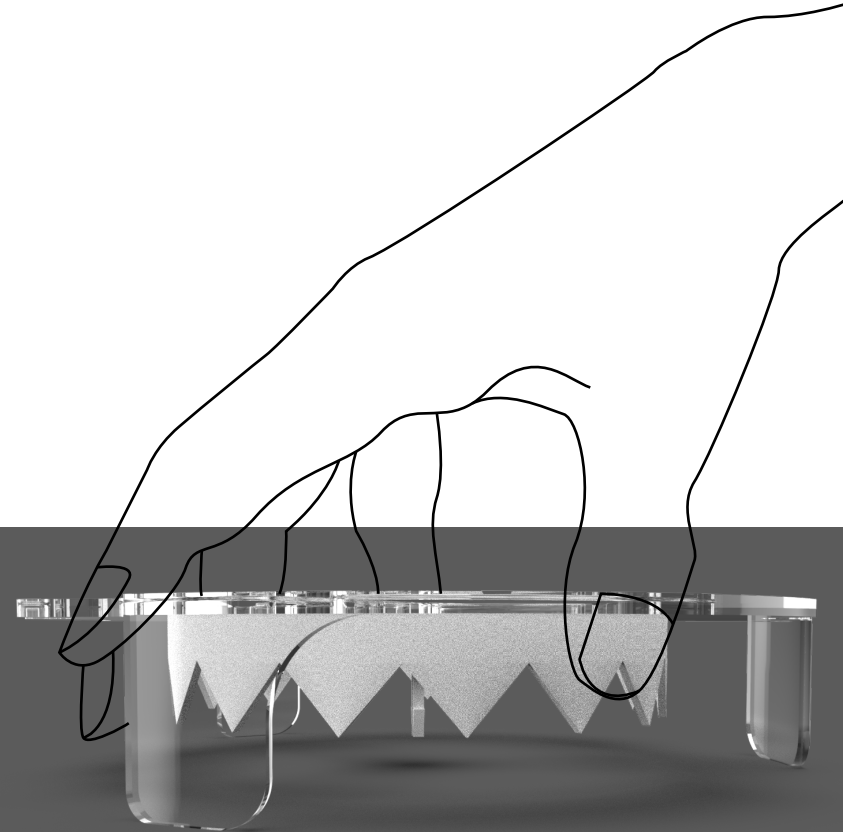
3.Take out

Easy to cut the lid and bring it!



PLACE IT!

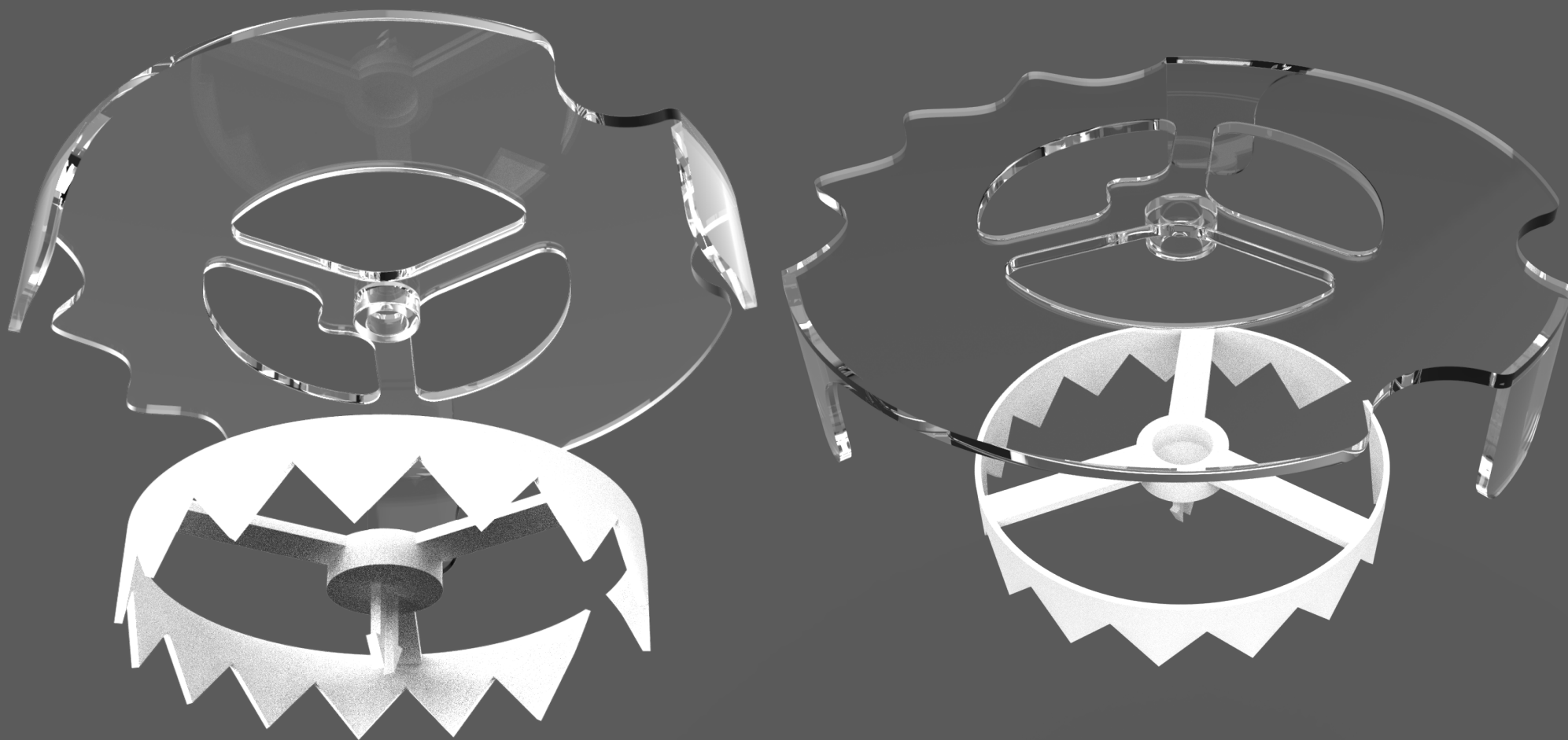
The feet of Antonino X help you easy to place, and air dry after cleaning, there will be no dust, make sure to use it next time.



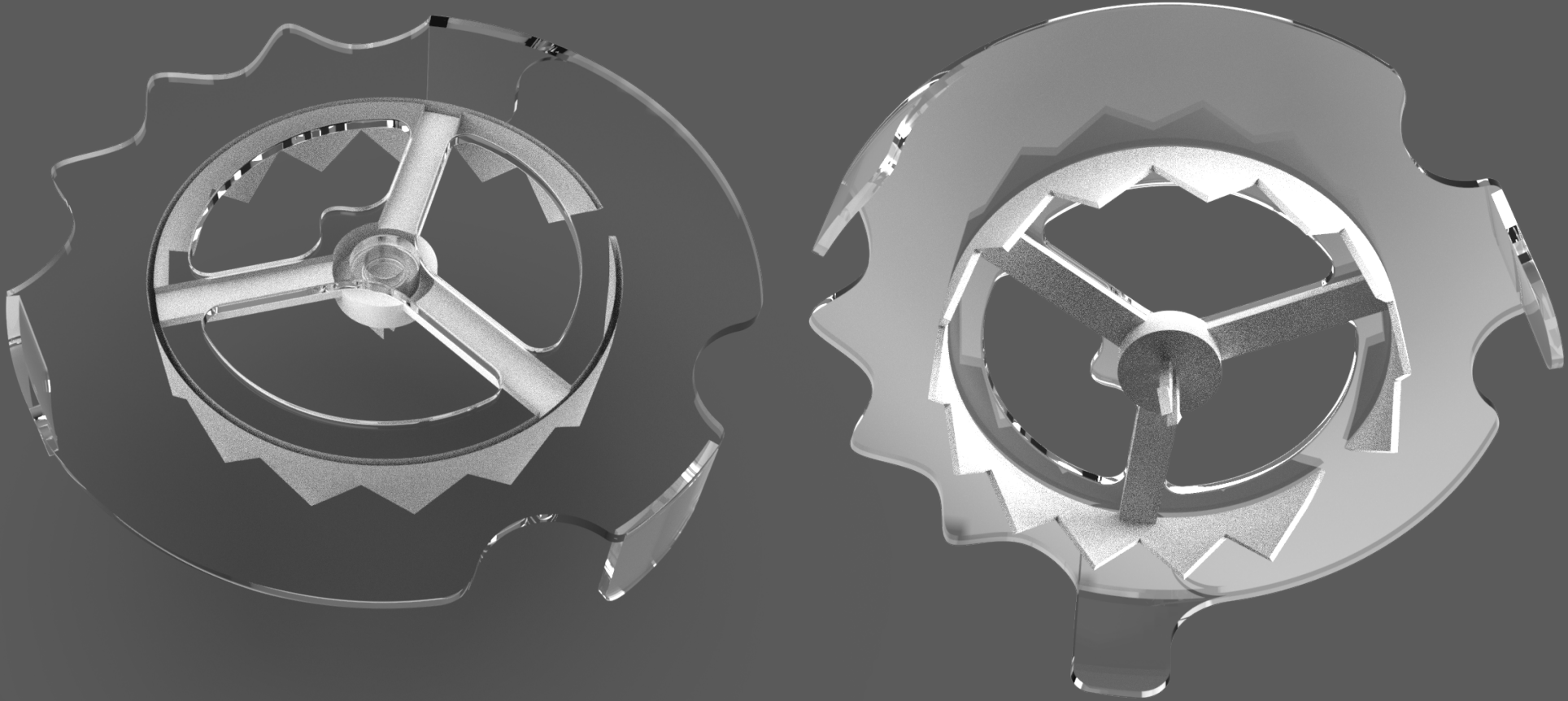
How to replace the sawtooth part?



Use the thumb to push the sawteeth part from the back of Anotino X



Before combination



After combination

After that, after pushing the sawteeth part, you can replace the other sawteeth parts you need. We have three different sizes of serrations for most food containers on the market.

ANTONINO X

TAKE IT

Suitable for hand-held shape design,
so Antonio can easily pick it up !



CUT AND
BRING THE LID



Reasonable sawtooth size makes
antonio easy to cut the lid.



Hook helps antonio X easy to bring the lid.



POSITION

When Antonio use Antonino X !



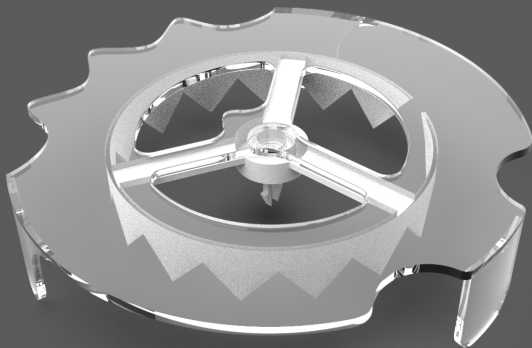
Transparent material helps antonio X to positioning well with the eye.

PLACE IT



The feet help antonio X easy to place it.

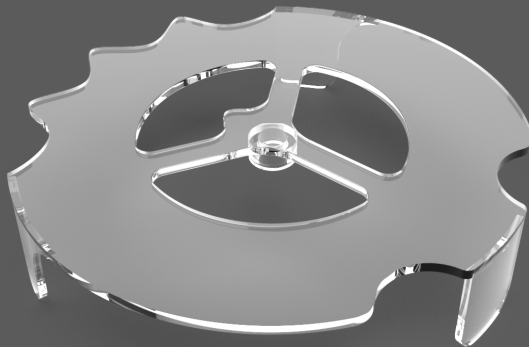
Production price of ANTONINO X



TOTAL PRICE :21 €
THE PRICE OF PRODUCING A HUNDRED IS13€/EACH
(Contains three sawteeth and one body)

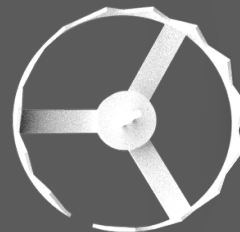
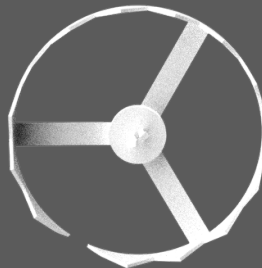
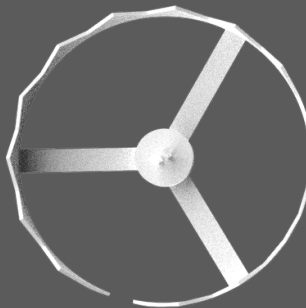


Shipping price : 10 €/kg



MATERIAL:
PHOTOSENSITIVE RESIN(TRANSPARENT)

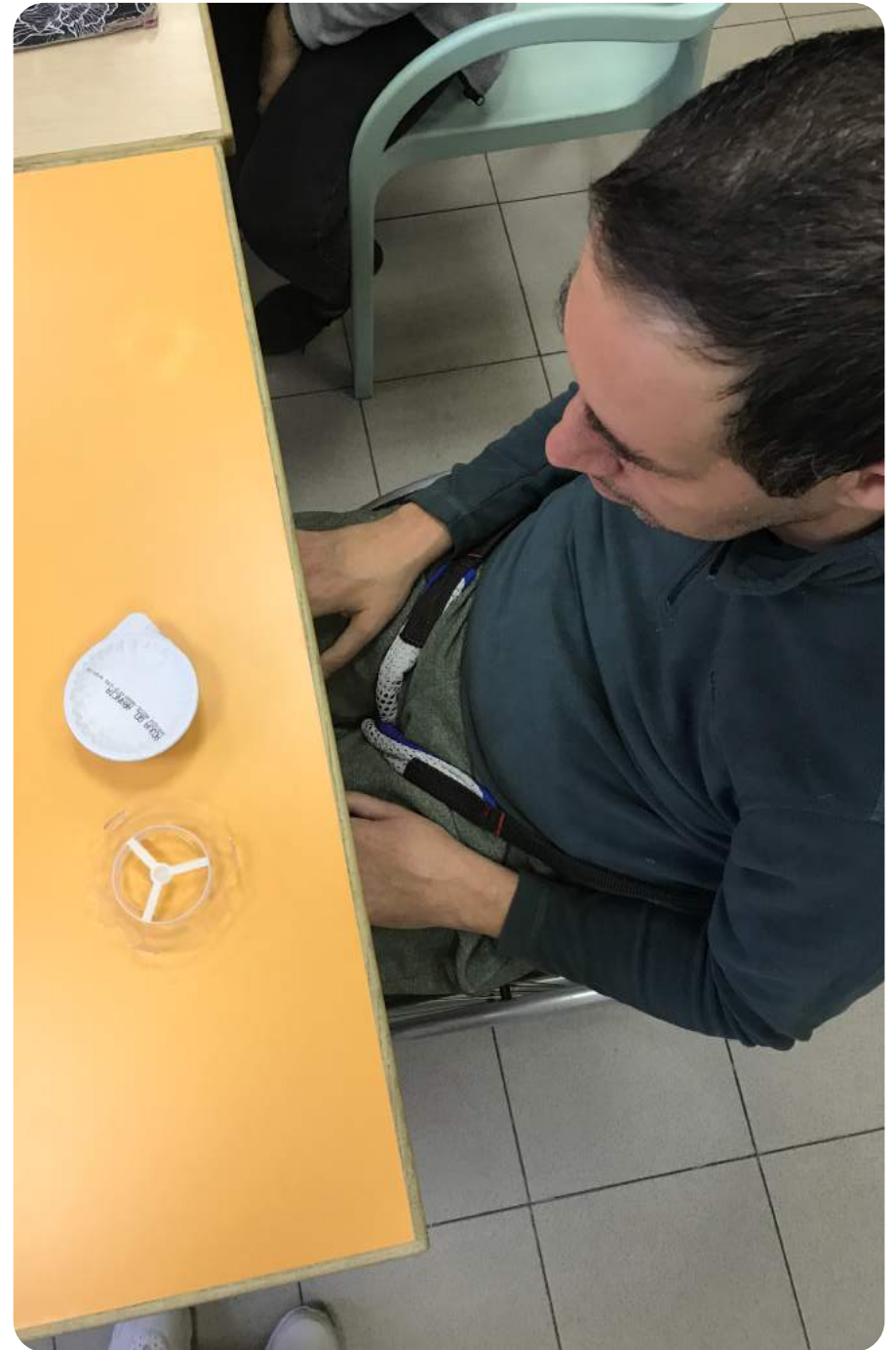
PRICE:
THE PRICE OF PRODUCING ONE IS 15 €
THE PRICE OF PRODUCING FIFTY IS 12 €/EACH
THE PRICE OF PRODUCING A HUNDRED IS10 €/EACH



MATERIAL:
PHOTOSENSITIVE RESIN(WHITE)

PRICE:
THE PRICE OF PRODUCING EACH ONE IS 2€
THE PRICE OF PRODUCING FIFTY IS 1 €/EACH

06. ACTUAL USE OF ANTONINO X



ANTONINO X

TAKE IT



Use the shape of the body of the opener to grasp the arc on the edge of the body that fits the shape of the hand

The bottle opener is light enough to allow the user to take it securely.

CUT AND
BRING THE LID



Perfectly cut the lid with the pressure of both hands and ensure that the sawteeth do not touch the horizontal lines inside the container

The hook at the center of the opener is perfectly pierced and hooked up, and the lid is lifted while lifting the hand.

POSITION



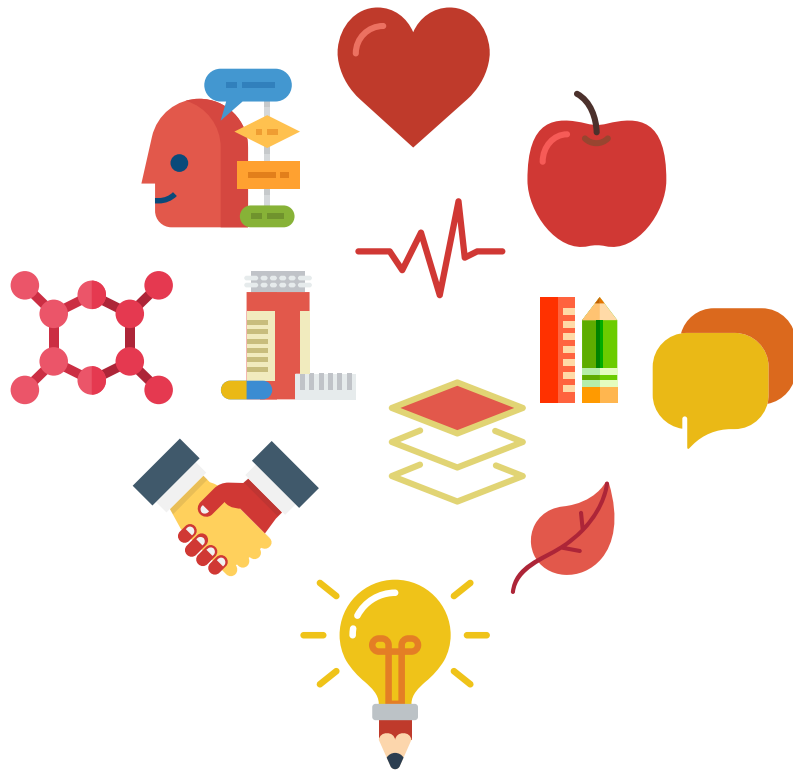
The transparent body material gives the opener maximum visibility and clearly shows the positioning between the sawteeth and the lid

PLACE IT



The three legs of the opener are used to support the body and steadily placed on the table.

Conclusion



The research work provided is very clear and hides many of the expertise on user requirements, health care issues, printing and production of 3D models. Multidisciplinary efforts have come to an end, and it involves a lot of “doing and redoing” parts, because each solution must be proven by practice, and practicality and flexibility have always been the key words of the entire project, which makes the product in the factory. Easy to implement, quick to assemble on site and well integrated in the actual use of rehabilitation centers.

Our new design is based on the product design done by VALDOCCO ONLUS ANIMATION after the Politecnico di torino’s workshop project “Design for each one” in March 2017, it can be clearly divided the product features that have been achieved and the product functional goals that have not been achieved, and in the long run, what we need is a product that can be used in factory production and sales.

First of all, from the structure of the product, the external conditions of the original product have reached the basic operational requirements, and is applicable to the operational ability of the target user.



It can be divided into grasping, visual, squeezing, cutting, and placing these main functions, we must continue to strengthen these functions, to enlarge the function, which requires new attempts and practices

Secondly, in order to expand the scope of application, considering the size of the multi-size hydrogel or yoghurt containers on the market (they all have the same tear-off lid), it is necessary to collect data on common container sizes on the market and integrate them. Adjusting the diameter of the serrations, the expansion of the target population is also part of the population, including all those who lack strength and basic operational difficulties.

Finally, because the original product operation process needs to add the action of taking the cover, this is also a design difficulty. We must design the parts of the product on the principle that the materials are as uniform as possible and no multiple materials are produced to achieve this goal.

From the perspective of the materials used in the production, the technology of 3D printing

using liquid resin realizes the ultimate goal of the transparent model, and if the mass production is required in the future, the production cost of the liquid resin will be greatly reduced.

In order to provide a better explanation of product design to different stakeholders (companies) and show them how to actually implement the idea, a sketch of a possible business model was developed, which can be found in this book.

As mentioned in the previous section of this book, all people with power loss and basic operational difficulties, whether elderly, children or patients, are end users of the product, and we aim to adapt to the needs of users, improve their operational ability and enhance their sense of self-worth. Provide flexible solutions to meet the needs of the rapid development of accessories. In addition, in order to provide the greatest level of flexibility possible, it is recommended to use a desktop factory machine to reinforce the design and creation of the product.

References

Books

"NINDS Multiple Sclerosis Information Page". National Institute of Neurological Disorders and Stroke. 19 November 2015. Archived from the original on 13 February 2016. Retrieved 6 March 2016.

Milo R, Kahana E (March 2010). "Multiple sclerosis: geoepidemiology, genetics and the environment". *Autoimmunity Reviews*. 9 (5): A387–94.

Tsang BK, Macdonell R (December 2011). "Multiple sclerosis- diagnosis, management and prognosis". *Australian Family Physician*. 40 (12): 948–55.

Compston A, Coles A (October 2008). "Multiple sclerosis". *Lancet*. 372 (9648): 1502–17.

GBD 2015 Mortality and Causes of Death Collaborators (October 2016). "Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015".

Compston A, Coles A (April 2002). "Multiple sclerosis". *Lancet*. 359 (9313): 1221–31.

Murray ED, Buttner EA, Price BH (2012). "Depression and Psychosis in Neurological Practice". In Daroff R, Fenichel G, Jan-kovic J, Mazziotta J. *Bradley's neurology in clinical practice* (6th ed.). Philadelphia, PA: Elsevier/Saunders.

Lublin FD, Reingold SC (April 1996). "Defining the clinical course of multiple sclerosis: results of an international survey. National Multiple Sclerosis Society (USA) Advisory Committee on Clinical Trials of New Agents in Multiple Sclerosis". *Neurology*. 46 (4): 907–11.

Ascherio A, Munger KL (April 2007). "Environmental risk factors for multiple sclerosis. Part I: the role of infection". *Annals of Neurology*. 61 (4): 288–99.

Huntley A (January 2006). "A review of the evidence for efficacy of complementary and alternative medicines in MS". *International MS Journal*. 13 (1): 5–12, 4.

Weinshenker BG (1994). "Natural history of multiple sclerosis". *Annals of Neurology*. 36 Suppl (Suppl): S6–11.

Berer K, Krishnamoorthy G (November 2014). "Microbial view of central nervous system autoimmunity". *FEBS Letters*. 588 (22): 4207–13.

World Health Organization (2008). *Atlas: Multiple Sclerosis Resources in the World 2008*
"Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013". *Lancet*. 385 (9963): 117–71. January 2015.

Clanet M (June 2008). "Jean-Martin Charcot. 1825 to 1893" (PDF). *International MS Journal*. 15 (2): 59–61.

Charcot, J. (1868). "Histologie de la sclerose en plaques". *Gazette des hopitaux, Paris*. 41: 554–5.

"MS Signs". Webmd. Archived from the original on 30 September 2016. Retrieved 7 October 2016.

Kurtzke JF (November 1983). "Rating neurologic impairment in multiple sclerosis: an expanded disability status scale (EDSS)". *Neurology*. 33 (11): 1444–52.

Amato MP, Ponziani G (August 1999). "Quantification of impairment in MS: discussion of the scales in use". *Multiple Sclerosis*. 5 (4): 216–9.

Rudick RA, Cutter G, Reingold S (October 2002). "The multiple sclerosis functional composite: a new clinical outcome measure for multiple sclerosis trials". *Multiple Sclerosis*. 8 (5): 359–65.

Web reference

https://en.wikipedia.org/wiki/Multiple_sclerosis

https://www.aism.it/index.aspx?codpage=aism_sua_fondazione

<https://www.webmd.com/multiple-sclerosis/multiple-sclerosis-symptoms#1>

https://www.aism.it/torino/indexSS.aspx?codpage=ss48_chisiamo

https://www.aism.it/torino/indexSS.aspx?codpage=ss48_newssezione

https://areeweb.polito.it/didattica/designworkshop/?page_id=6

https://it.brandmemo.com/yomo/breakfast/network?filter=lovers&limit=10&offset=0&sort=-rank_timestamp%2Cuser_name

<http://www.chronicle.lu/category/agriculture-viticulture/18110-greek-yoghurt-company-fage-invests-%E2%82%AC100m-in-luxembourg,-creates-100-jobs>

<http://www.plastitalia.it/catalogo/le-fruttuose>

https://en.wikipedia.org/wiki/Can_opener

<https://www.china-10.com/goomai/160364.html?fromapp=topic>

<https://www.nutrisens-medical.it/nutrizione/prodotti-per-disfagia/acqua-gelificata-pronta-all-uso-zuccherata/5>

<http://vuro.com/3d-printing.php>

<https://thewirecutter.com/reviews/best-can-opener/>

<https://www.3dhubs.com/3d-printers/thing-o-matic>

<https://lagunatools.com/cnc/iq-series/iq-24-36-cnc/>

<https://www.epiloglaser.com/laser-machines/zing-laser-series.htm>

<https://www.rolanddga.com/support/products/3d-scanners/picza-lpx-600ds-3d-laser-scanner>

<http://vuro.com/3d-printing.php>

<https://newatlas.com/carvey-cnc-milling-3d-printer-prototype/34337/#gallery>

<https://detail.tmall.com/item.htm?spm=a220o.1000855.0.0.1a59626fMvWMwJ&id=557792746306&rn=efb3c8c9f442d06230711b4eabe7de25&abbucket=7>

<https://item.taobao.com/item.htm?spm=a230r.1.14.110.2f058b93c2cSJH&id=549258704372&ns=1&abbucket=19#detail>

<https://item.taobao.com/item.htm?spm=a230r.1.14.76.2f058b93c2cSJH&id=532195129551&ns=1&abbucket=19#detail>

https://detail.tmall.com/item.htm?spm=a230r.1.14.13.2f058b93c2cSJH&id=567216091749&cm_id=140105335569ed55e27b&abbucket=19&skuld=3779800855428

<https://3dprint.com/75233/new-formlabs-tough-resin/>

<https://www.kisspng.com/png-the-lego-store-lego-logo-octalysis-2014830/preview.html>

<http://www.p1prototipos.com.br/blog/sites-para-baixar-modelos-gratuitos-para-impressao-3d>

Master's degree in Systemic Design
Department of Architecture and Design
Graduated in December 2018
Master Thesis

ANTONINO X

Opener of water-gel container