Konstruktionsmethoden
Bachelor ZHdK
FS 2014
Martin Schütz

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CITY BIKE LOCK
DOCUMENTATION

Contents

1.1 Project definition

Bike usage is a common and growing means of transportation. It‘s concentrated to cities, where it makes up to 10% of the daily traffic. Its usage on shorter distances is more efficient than the public transport and stands for a modern, healthy, and sustainable cityscape.
Yet it still causes inconviniences. Usually the cities infrastructure lacks the parking spaces and designations needed to properly communicate with cyclists. Bike users have to deal with a high rate of thievery and have to provide their own security system; which is heavy, inconvenient and expensive.

Our challenge is to design a locking system, which makes it more comfortable to use the bike in the city. The solution is based on the connection between the city infrastructure and the bike user. The result should ensure more safety, easy handling and less weight to transport for the user. It generates a modern and progressive image of the city, reduces maintenance cost and creates a more attractice cityscape, promoting bike usage.

1.2 Statistics/ Facts

For the product development we decided to put our focus on the city of Zurich. Zurich is Switzerland‘s biggest and fastest growing city and represents a worldclass standard. The urban cityplaning is a worldwide representative and investigated in numerous international studies like the audi future initiative.

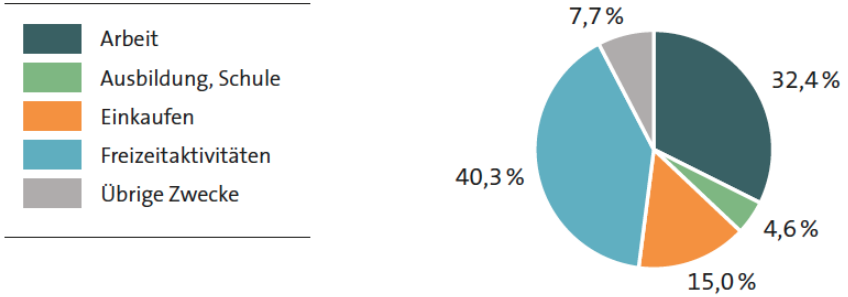
switzerland

- 3.9 million bikes
- 1.4 bikes per household
- 63% of households own at least one bike
- 350‘000 new bikes sold per year

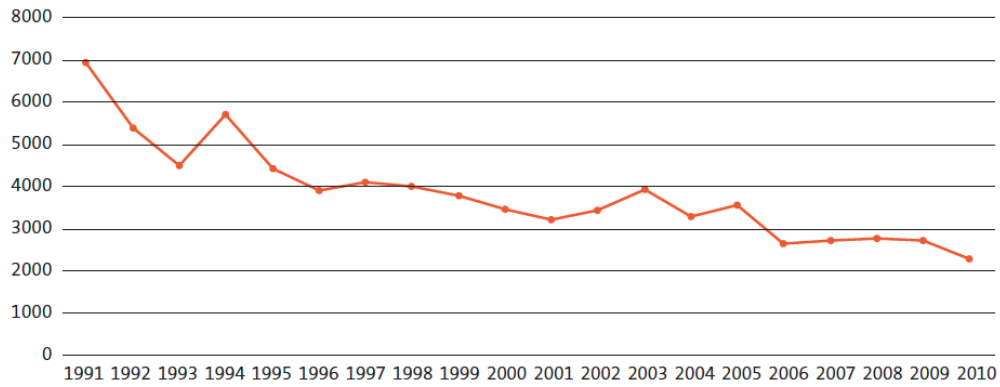
zürich

- 10% of the daily traffic
- 2300 stolen bikes in 2012
- 2.5% of the thefts could be solved by the police
- increased usage causes less parkingspace and accidents
- reason for bike usage is to bridge short distances and live more healthy

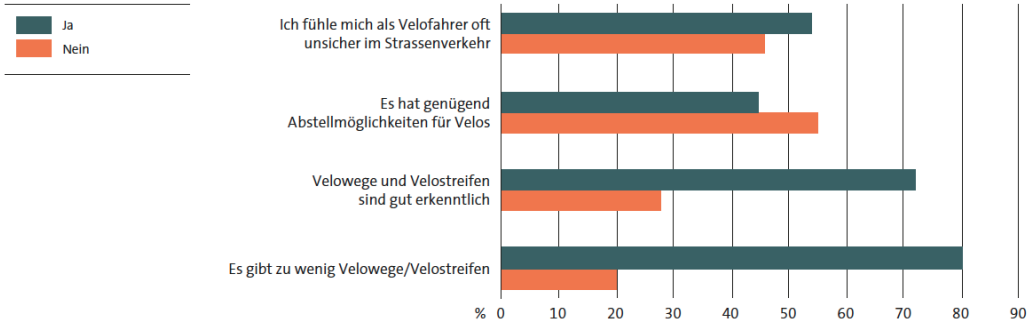
Mit dem Velo zurückgelegte Distanz G_2.12
► nach Zweck, 2010

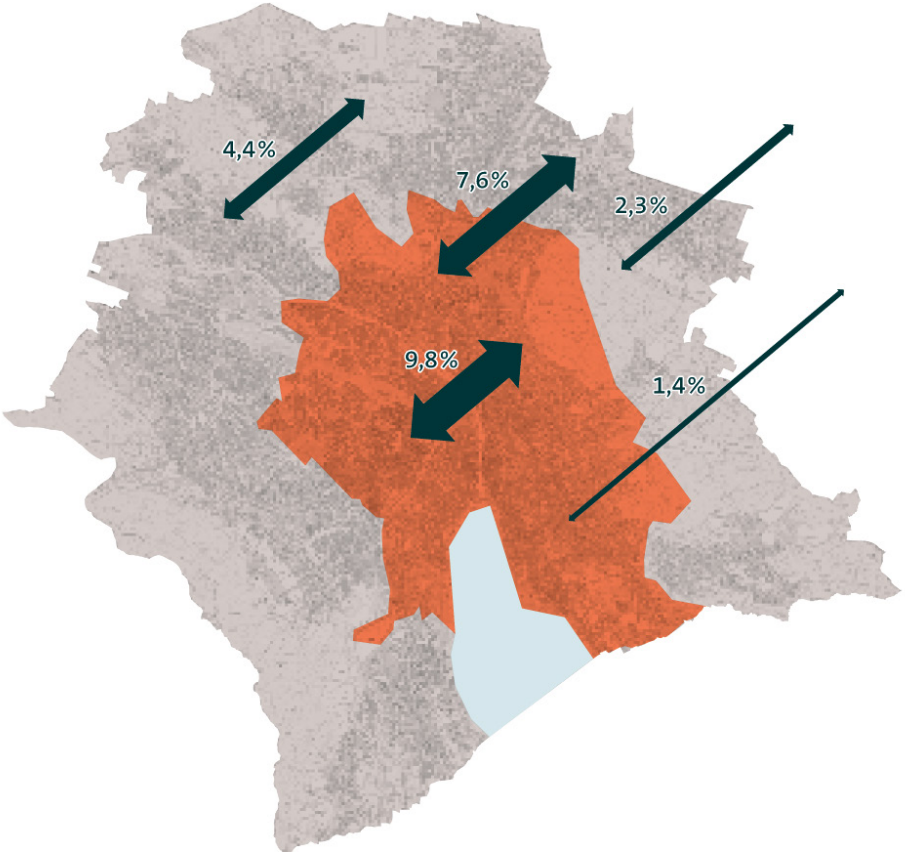


Gemeldete Entwendungen von Velos G_2.4
► in der Stadt Zürich, 1991–2010



Meinungen zur Velo-Infrastruktur G_2.9
► von Personen, die regelmässig mit dem Velo unterwegs sind, 2009





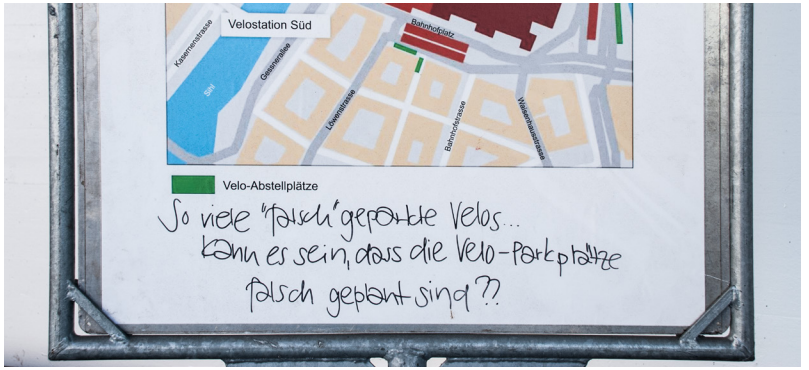
1.3 Situation today


P
VELOPARKPLATZ


SCOTT


ZH
82153
MOTOSHOP

1.4 Problem


Velostation Süd
Bahnhofplatz
Kasernenstrasse
Gasstrasse
Löwenstrasse
Bahnhofstrasse
Velo-Abstellplätze
So viele "falsch" geparkte Velos...
kann es sein, dass die Velo-Parkplätze
falsch geplant sind??


olé
olé
bar
GALERIE
Neufranke
BAR-DISCO

2.1 baseline study

We separated the different solutions into three groups. For each group we conducted research about existing and conceptual product solutions. The results posed multiple viable concepts. Once organized, we worked out the advantages and disadvantages.

USER

- safety is on the user side
- user has to bring and carry the lock

CITY

- safety is on the city side
- the user pays to use the locking infrastructure

USER - CITY

- safety is on the user and the city side
- the city provides infrastructure and the user brings his own locking mechanism

2.2 Baseline study
bike | bike-city | city

BIKE

individual+ bike can be locked anywhere+ part of the bike+ attached to the frame+	-heavy object to carry -expensive -built into the frame

BIKE-CITY

less to carry+ more security+ works in addition to current system+ improved integrated to the city+ improved bycycle organization+ personal locking system+ split cost between city and user+ sharing system+	-fixed stations -limited Space -different frame sizes and shapes -Abandonded Bikes

CITY

nothing to carry for user+ nothing to purchase for the user+ encouraged bike use+ more security+ works in addition to current system+ improved bycycle organization+ sharing system+	-fixed stations -limited space -needs individual locks for each user -Abandoned bikes

2.3 Baseline study existing patents

BIKE

US 20080018440A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2008/0018440 A1**

Aulbers et al. (43) **Pub. Date: Jan. 24, 2008**

(54) **BICYCLE LOCK, USE THEREOF AND SYSTEM FOR GIVING BICYCLES ON LOAN**

(75) Inventors: **Antonius Paulus Aulbers**, Eindhoven (NL); **Frederikus Johannes Maria de Vreede**, Eindhoven (NL); **Hendrik Enting**, Best (NL); **Anna Elizabeth den Besten**, Meteren (NL)

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(73) Assignee: **NEDERLANDSE ORGANISATIE VOOR TOEGEPASTNATUUR-WETENS**, Delft (NL)

(21) Appl. No.: **11/632,689**

(22) PCT Filed: **Aug. 2, 2005**

(86) PCT No.: **PCT/NL05/00569**

§ 371(c)(1),
(2), (4) Date: **Mar. 14, 2007**

(30) **Foreign Application Priority Data**

Aug. 2, 2004 (EP) 04077205.5

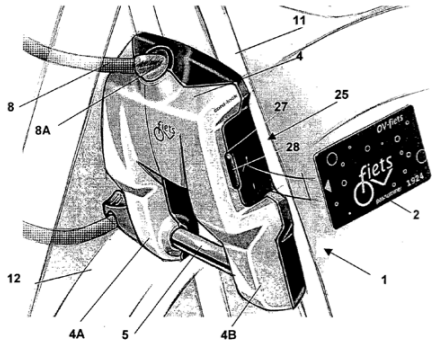
Publication Classification

(51) **Int. Cl.**
B62H 5/20 (2006.01)

(52) **U.S. Cl.** **340/432**; 194/205; 70/233

(57) **ABSTRACT**

The invention relates to a bicycle lock (**1**), comprising locking means (**5,8**) for locking a bicycle (**10**), and releasing means (**6**) for removing the locking. The releasing means (**6**) can be operated with a pass (**2**), which is provided with a valid operating code (**3**). For this purpose, the lock comprises reading means (**15**), preferably non-contact, by means of which the operating code (**3**) can be read out and compared with a code preprogrammed in the lock. In order to save energy consumption, the reading means are preferably provided with switching means, which are preferably automatically switched on when the pass is brought into a reading position. The invention further relates to a system for giving bicycles on loan, wherein each bicycle is provided with a lock according to the invention, and wherein issue and collection of the bicycles is managed with the aid of the issue and collection of passes (**2**).



BIKE-CITY

US008065895B2

(12) **United States Patent**
Andersen

(10) **Patent No.: US 8,065,895 B2**
(45) **Date of Patent: Nov. 29, 2011**

(54) **PUBLIC FACILITY BICYCLE LOCK**

(75) Inventor: **Jacob Silas Lee Andersen**, Liberty Lake, WA (US)

(73) Assignee: **Andersen Holdings, LLC**, Liberty Lake, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **12/713,975**

(22) Filed: **Feb. 26, 2010**

(65) **Prior Publication Data**

US 2011/0209508 A1 Sep. 1, 2011

(51) **Int. Cl.**
E05B 71/00 (2006.01)

(52) **U.S. Cl.** **70/14**; 70/18; 70/30; 70/49; 70/233; 70/278.7; 340/427

(58) **Field of Classification Search** ..... 70/14, 18, 70/30, 49, 233, DIG. 41, 278.7, 279.1; 242/379, 242/380; 340/5.54, 427, 432
See application file for complete search history.

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2006/0162407	A1 *	7/2006	Kahblank	70/233
2009/0201127	A1 *	8/2009	Stobbe et al.	340/5.6

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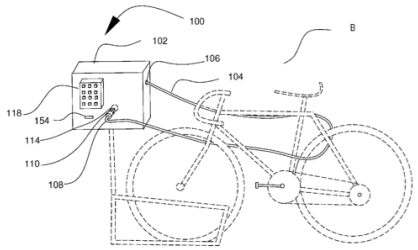
Primary Examiner — Lloyd Gall

(57) **ABSTRACT**

A bicycle lock device for public use is disclosed. The device is comprised of an enclosure, a retractable reel with a retractable cable, a lock/unlock device having a first member attached to the cable free end, and a second member secured in the enclosure, and a lock control device. The user accesses the device by inserting a payment such as a coin or credit card in a user interface of the device. If the payment is accepted, the user then enters a user-specified key code in a keypad on the lock control device. The lock control device unlocks the lock/unlock device. The retractable cable may then be extended. The user weaves the cable through the bicycle components and then enters the cable free end into the lock/unlock device, thereby locking the lock/unlock device and securing the bicycle. When the user later enters the key-code, the device unlocks the cable.

19 Claims, 5 Drawing Sheets



CITY

US 20100163503A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2010/0163503 A1**

KELLY (43) **Pub. Date: Jul. 1, 2010**

(54) **COMPUTERIZED LOCKING SYSTEM FOR STORAGE OF BICYCLES AND ACCESSORIES**

(76) Inventor: **MICHAEL JAMES KELLY**, Baltimore, MD (US)

Correspondence Address:
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Baltimore, MD 21230 (US)

(21) Appl. No.: **12/649,593**

(22) Filed: **Dec. 30, 2009**

Related U.S. Application Data

(60) Provisional application No. 61/141,349, filed on Dec. 30, 2008.

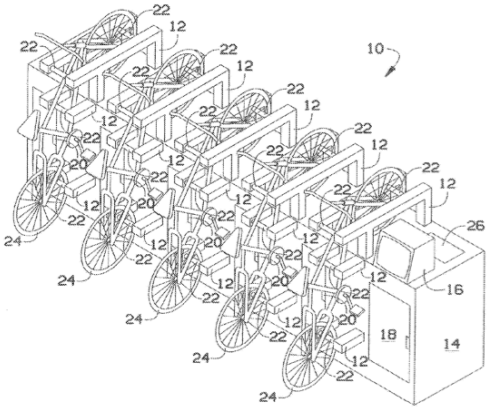
Publication Classification

(51) **Int. Cl.**
A47F 7/19 (2006.01)
A47F 7/00 (2006.01)
B62H 5/00 (2006.01)
G06K 5/00 (2006.01)

(52) **U.S. Cl.** **211/85.3**; 211/85.7; 70/233; 235/382

(57) **ABSTRACT**

A computerized locking system for storage of bicycles and accessories includes: plurality of receiving bays to releasably secure the bicycles; a plurality of equipment storage units; a support surface for the receiving bays and the equipment storage units; and a computerized access box. The access box controls the locking and releasing of the bicycle and the storage unit.



2.4 Baseline study

User - City
advantages/ interests

user

safety
security
less to care
add value

handling
weight
less to carry

costs splitted

---

city

green city
sustainability
less cars
promoting bike use
improved image

overview
control
collect datas
less costs

communication
with the user

2.5 Baseline Study Requirements

LOCK	CITY
safe / hidden hardware durable easy to use / quick / understandable ergonomic less to carry universal (frames)	using standards space saving/ forced organisation less costs integration to the city safe / hidden hardware
added value object you like	communication with the user organisation /system

must
nice to have

2.6 Baseline Study
Szenario

SITUATION TODAY	VISION	FUNCTION
1 search a place	1 know a place	• signed (city)
2 place the bike	2 place the bike	• force organisation
3 retreave the lock	-	
4 get the key	-	
5 unlock the lock	-	• interface of the city
6 place the lock	-	• locking mechanism
7 lock the bike	3 lock the bike	• interface of the bike
8 doubelcheck	4 communication locked	• visual/audio feedback
9 find the bike	5 find the bike	
10 get the key	6 get the key/batch/card	
11 unlock the lock	7 unlock the bike	• visual/audio feedback
12 store the lock	-	
13 remove the bike	8 remove the bike	

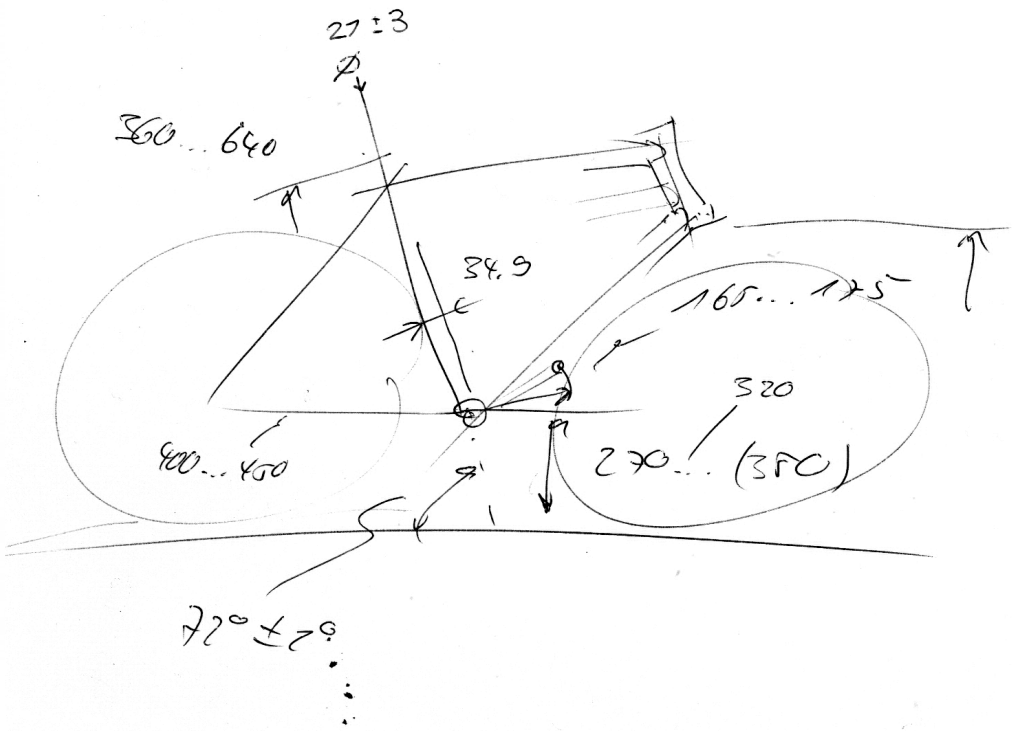
reduce the prozess by **5** steps

easier, quicker, ergonomic

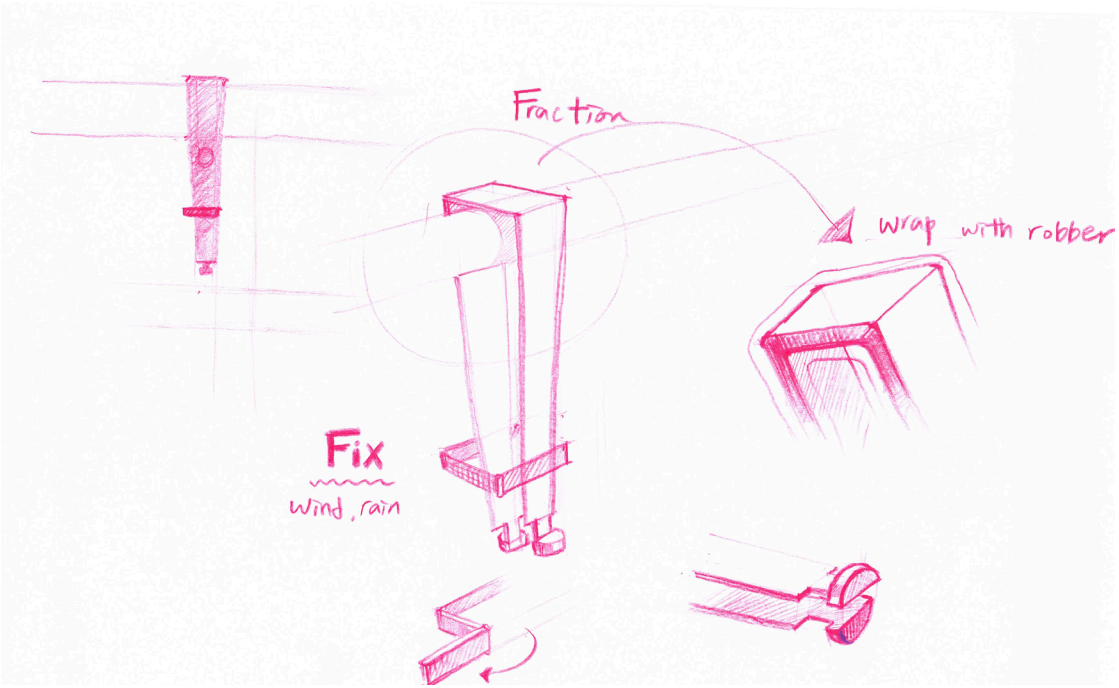
- city prevented
- lock feature

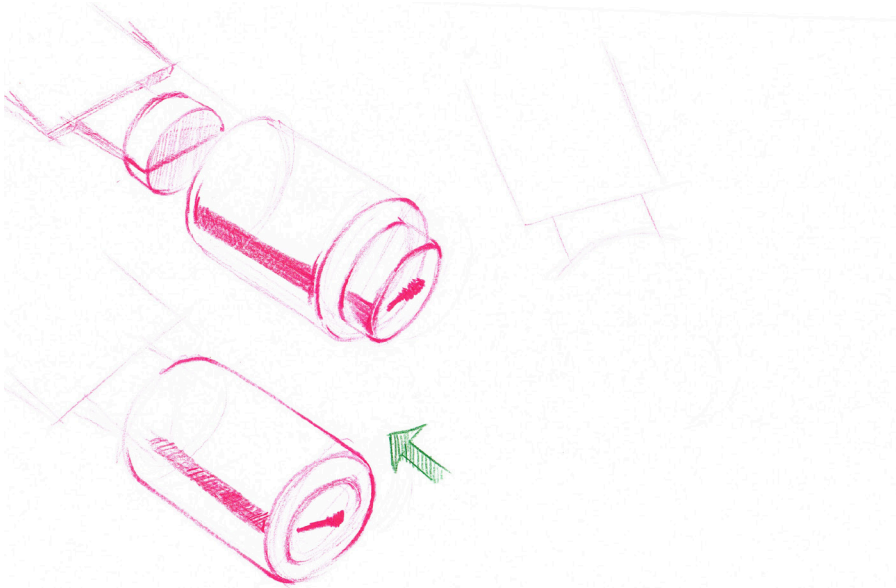
2.7 Baseline Study
Bike Standarts

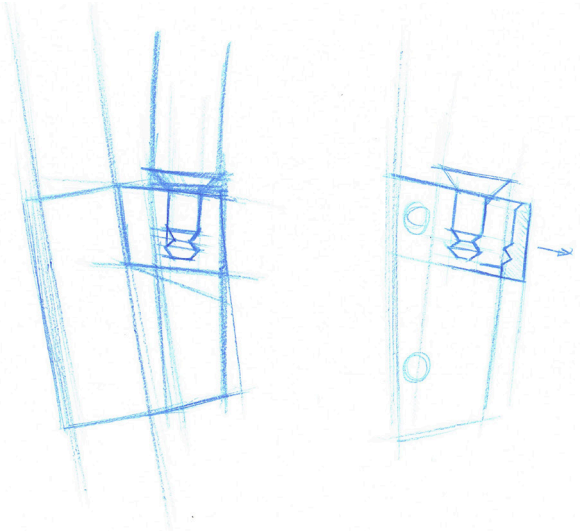
For the positioning of the bikelock we decided to check the different standards in bike frames. This included the toptube, the seattube and downtube. We found out that the Angle of the seattube to the ground is consistently around 72° +/- 2 degrees.

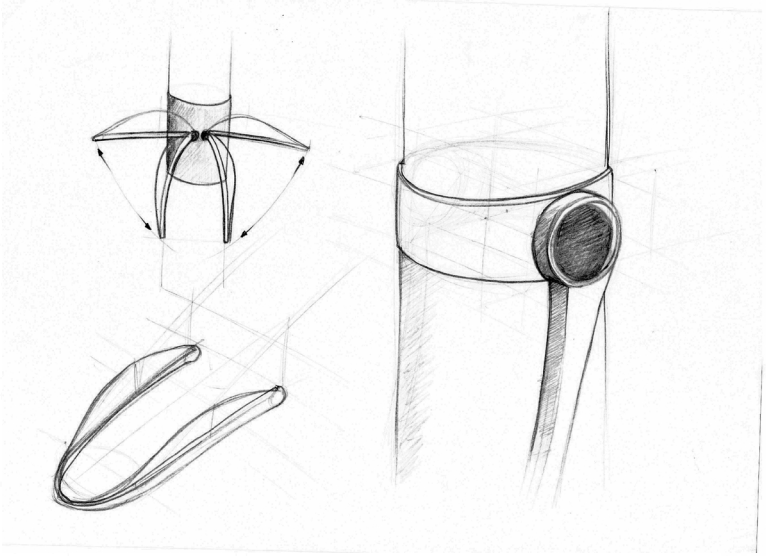


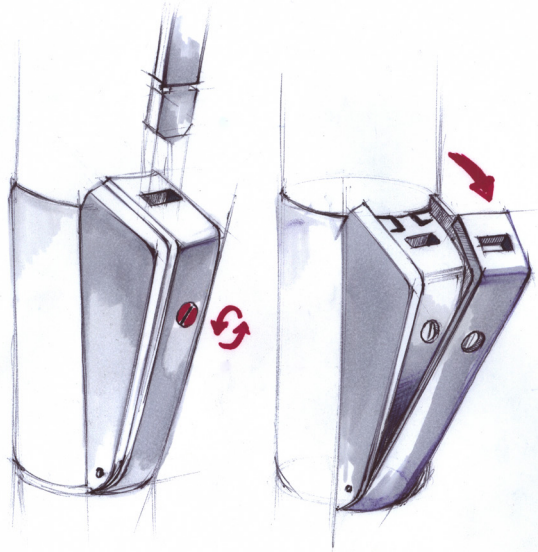
3.1 design process



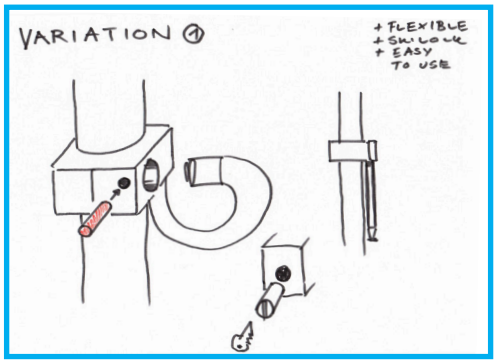


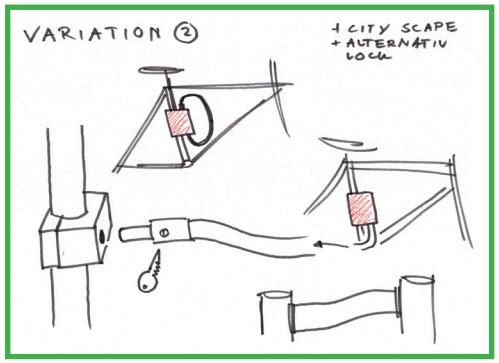


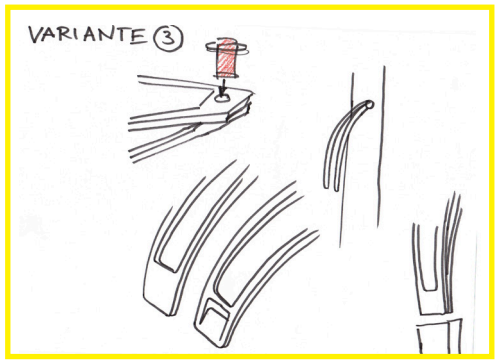


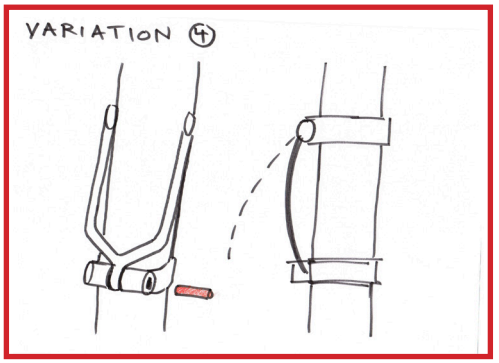


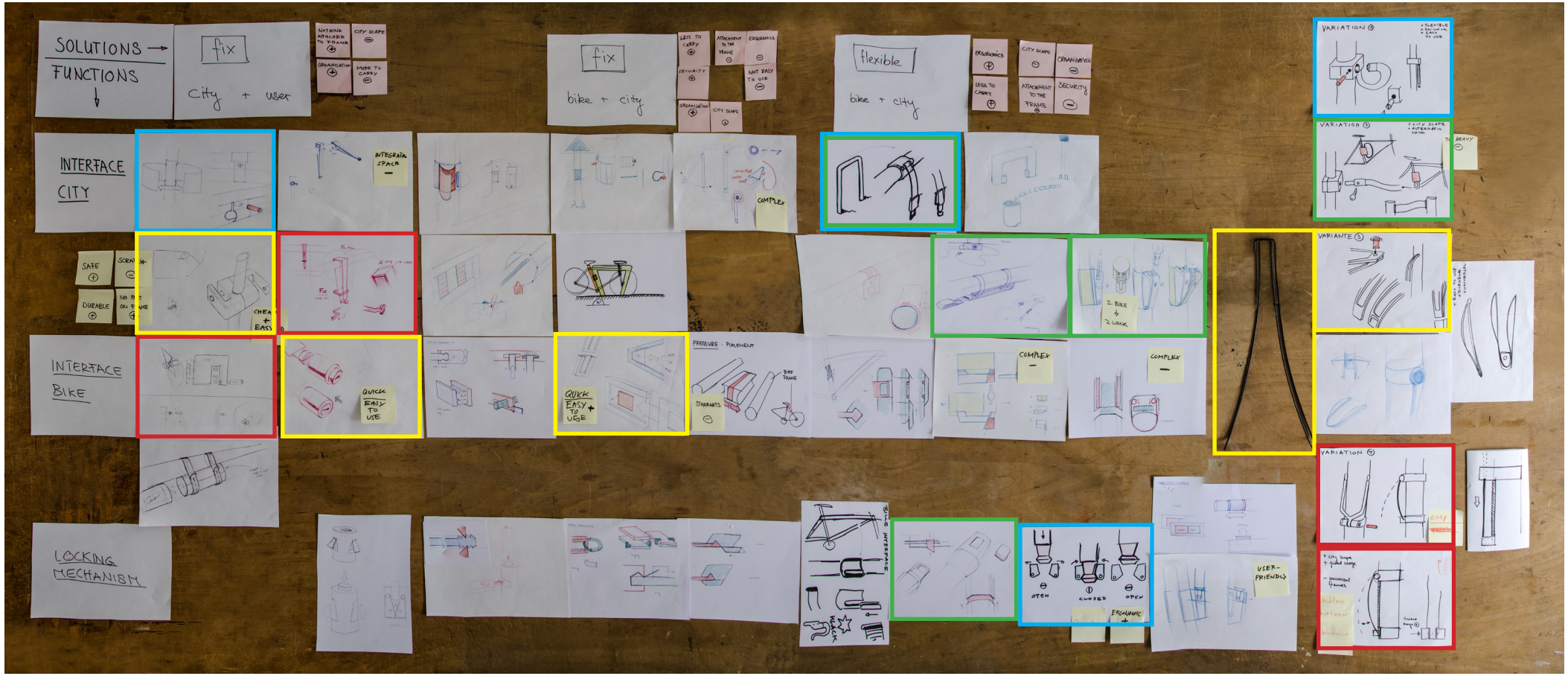
3.2 morphological box



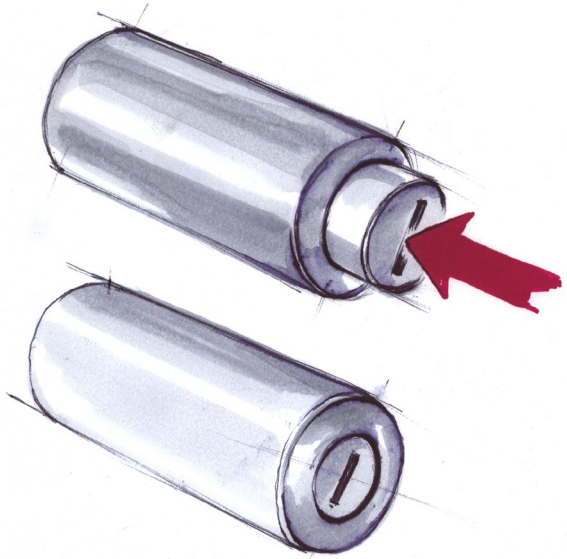






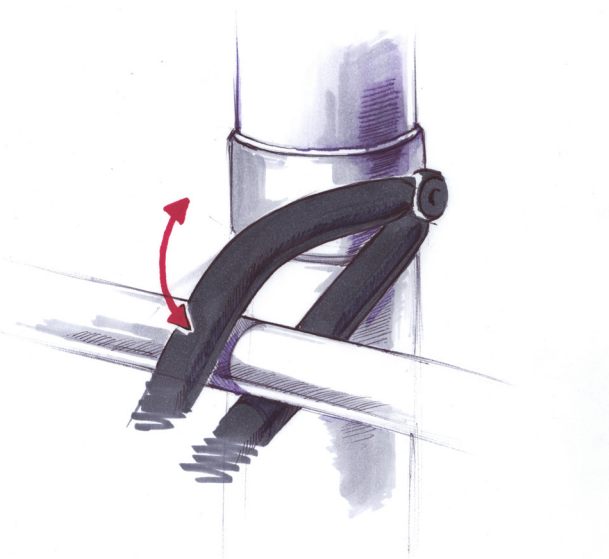


3.3 productvision



solution 1

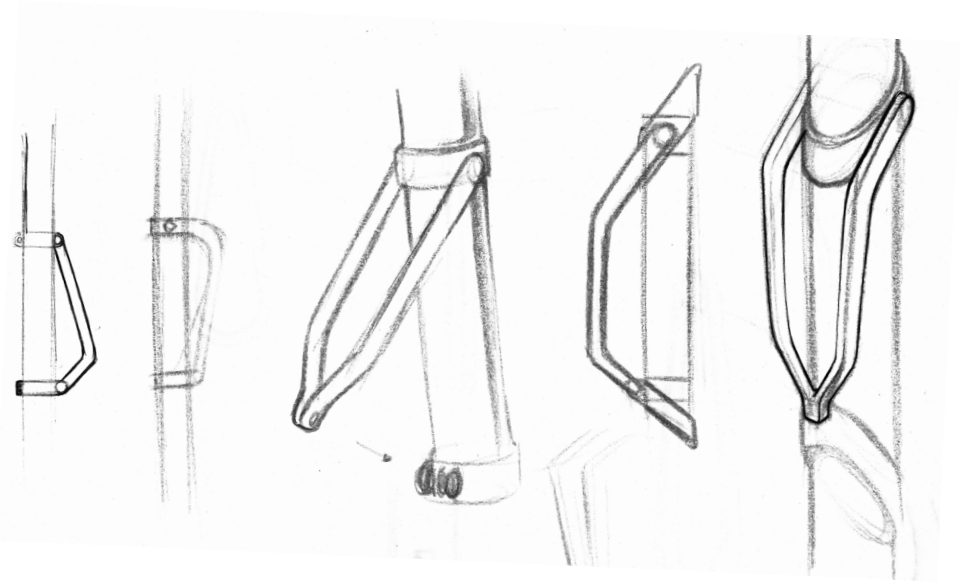
less to carry
use standarts
easy to lock

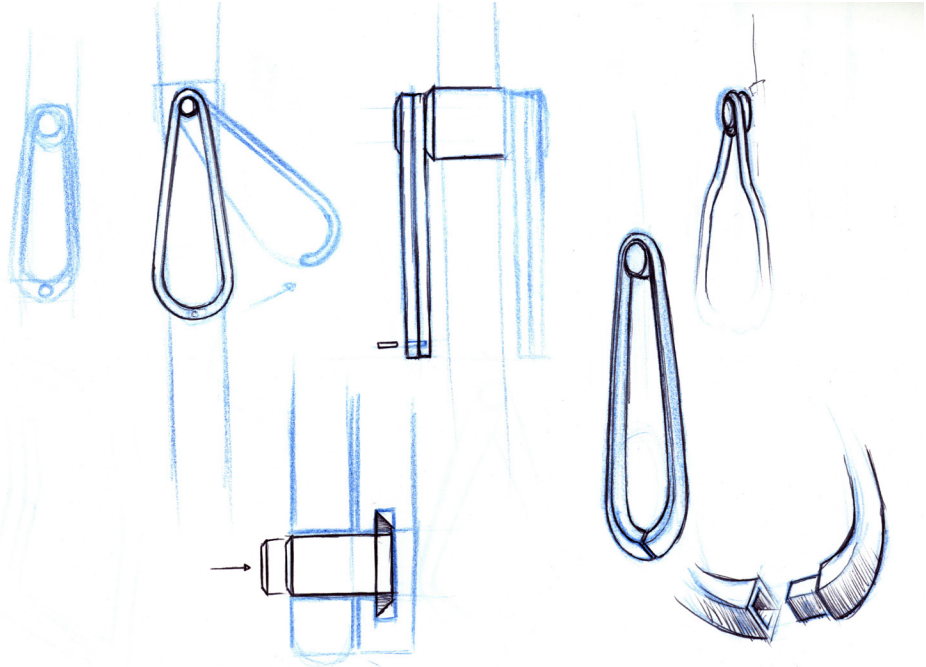


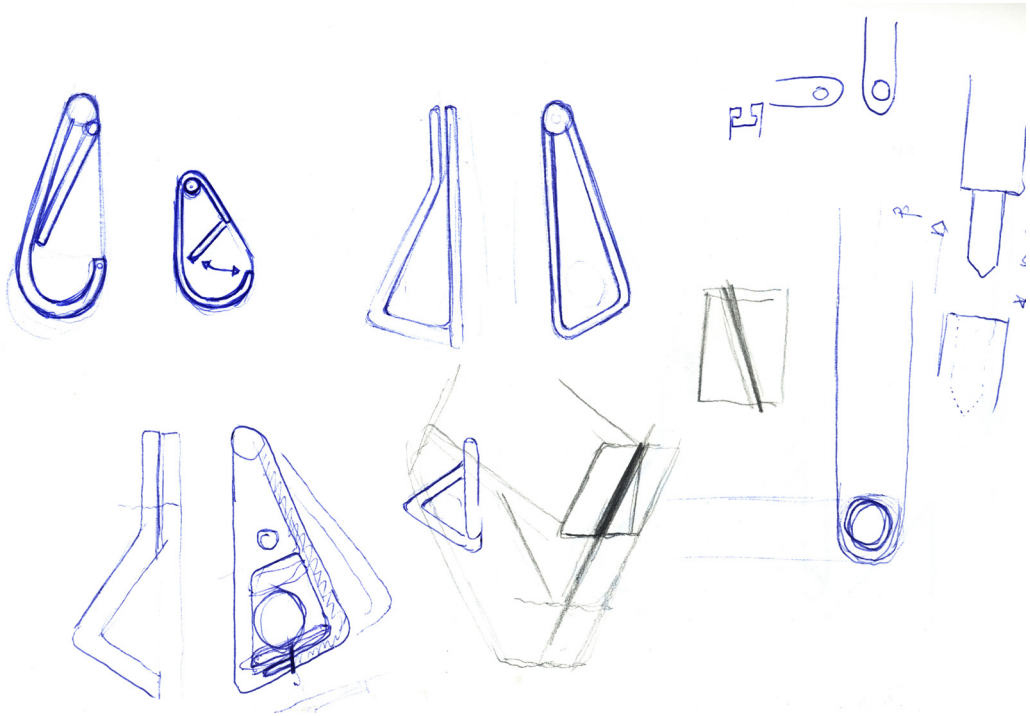
solution 2

safety
integration to the city
adjustment to different frames

3.4 defining shape







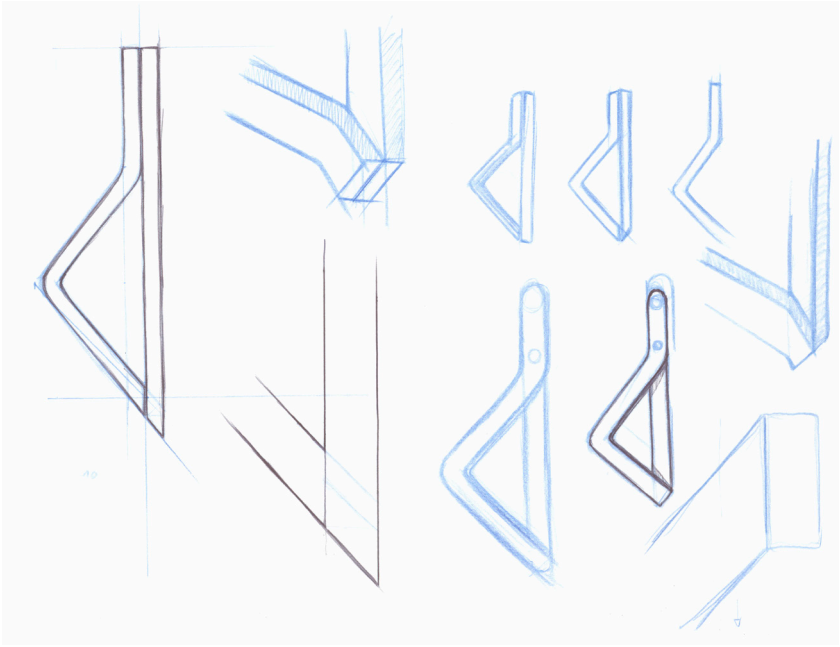
3.5 ergonomics

Out of the sketching ideas we went to the workshop to test the different shapes in ergonomics, handling, dimensions and function. We decided on one joint at the top where the two lockarms are attached to the piller.

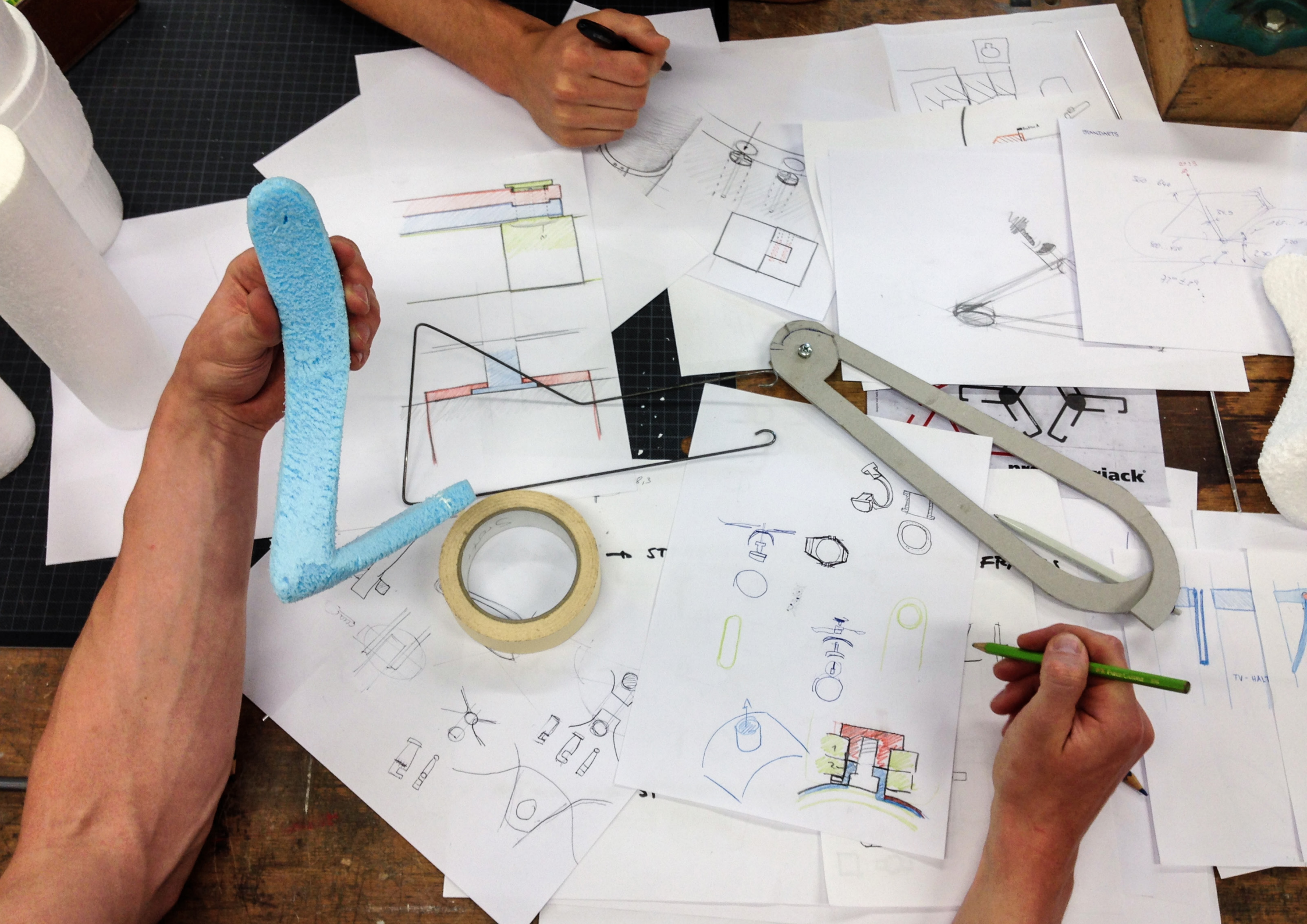
sequence of usage

1. pull the angeld arm upwards
2. after a certain angle the other arm follows automatically
3. place the bikeframe through the open space
4. close the upper (angled) arm
5. insert the lock

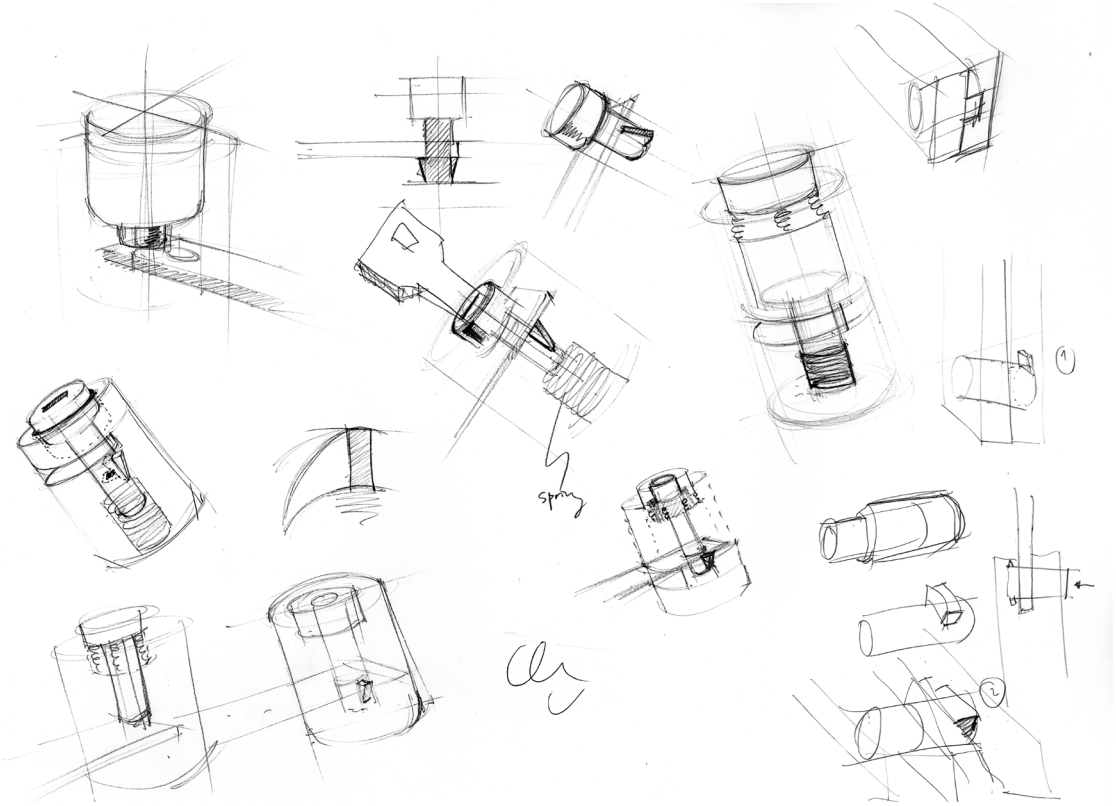
3.6 shape

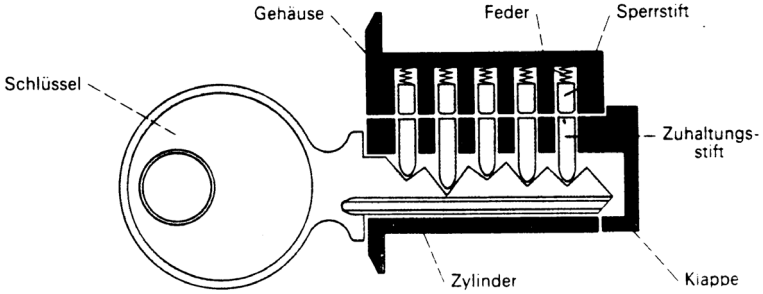


The shape was designed to lock the seatube as well as the toptube. Its unique shape enables to lock to accomidate different frame sizes and shapes. The curve of the upper arm fits perfectly to the shape of the frame.

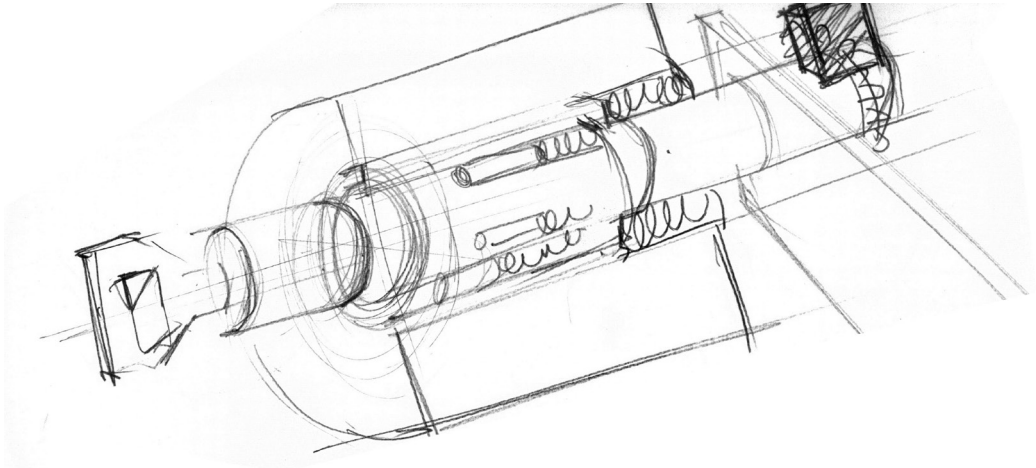


3.7 the lock

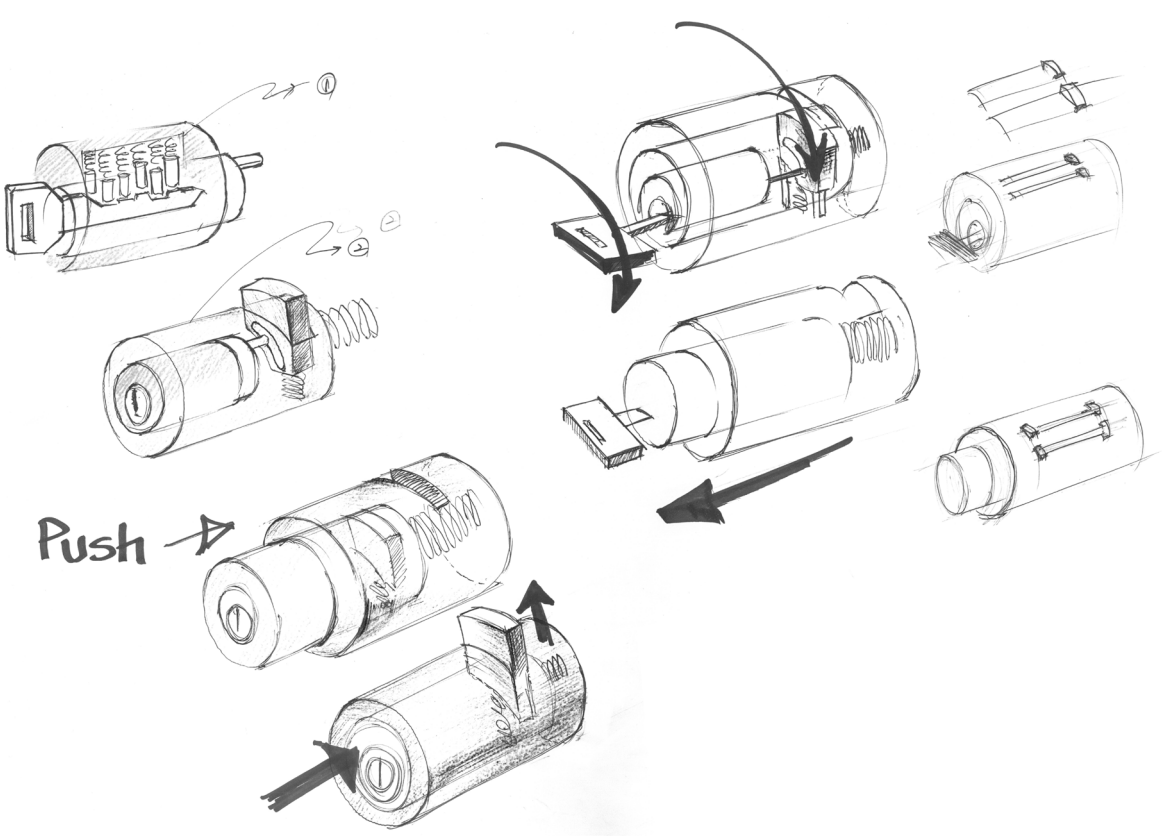


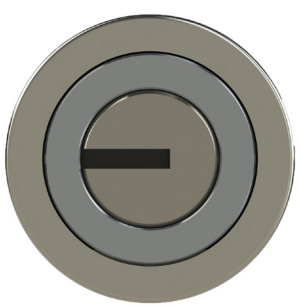


Schema eines Sicherheits-(Zylinder-)schlosses

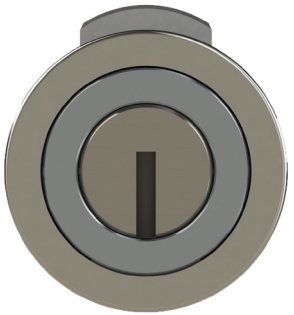


4.1 final product
the locking mechanism

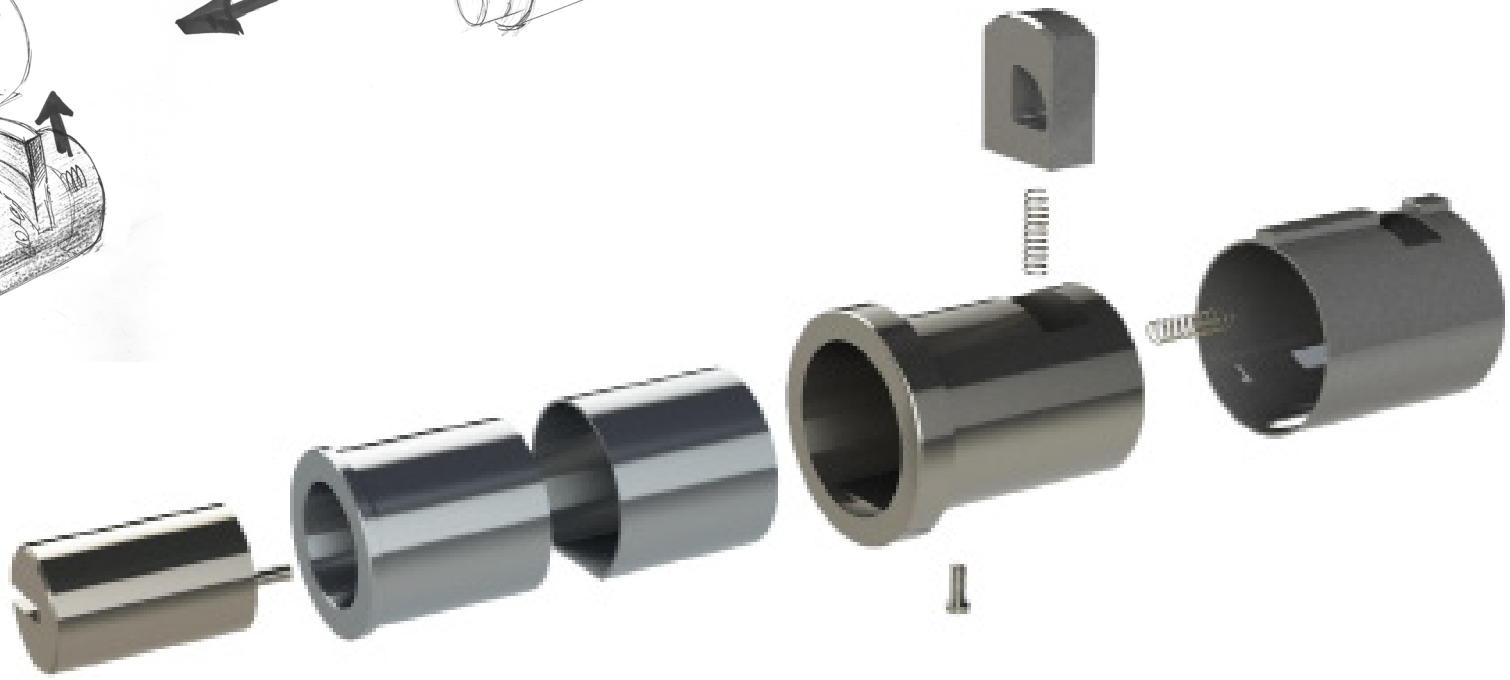




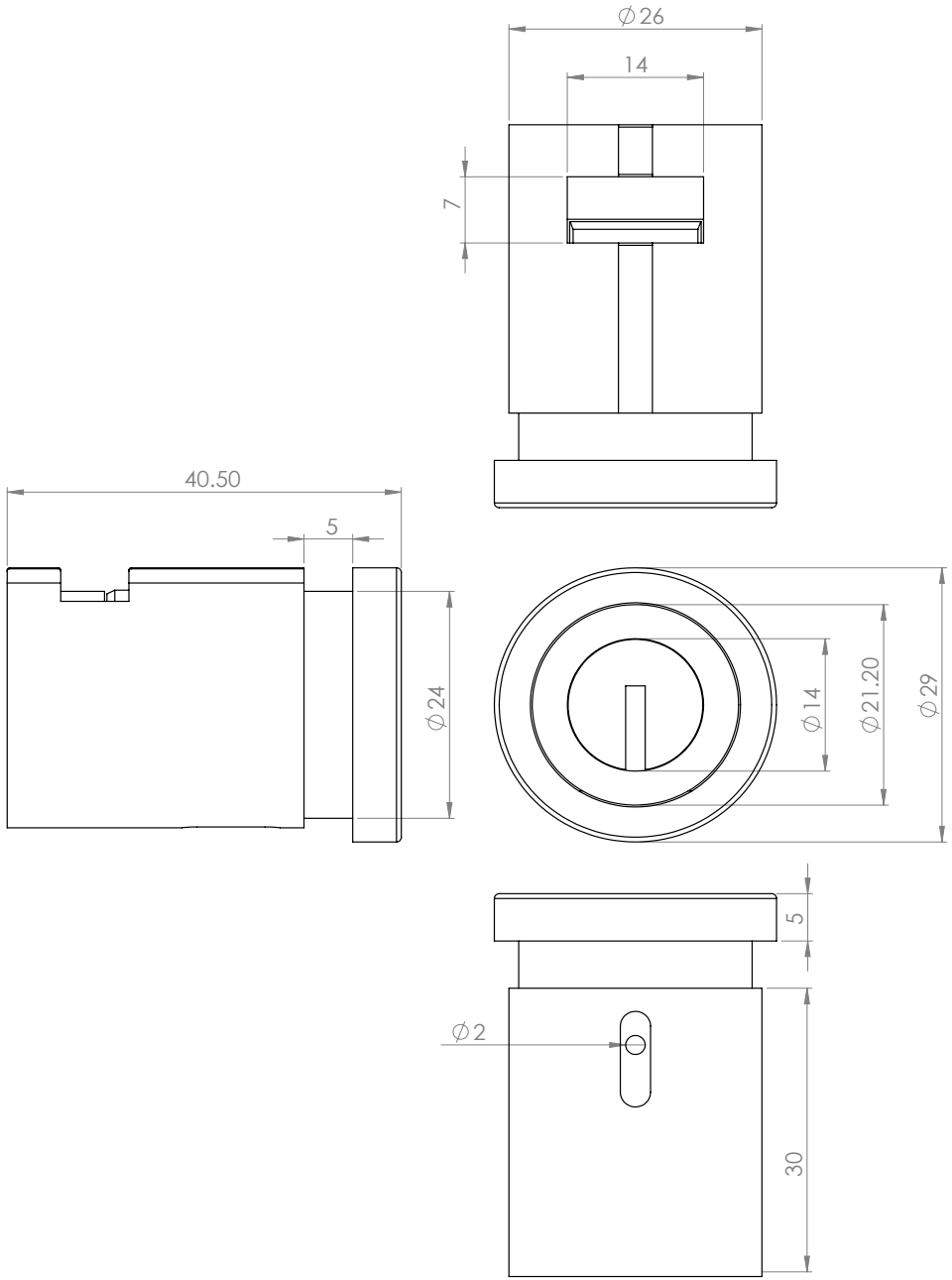
open

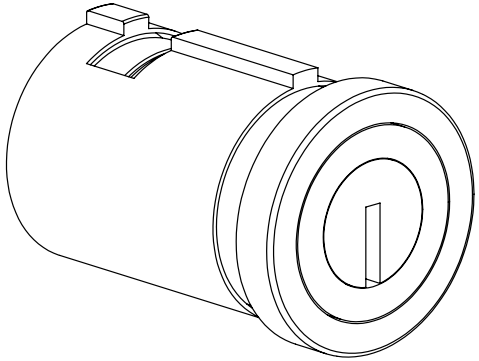


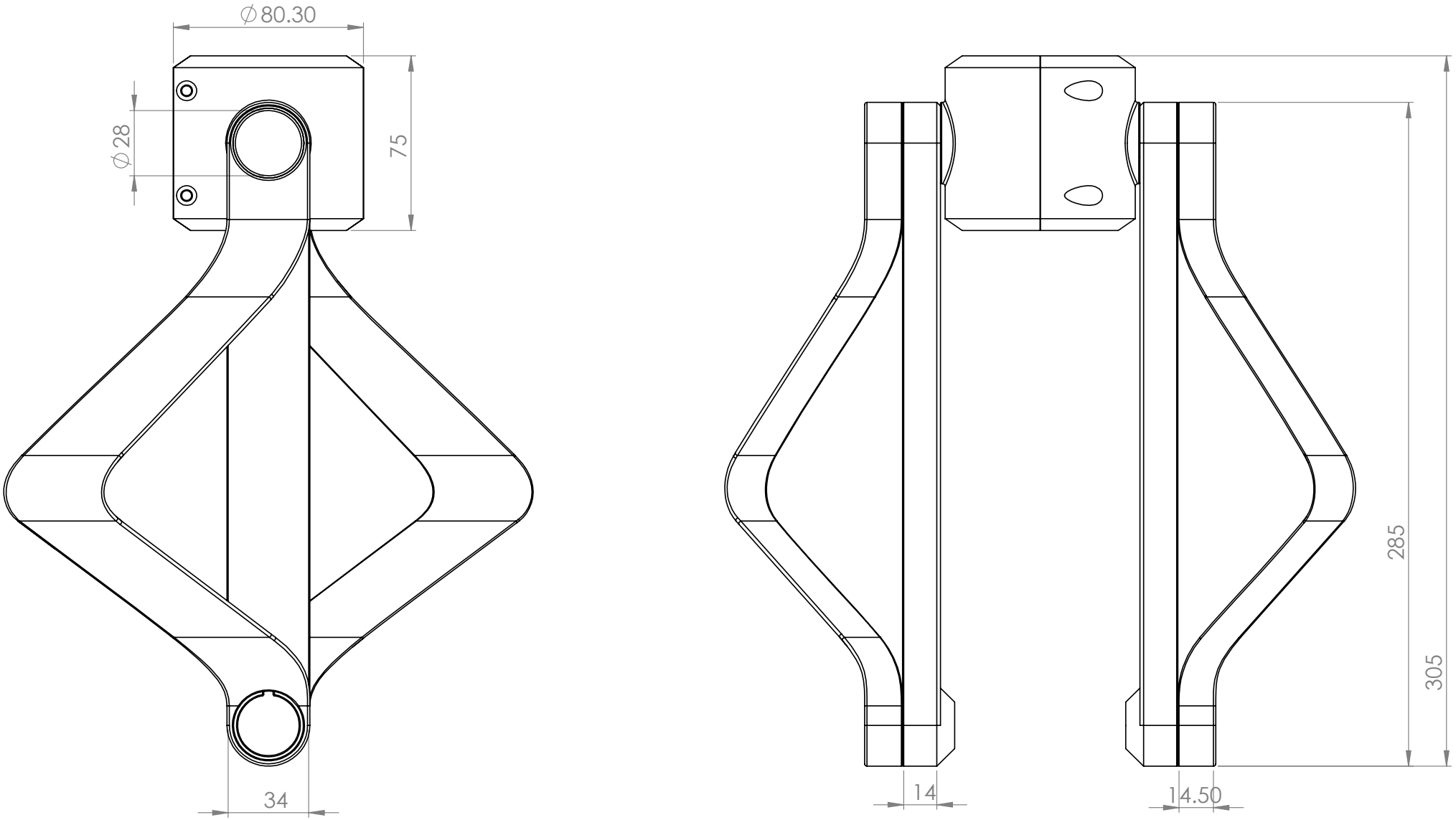
closed



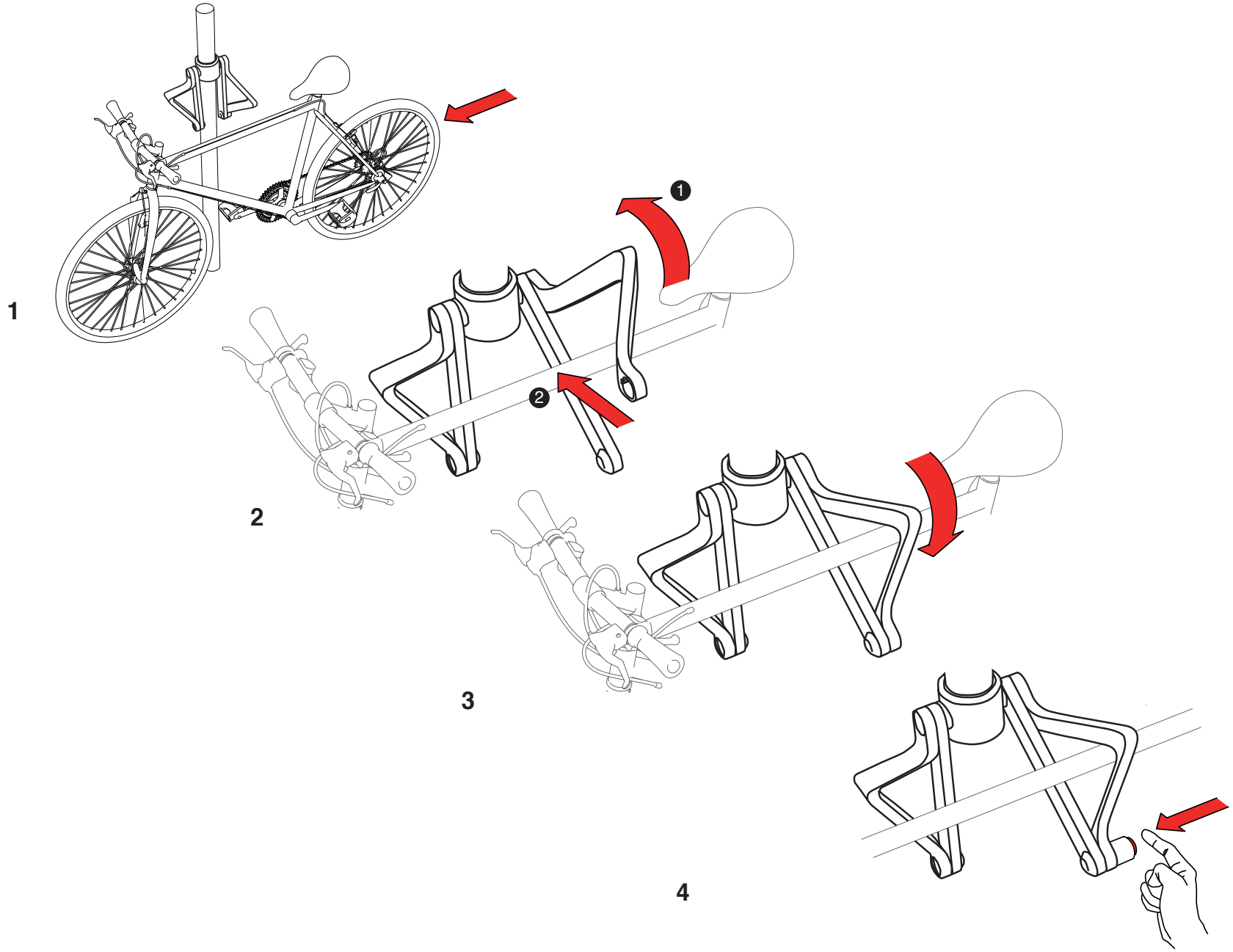
4.2 product structure



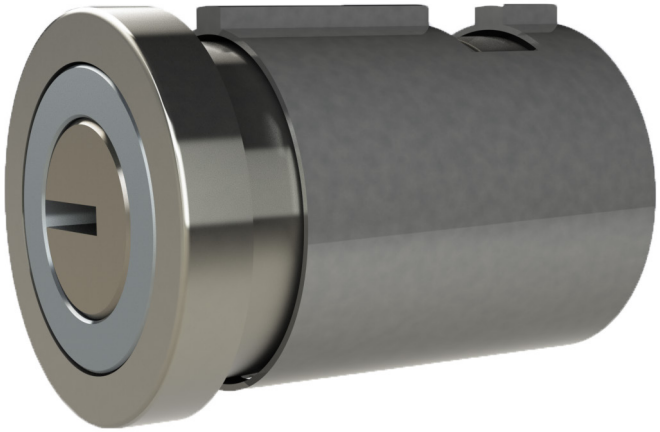



∅80.30
∅28
75
34
14
14.50
285
305

4.3 product usage



4.4 product vision



4.5 prototype

4.6 product usage

locking

To simplify the locking process, the cylinder was designed to be placed easily in the poper position located in the bottom of the lockingarms. To lock the cylinder just push it in until it clicks into place.

opening

Get the key in the suitable position and turn it clockwise 90 degrees. Pull the cylinder out of the locking hole and release your bike.

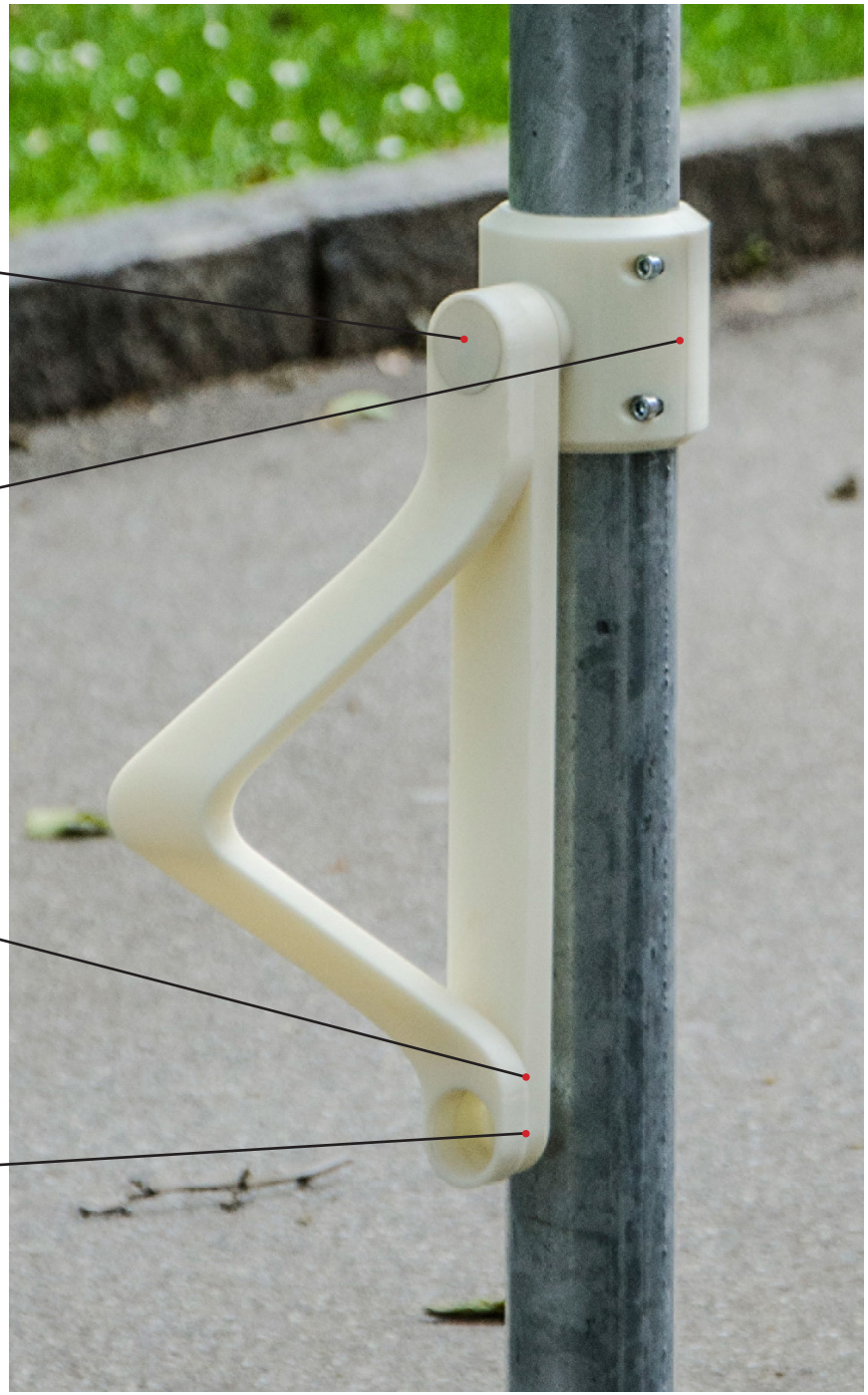
5.1 first prototype revisions

Rotation direction change; bent arm should come up from bottom

Multi layer locking system needed to protect against disassembly

Tongue and elongated groove slot needed for extra security

Chamfer needed to ease realignment of the arms

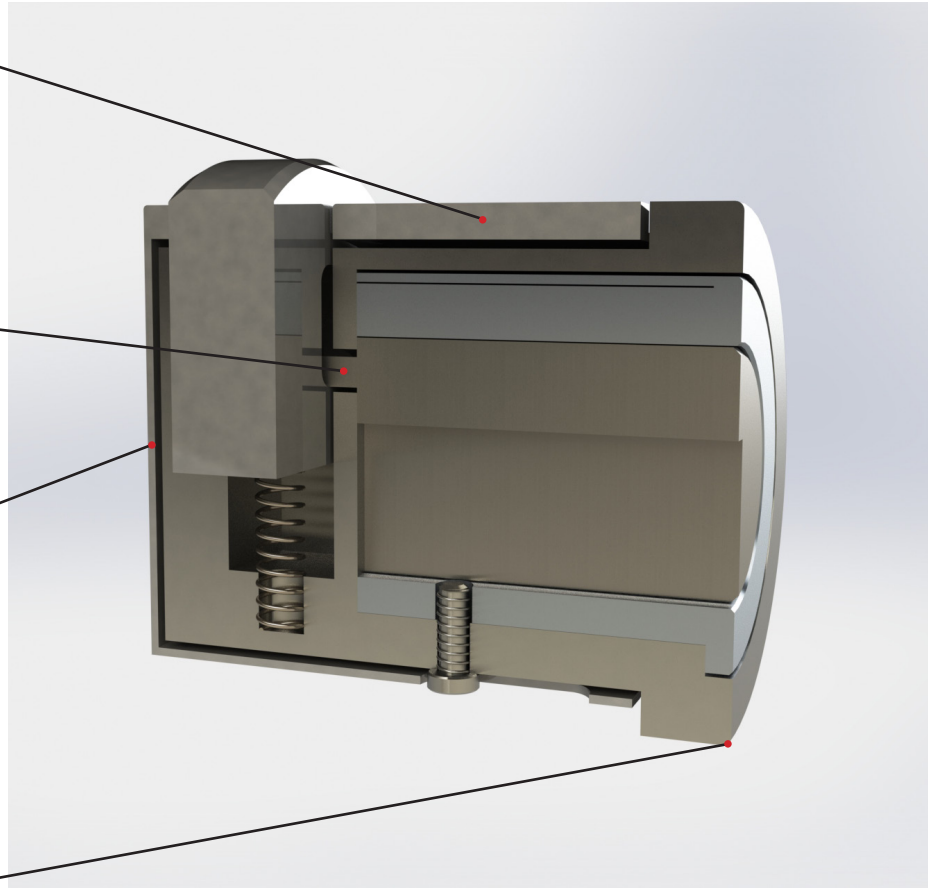


Move alignment groove to bottom,
to allow for a larger fixation screw

Guide pin must be larger to
improve durability

Open rear to allow trapped
debris to escape

Larger chamfer to edge, to
improve lock to arm interface

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