

Effects and Problems Coming in Sight Utilizing TRIZ for Problem Solving of Existing Goods

- Problem Solving of a Deferment Handrail
as an Example -

OM Kiki Co., Ltd.

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1. Company overview



Establishment	February, 1973
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Number of employees	120 people
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Address	Soja city Okayama Prefecture
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Production foothold	Soja factory Aida factory Ibaraki factory
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Business base	Headquarters Tokyo
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Main products

■ Office related product

OA floor



■ Work related product

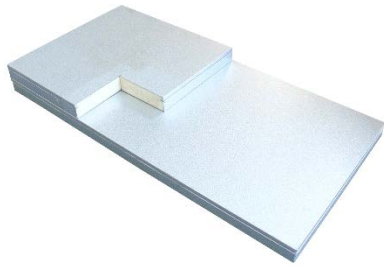
Dolly



Main products

■ Insulation and high performance commodities

Insulation panel



■ Welfare related product

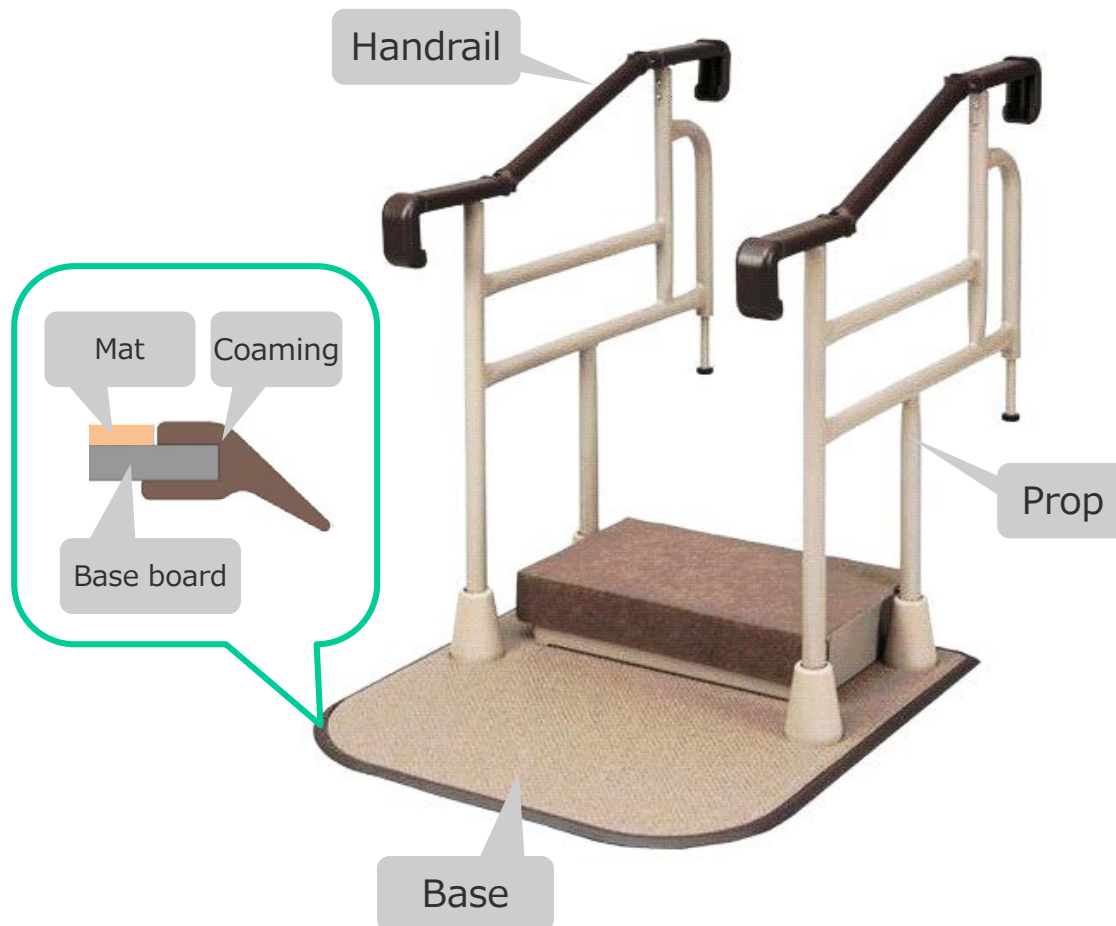
Handrail



2. Problem of existing commodity

Theme

Problem solving of
a deferment door handrail



Customer requirements ...



The gap between
the base and the floor
is anxious.

As the base is heavy
(20kg), it is not easy
to carry.

As the coaming cannot
be peeled off,
it is not easy to clean it.



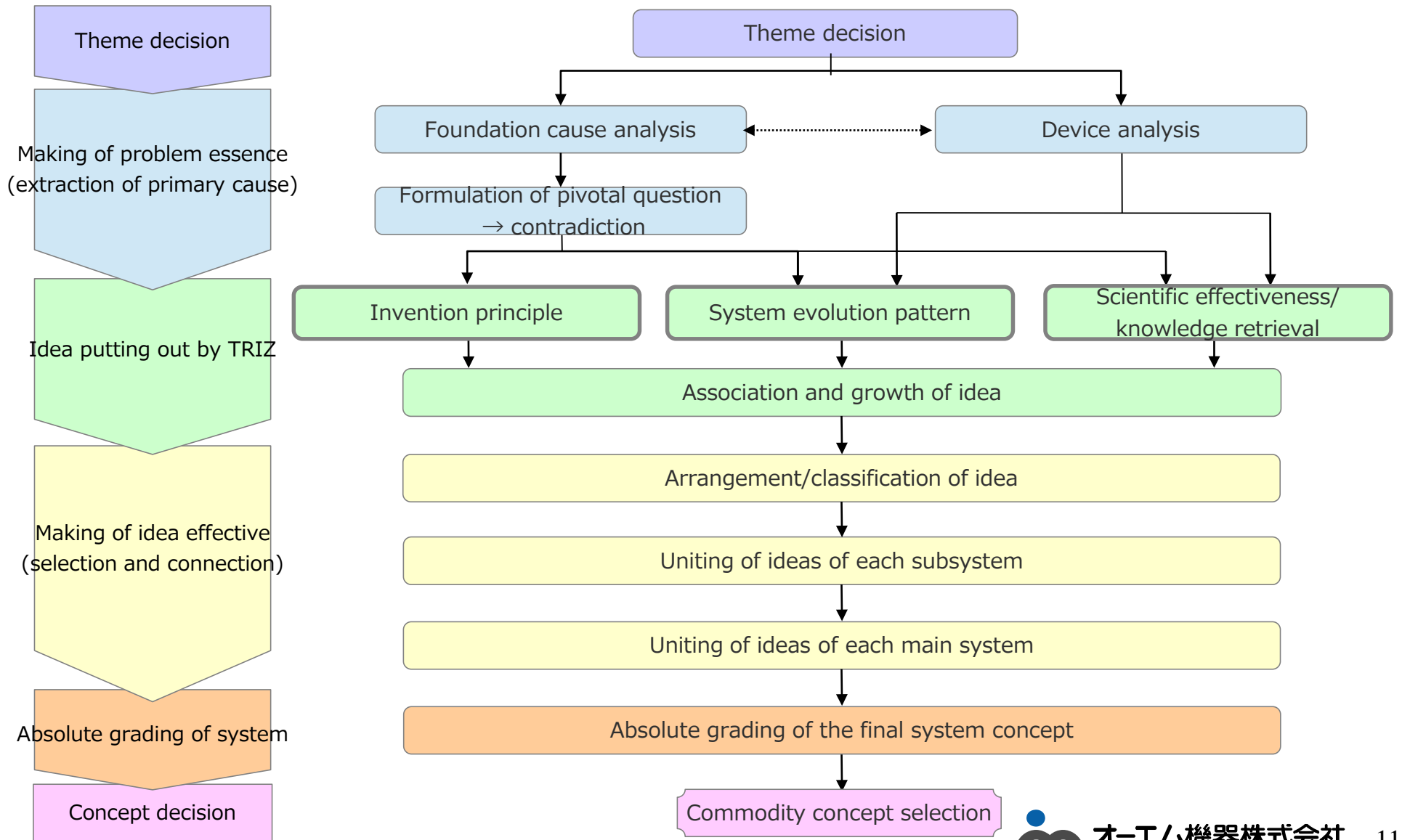
3. Target specification setting by QFD

Purpose

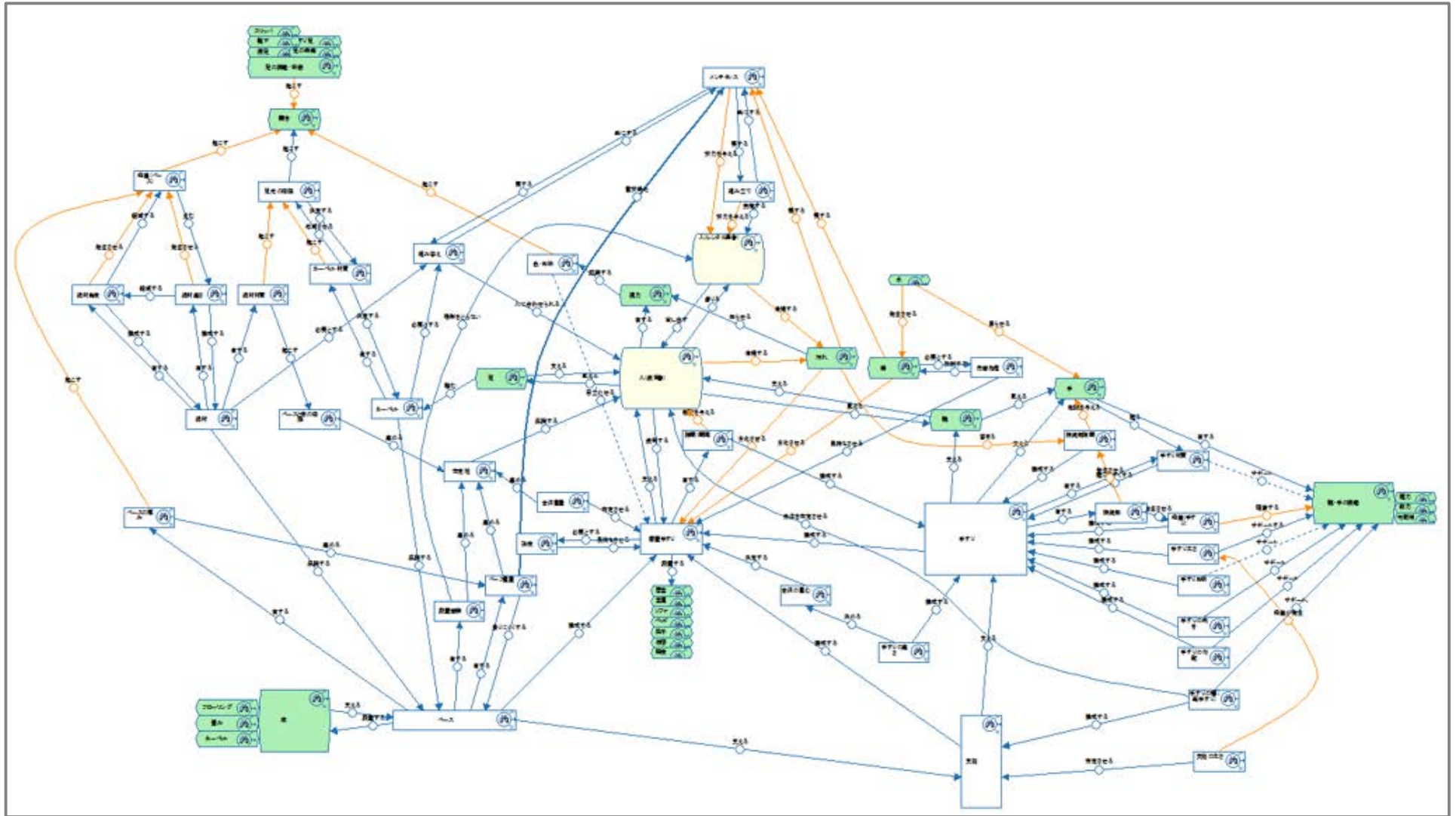
Clarification of related function of digging up and problem solution of potential demand and clarification of problem

The image shows a detailed QFD matrix. The columns are organized into several functional areas: 'Customer Requirements', 'Product Requirements', 'Process Requirements', 'Manufacturing Requirements', 'Service Requirements', 'Quality Requirements', and 'Project Requirements'. The rows represent specific customer and product requirements. The matrix cells contain symbols indicating the relationship between requirements and project tasks. Three callout boxes highlight specific elements: 'Quality property' points to a column under 'Quality Requirements', 'Demand for quality' points to a row under 'Customer Requirements', and 'Quality project' points to a cell in the 'Project Requirements' section.

4. TRIZ practice case



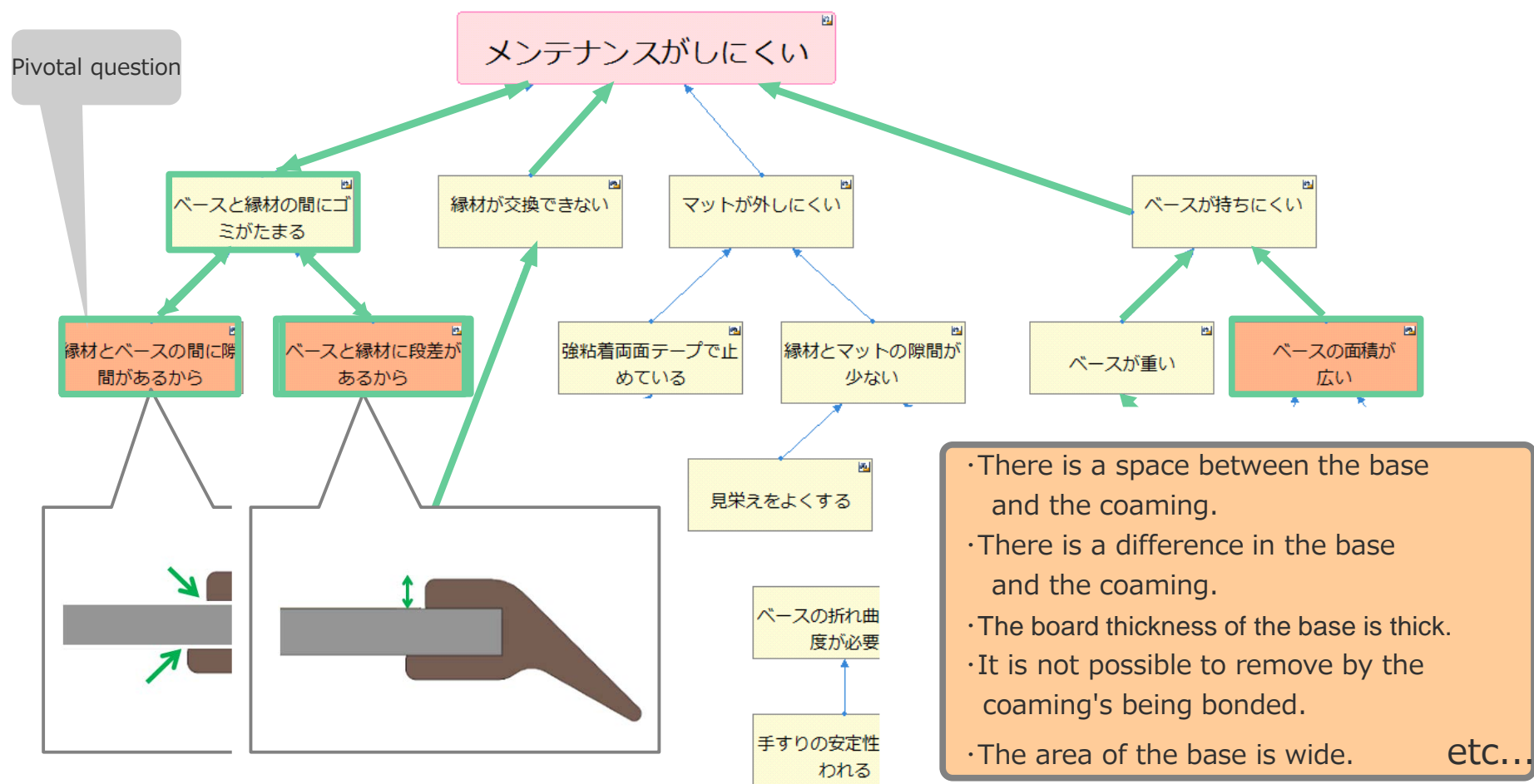
Device analysis



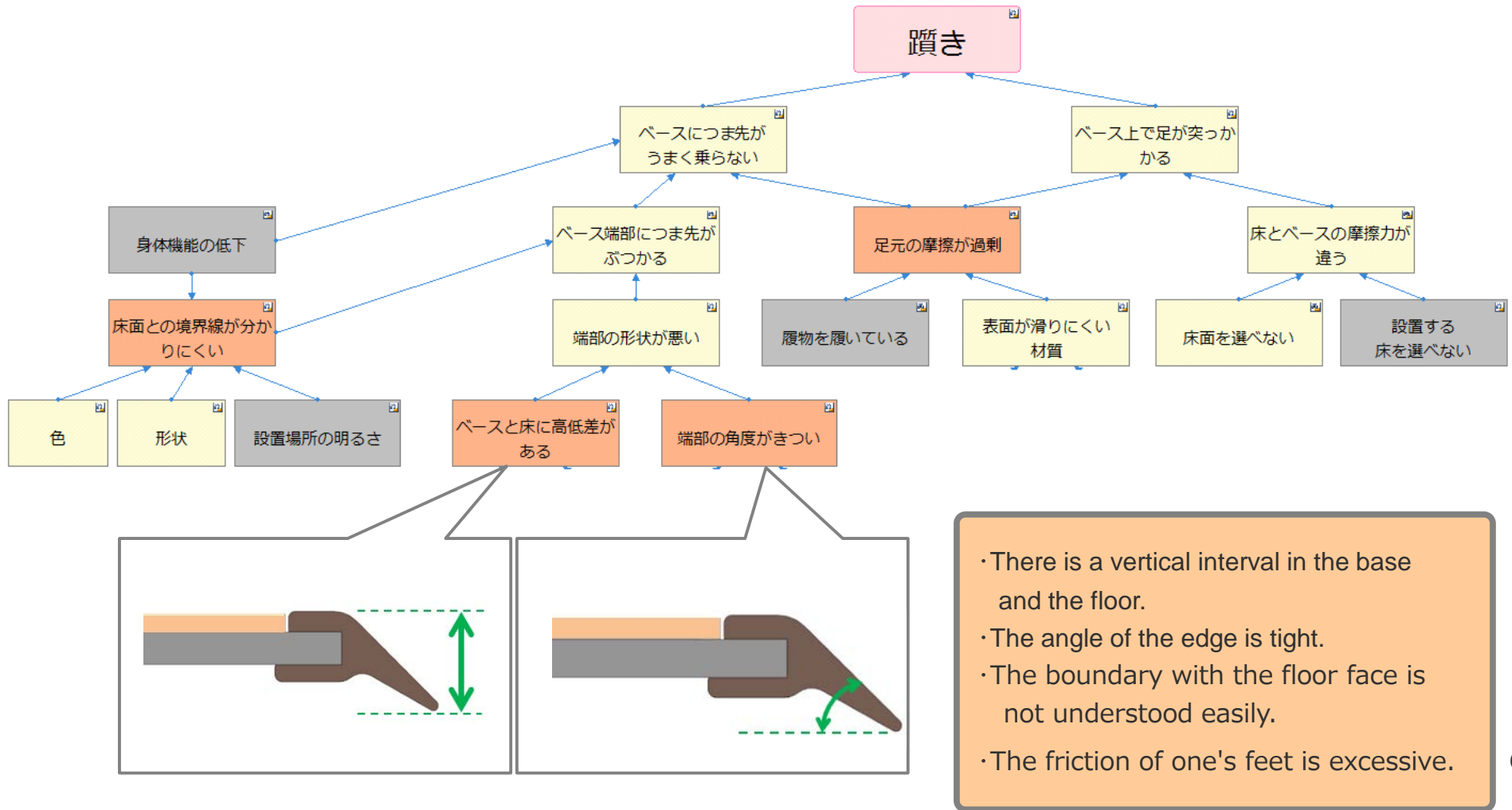
Foundation cause analysis—The center problem extraction—

Purpose

The cause and the result of making trouble are analyzed, and a fundamental cause (pivotal question) is clarified.



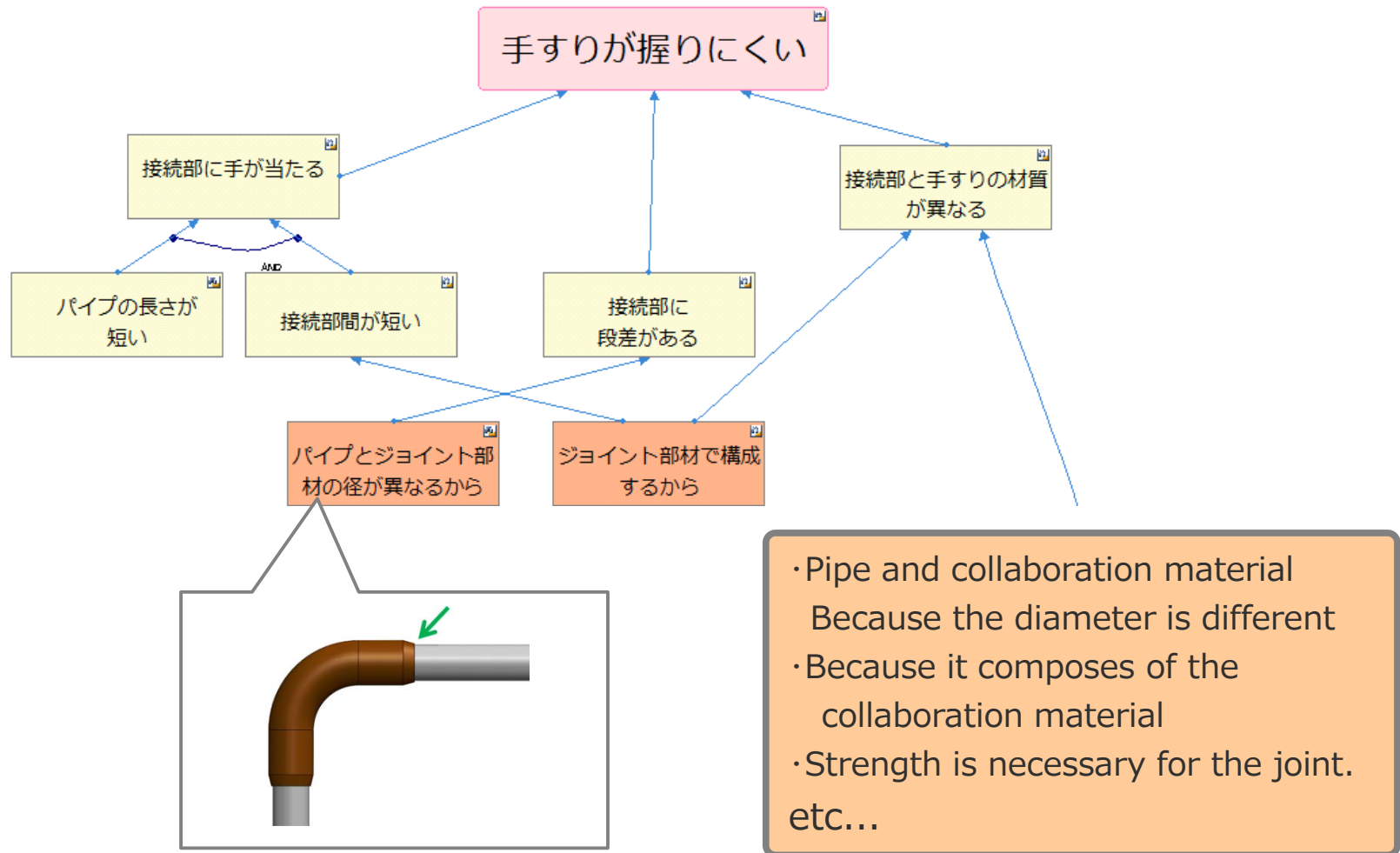
Foundation cause analysis—The center problem extraction—



- There is a vertical interval in the base and the floor.
- The angle of the edge is tight.
- The boundary with the floor face is not understood easily.
- The friction of one's feet is excessive.

etc...

Foundation cause analysis—The center problem extraction—

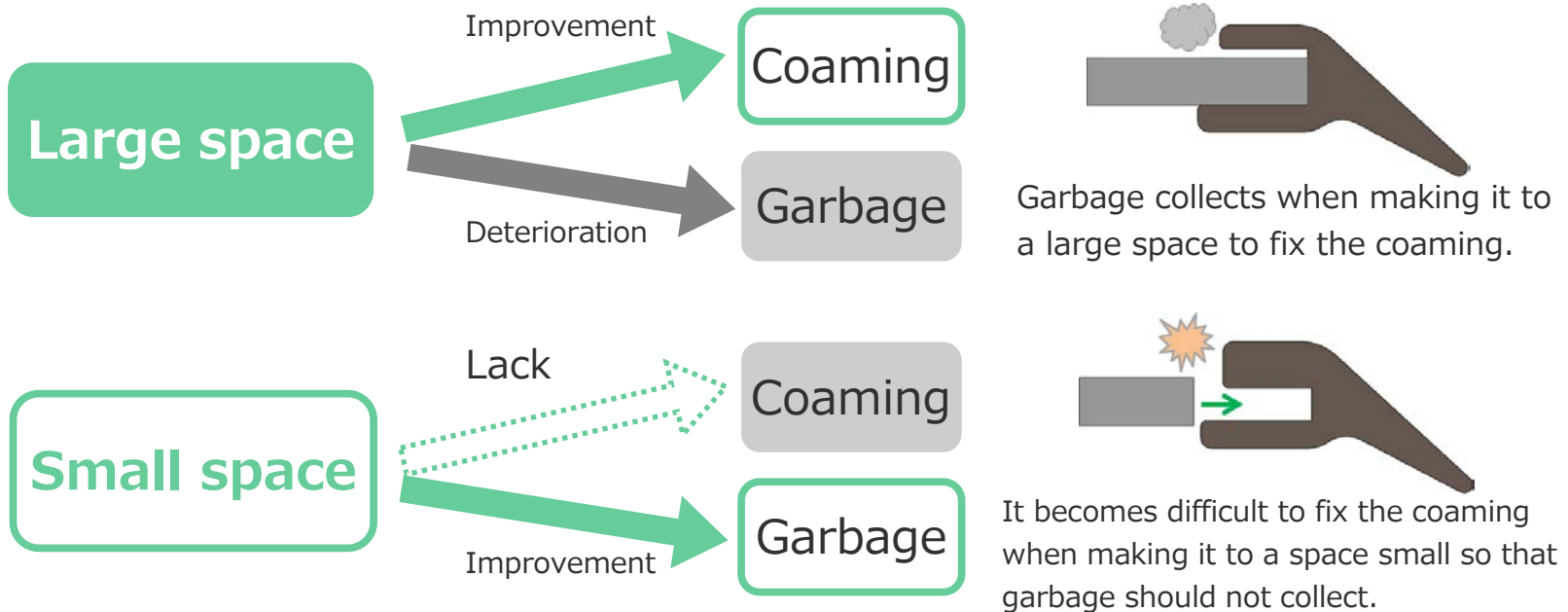


Arrangement of contradiction problem

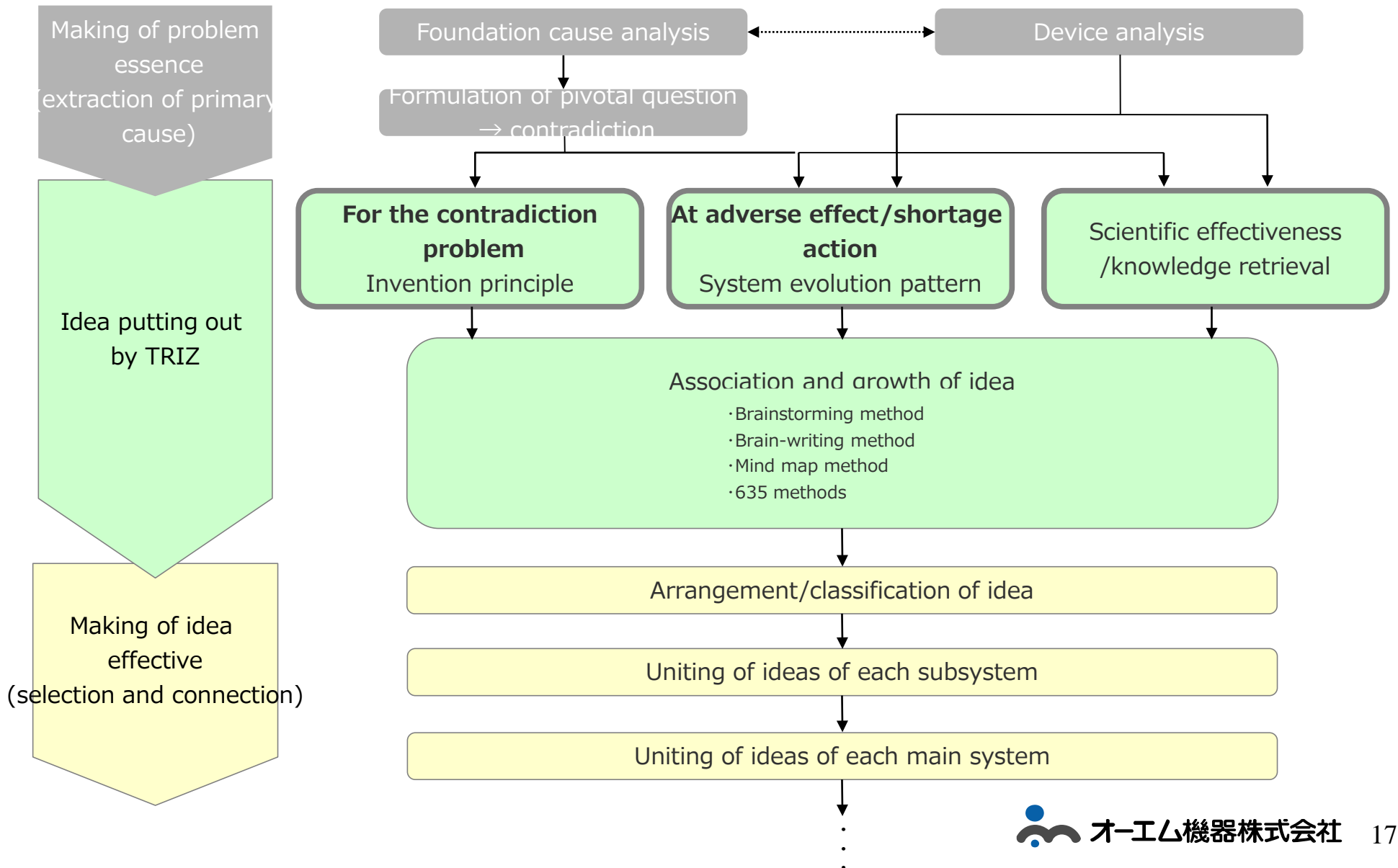
Pivotal question

There is a space between the base and the coaming.

Contradiction problem



Putting out idea method



Result of idea putting out

The idea came out so much. !



Rule of idea putting out

Rule of idea putting out

- 1.The cost is not thought.
 - 2.The feasibility is not thought.
 - 3.It doesn't criticize.
 - 4.Amount from quality.
- It repeats and it puts it out to the mouth.
- 5.It takes advantage.
 - 6.It sets up the time-limit.
 - 7.It holds it many times.



Idea putting out—Invention principle—

Technical contradiction and physical contradiction

➔ Invention principle

			Deteriorating characteristic	
			Garbage collects.	
			Weight of geostationary thing	Volume of geostationary thing
Improvement	Large space	Length of geostationary thing	36 22	22 1
	The coaming is fixed.	Strength	35 28	2 35
			40 29	1 18

Parameter of 39

Invention principle

- 1.Division
- 35.Parameter change
- 28.Phase change
- 40.Composite materials

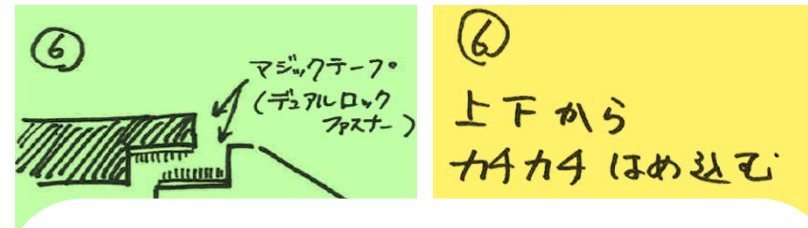
Idea putting out—Invention principle—

1. Division

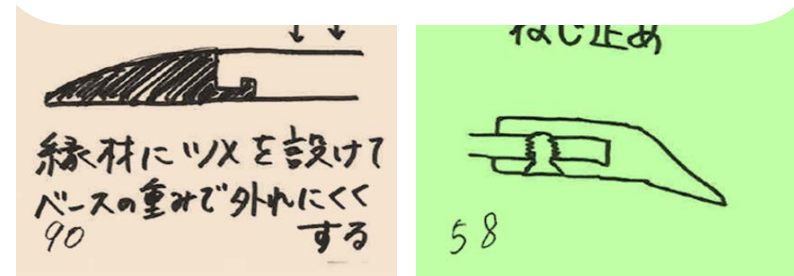
- It divides. It divides.
- It divides.
- The degree of the division and division is strengthened.



Idea



Idea 295 件

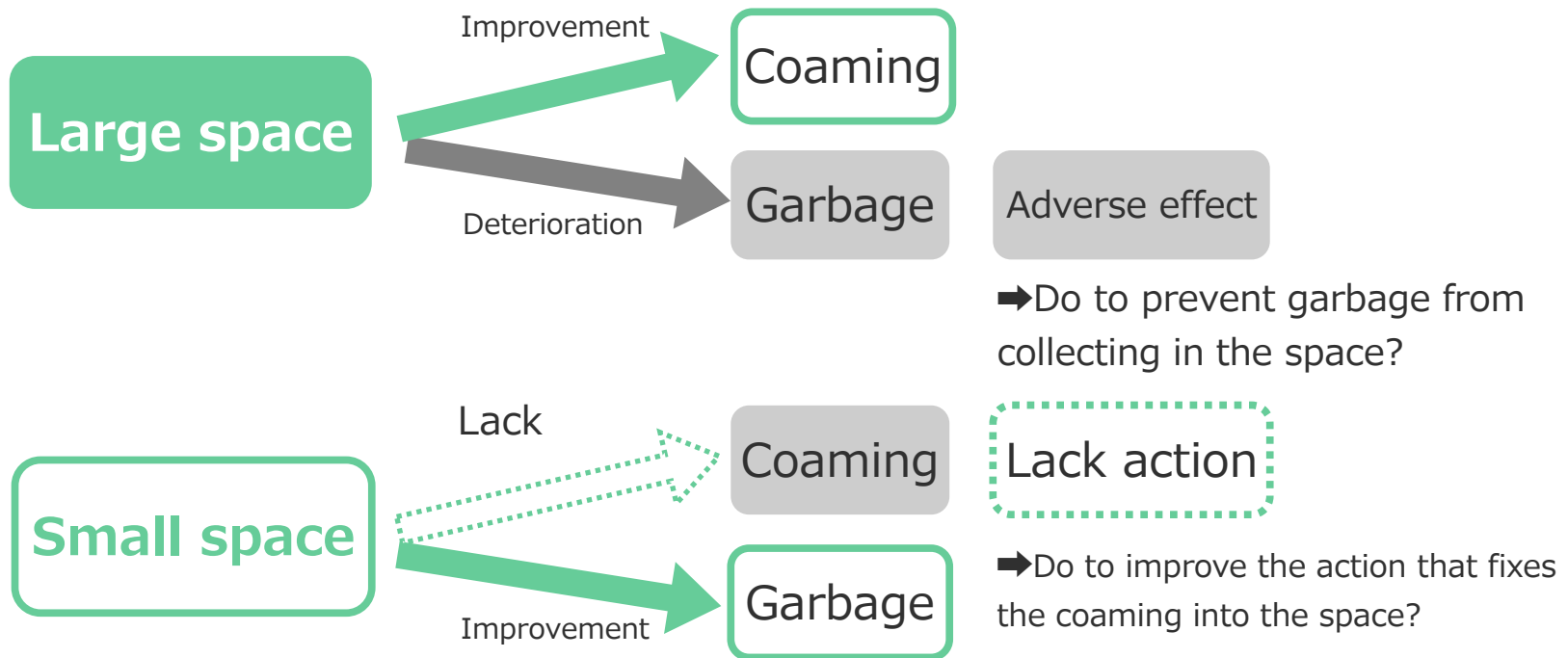


Idea putting out—System evolution pattern—

Adverse effect and shortage action

➔ System evolution pattern

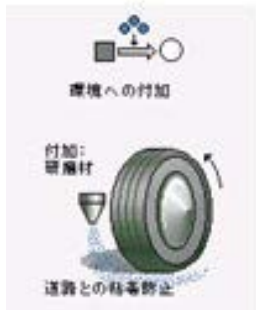
Contradiction
problem



Idea putting out—System evolution pattern—

Introduction of new material

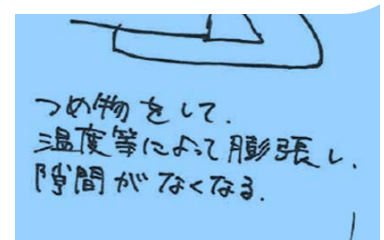
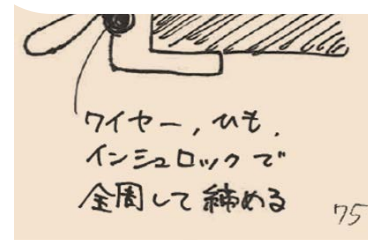
A new material is improved and the action is improved by the introduction.



Idea



30 ideas



Idea putting out—Scientific effectiveness and knowledge retrieval—

New method →

Scientific effectiveness and knowledge retrieval

Scientific effectiveness

**Conception because of laws of nature,
knowledge in effect, and case**

Ex) Does the method of losing the space between
the base and the coaming :?
?The method of uniting iron plate and rubber?
?The method of connecting objects mutually?

Knowledge retrieval

**Information in the patent and the document,
etc. is quickly collected.**

Ex) Iron < and > rubber < and > uniting
The method of uniting iron with rubber?

Idea

⑥
冷却に硬化する
素材を綴材に



86 ideas



Result of idea putting out

Invention principle	2 9 5
System evolution pattern	3 0
Scientific effectiveness and knowledge retrieval	8 6
Total	4 1 1



Result of idea putting out

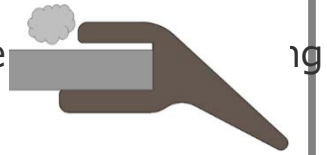
The idea came out so much. !



Example of idea ①

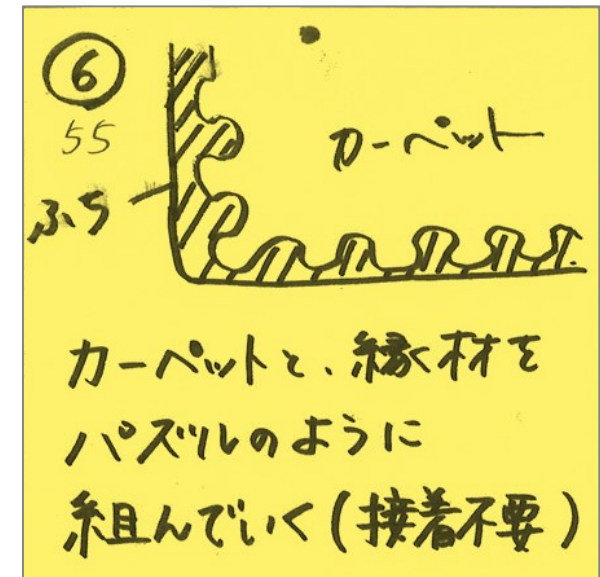
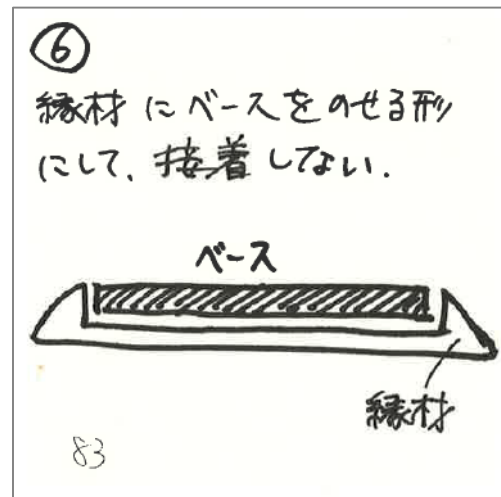
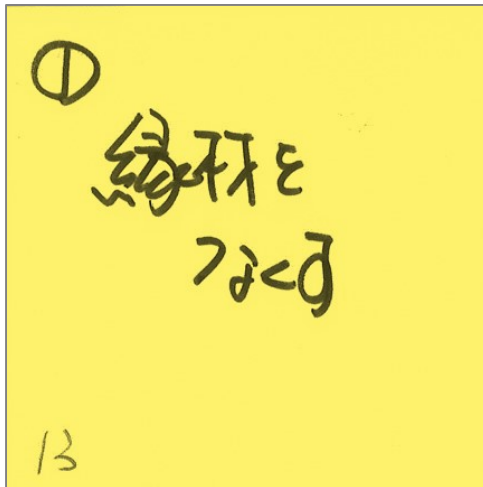
Problem

- Garbage collects between the base
- Coamings cannot be exchanged.



Point aimed at

- Shape of coaming
- Method of fixing coaming



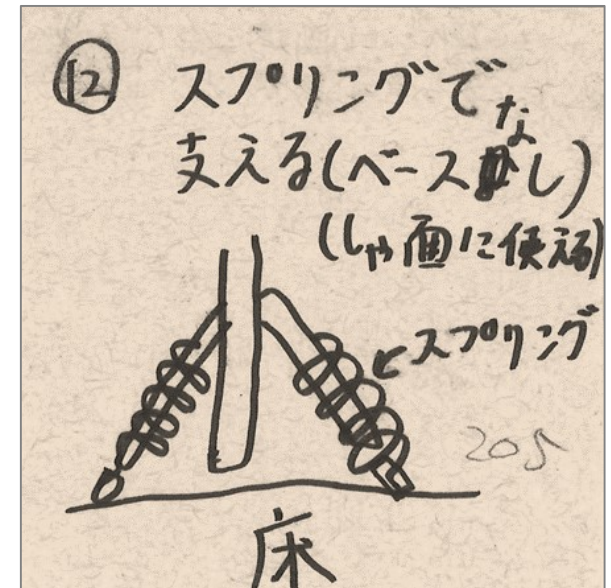
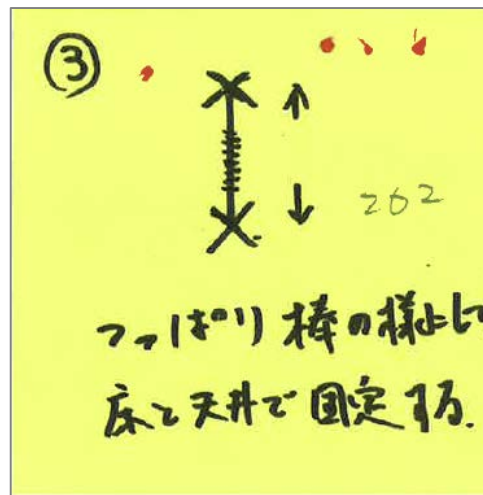
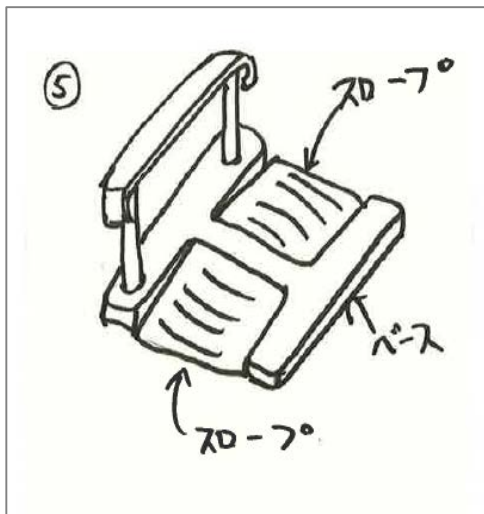
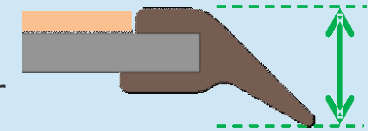
Example of idea ②

Problem

It paves it
in the base.

Point aimed at

- Because there is a vertical interval in the base and the floor
- Shape of base



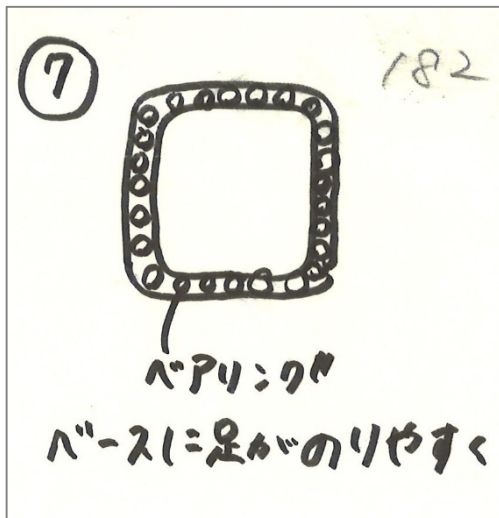
Example of idea ③

Problem

It paves it
in the base.

Point aimed at

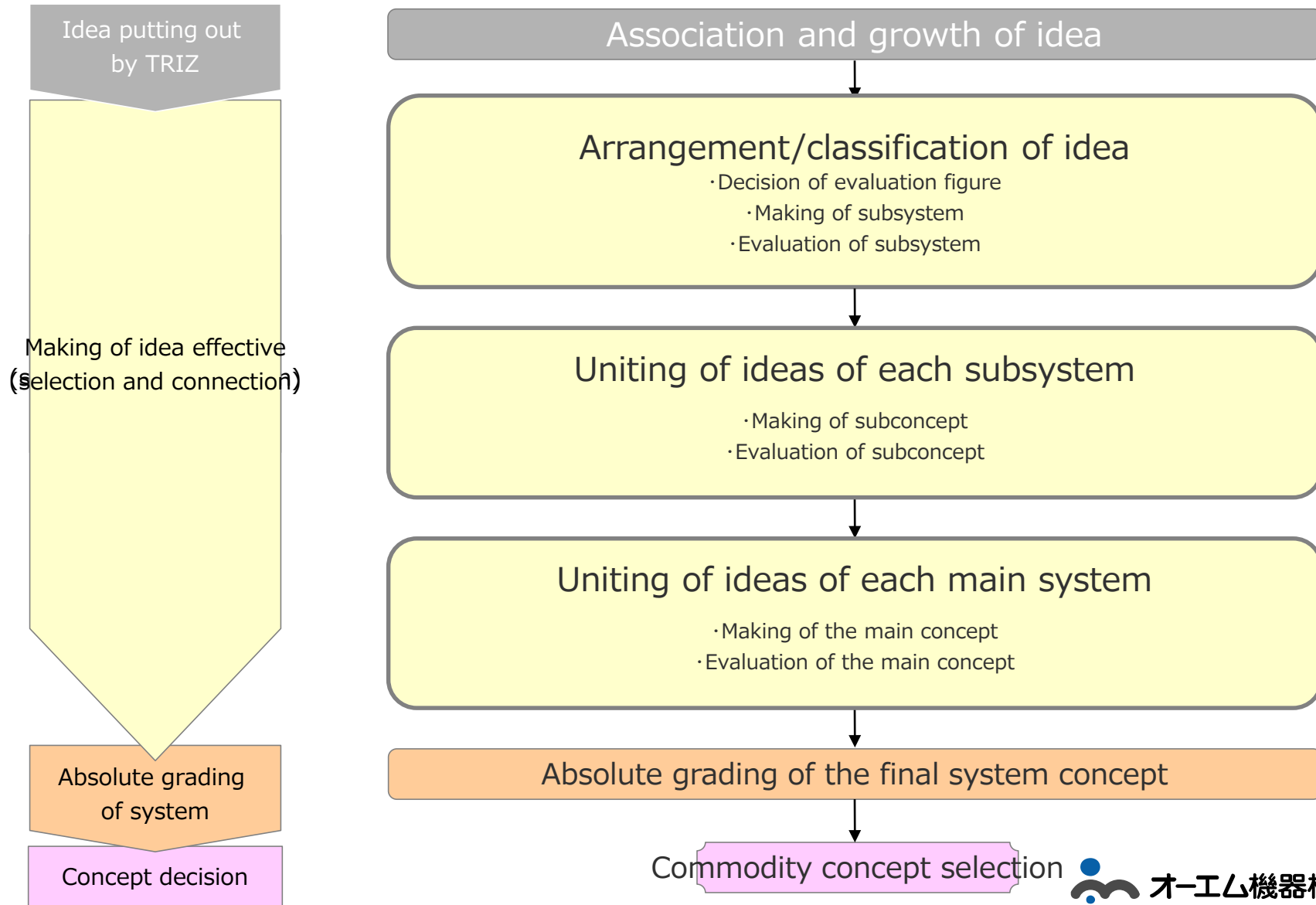
Difference between friction of floor
and friction of surface of base



Example of idea ④

It puts on socks
with good
compatibility.

Making of idea effective

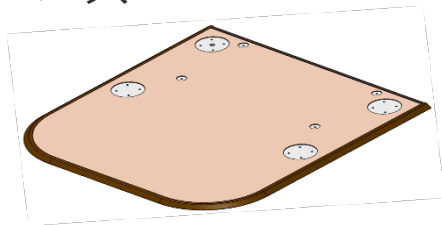


Making of subsystem

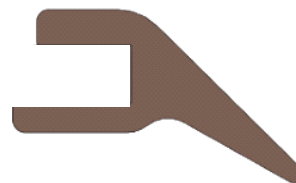
The idea at each subsystem (parts) is classified.

Main system

ベース



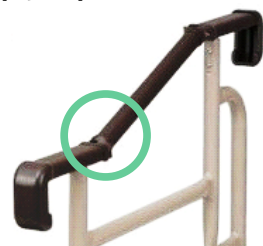
縁材



手すり



ジョイント



マット



支柱



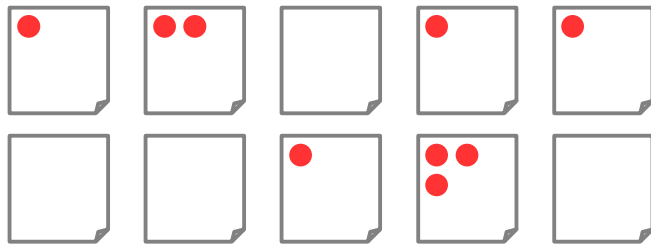
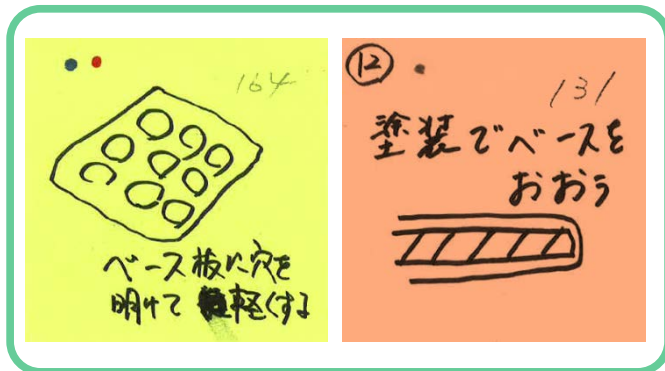
Making of subconcept —Idea uniting—

1. Selection of idea

➔ The black circle sign is applied to the idea to be thought to be good in intuition.

2. Making of subsystem ➔ Uniting of selected ideas

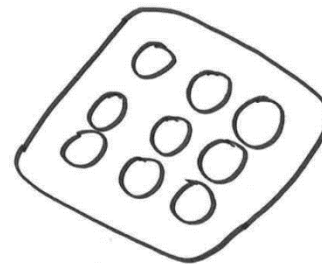
Subsystem: Base



Subconcept

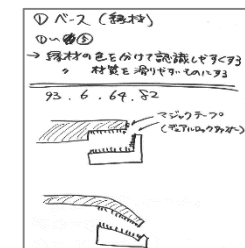
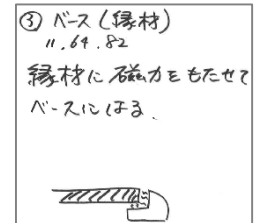
④ ベース

164



ベース板に穴を開けて軽くする

ベースは塗装でおおう。131



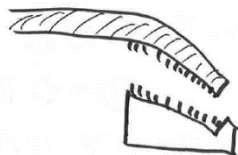
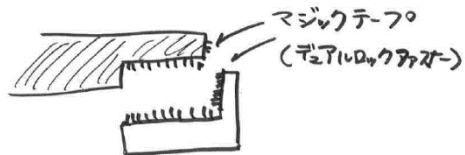
Making of subconcept —Idea uniting—

Subsystem: Coaming

Subconcept

- ① ベース (縁材)
- ①-⑤
- 縁材の色を分けて認識しやすくする
- ↳ 材質を滑りやすくする

93.6.64.82



Subconcept

- ③ ベース (縁材)
- 11.64.82

縁材に磁力をもたせて
ベースに吸着



Clarification of selection criterion of idea

Decision of evaluation figure of concept

		目標値		
		Q1	Q2	Q3
		躓きにくい	メンテナンスがしやすい (時間、労力、メンテナンス項目)	握りやすい
現状	要因	緑材の角度	ベースと緑材の隙間	パイプとジョイント部材の径が異なる
		ベースの厚み	緑材が接着で外せない	
		足元の摩擦	ベースと緑材の段差	ねじの頭が突出
		ベース縁の視認性	ベースが重い	
		躓き 10人/10人	100% (総合的に)	0人/10人 握りやすい
1年後	躓き 8人/10人	80% 軽減	5人/10人 握りやすい	
3年後	躓き 5人/10人	65% 軽減	7人/10人 握りやすい	
5年後	躓き 2人/10人	50% 軽減	9人/10人 握りやすい	

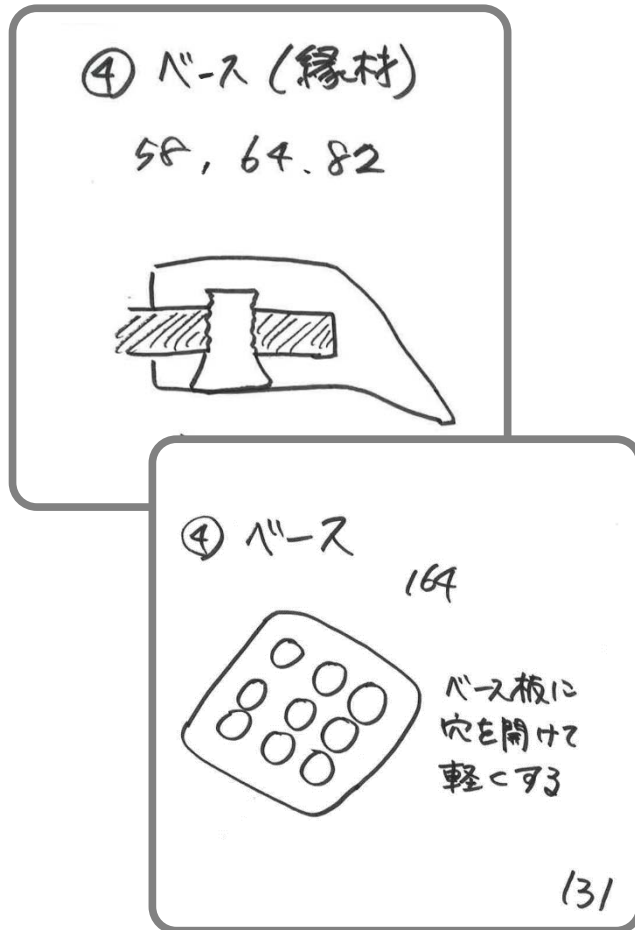
Evaluation of subconcept

The effect of the subconcept on the target is evaluated.

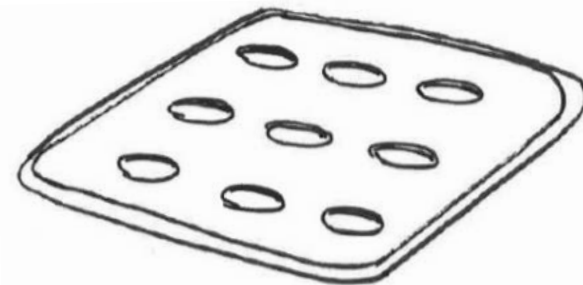
		サブコンセプト		3年後の目標値		
				Q1	Q2	Q3
				踏みにくい	メンテナンス性	握りやすい
				踏き 5 / 10人	65% 軽減	7 / 10人
サブシステム	ベース	ベース①	①'吸着剤+ベースの形状を工夫	-	S	S
		ベース②	①'+ベースを無くす(自立・突っ張り)	+	+	S
		ベース③	①'+ベースビード加工+ヘミング	+	+	S
		ベース④	①'+ベース穴あけ+塗装	S	+	S
	緑材	緑材①	①'認識しやすい色+滑りやすい材質 マジックテープ止め	-	+	S
		緑材②	①'+緑材の上にベースを置く	+	+	S
		緑材③	①'+磁力で貼る	-	+	S
		緑材④	①'+ねじ止め	S	+	S
		緑材⑤	①'+緑材無くす→裏面滑り止めシート	-	S	S
	手すり	手すり①	段差が目立たない形状+アームレストカバー	S	-	+
	ジョイント	ジョイント①	パイプとジョイント径を合わせる	S	S	+
	カーペット	カーペット①	材質・柄が選択可能+熱で貼り付け	S	S	S
	支柱	支柱①	根本を太らせて自立	-	+	S
		支柱②	根本と支柱をねじ止め	+	S	S
		支柱②'	ベースと支柱をねじ込み	S	+	S
		支柱③	突っ張り	+	S	S
	支柱④	シェルフのような高さ調整	S	+	S	

There is an effect from present. : +
 Equal to present : S
 It is inferior to present. : -

Making of the main concept ①

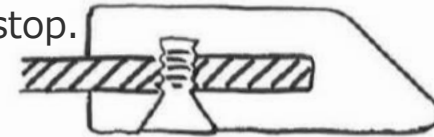


The main concept A



The base is punctured and it lightens it.

The coaming is detachable in the screw stop.



Problem

- The type of construction it and the construction of the corner by two colors.
- Material of pushing out in straight part

Making of the main concept ②

② ベース (素材)
83.90, 69.82

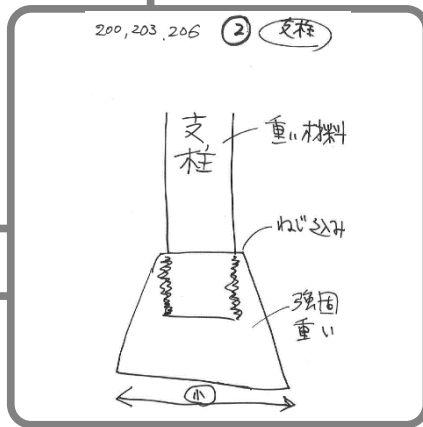
③ 支柱
200, 203, 206

支柱の上にベースをのせて
接着しない。
(ツメを組付けする)

④ ベース
164

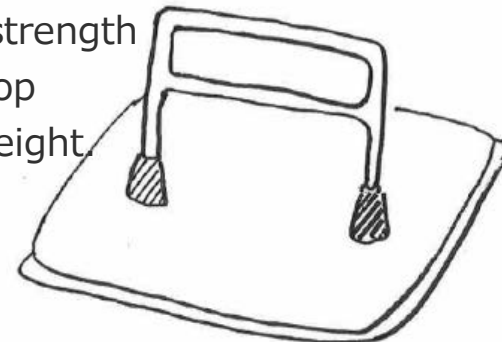
ベース板に
穴を開けて
軽くなる

ベースは塗装せよ。131

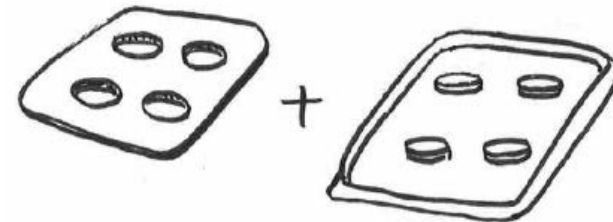


The main concept G

It is putting strength
UP in the prop
as for the weight.



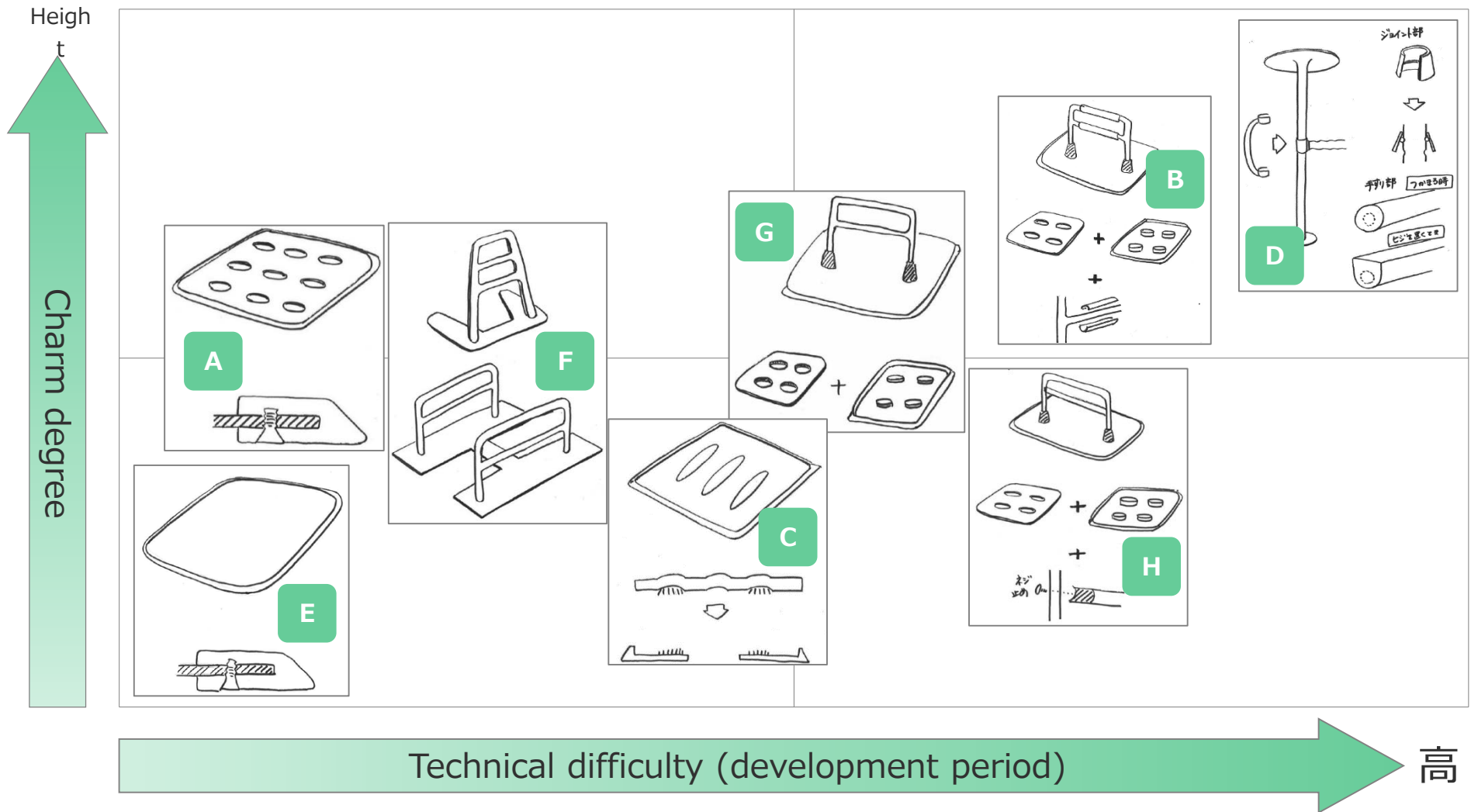
The coaming that attaches to the hole of the
base convex is paved.



Problem

- A large resin type is necessary.
- The coaming is a division type.

Concept map of main system



Evaluation of the main concept

The main concept that aims at achievement at a short term, middle term, and a long term is evaluated and selected.

メインシステム	目標値	Q1			Q2			Q3			メインコンセプト評価					
		置きにくい			メンテナンス性			握りやすい			C	D	E	F	G	H
	1年後（短期）	8人／10人	80%	軽減	5人／10人	◎					○	△				
	3年後（中期）	5人／10人	65%	軽減	7人／10人	◎	○									
	5年後（長期）	2人／10人	50%	軽減	9人／10人					△			◎	○		

◎: Favorite
○: There is a possibility.
△: It is interesting.

サブシステム		サブコンセプト	
ベース	ベース①	①'吸着剤+ベースの形状を工夫	
	ベース②	①'+ベースを無くす（自立・突っ張り）	
	ベース③	①'+ベース ピード加工+ヘミング	
	ベース④	①'+ベース穴あけ+塗装	
緑材	緑材①	①'認識しやすい色+滑りやすい材質 マジックテープ止め	
	緑材②	①'+緑材の上にベースを置く	
	緑材③	①'+磁力で貼る	
	緑材④	①'+ねじ止め	
	緑材⑤	①'+緑材無くす→裏面滑り止めシート	
手すり	手すり①	段差が目立たない形状+アームレストカバー	
ジョイント	ジョイント①	パイプとジョイント径を合わせる	
カーペット	カーペット①	材質・柄が選択可能+熱で貼り付け	
支柱	支柱①	根本を太らせて自立	
	支柱②	根本と支柱をねじ止め	
	支柱②'	ベースと支柱をねじ込み	
	支柱③	突っ張り	
	支柱④	シェルフのような高さ調整	

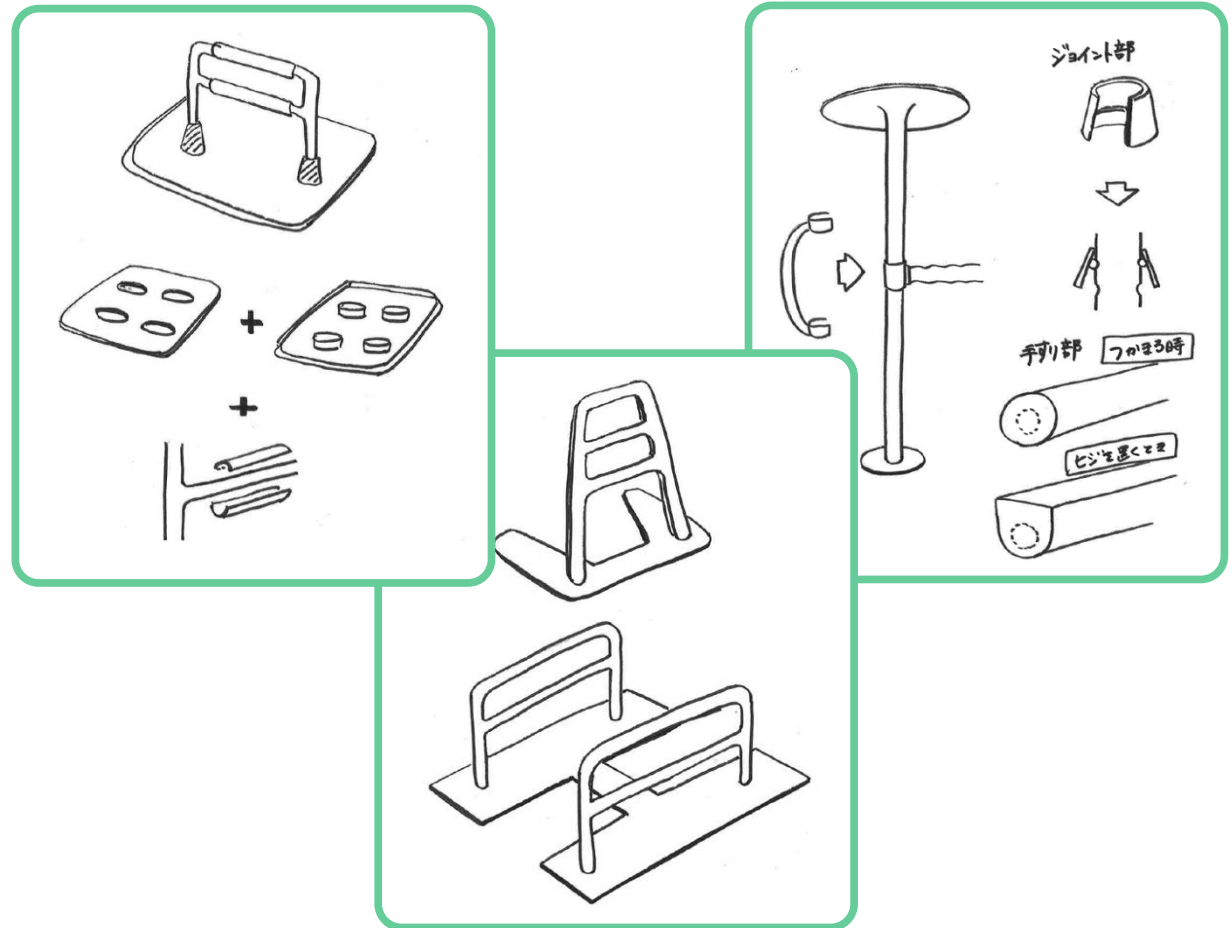
It is putting strength UP in the prop as for the weight.
The coaming that attaches to the hole of the base convex is paved.

4. Result

Present goods



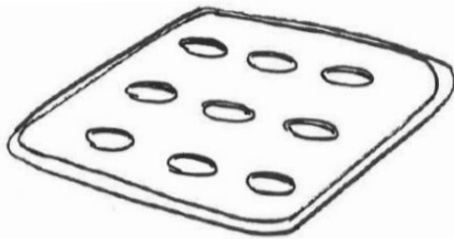
Idea that uses QFD-TRIZ



5. Summary

Favorite idea one year later

The base is punctured and it lightens it.

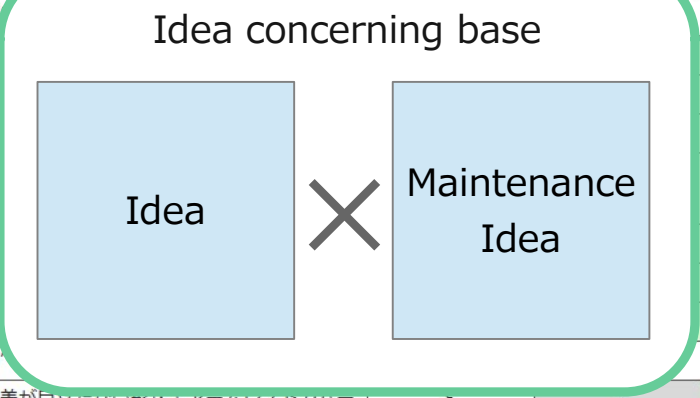


The coaming is detachable in the screw stop.



メインシステム	目標値		1年後（短期）	3年後（中期）	5年後（長期）
			5人/10人	5人/10人	2人/10人
			65% 軽減	65% 軽減	50% 軽減
			5人/10人	7人/10人	9人/10人

サブシステム	サブコンポーネント		サブシステム評価		
	名称	説明	コスト	メンテナンス	操作性
ベース	ベース①	①	S	-	+
	ベース②	①	S	S	+
	ベース③	①	S	S	S
	ベース④	①	S	S	S
緑材	緑材①	① マ	S	-	+
	緑材②	①	S	S	+
	緑材③	①	S	S	S
	緑材④	①	S	S	S
	緑材⑤	①	S	S	S
手すり	手すり①	段差が自立しない形状+アームレストカバー	S	-	+
ジョイント	ジョイント①	パイプとジョイント径を合わせる	S	S	+
カーペット	カーペット①	材質・柄が選択可能+熱で貼り付け	S	S	S
支柱	支柱①	根本を太らせて自立	-	+	S
	支柱②	根本と支柱をねじ止め	+	S	S
	支柱②'	ベースと支柱をねじ込み	S	+	S
	支柱③	突っ張り	+	S	S
	支柱④	シェルフのような高さ調整	S	+	S



QFD is used

Good point

- The level of its own commodity was able to be confirmed.
- The conviction was superable to work by all members, and to print and to have matched the opinion.
- Customer's voice is analyzed, and the customer doesn't notice it either.

The technique of analyzing needs is attractive.

- The reconfirmation of the problem and recognition was able to advance the problem smoothly by using the tool of quality table without going back.

Effect

- It becomes the tool of the needs confirmation with the sales manufacturer.
- It becomes the customer needs and designer's vector match.
- The product development that shoots market and customer's targets can be done.

Hardship point

- It takes time to make the quality table.
- Customer's voice and information on the other companies commodity are little, and the precision of analysis is lacked.
- The criterion varies by evaluating the demand for quality, and it has gone back because the target was not decided.

Problem

- The quality table making is not assumed to be work.
- Information gathering power strengthening like customer needs and complaint, etc.

TRIZ is used

Good point

- As many as 400 ideas or more were able to be shown, and it became confidence. (There is tiredness after it puts forth completely.)
- The point that had been assumed to be a problem up to now was a superficial problem, and a true cause noticed that there were some from the foundation cause analysis.
- The peculiarity that gathered in other problems in everyone because the member gathered and it did the idea putting out attached.

Effect

- It makes the idea by increasing the number of cuts of the problem solution, "Why don't you combine?" and "What is the primary cause?" a custom.
- It consults all, and the examination is made a custom.
- It comes to be able to do a flexible conception.

Hardship point

- It is necessary to train to the operation acquisition of Goldfire.
- The retrieval technique like the paraphrase of the word etc. is necessary in the knowledge retrieval.
- The idea matched to our company was not able to be done in the scientific effectiveness, and the number of ideas was little.
- The idea is spirited and it is dropped because the idea putting out is done without thinking about the cost.

Problem

- Operation acquisition of Goldfire.
- Even if it is partial, the technique of TRIZ is used.
- An epoch-making idea is shown.
- The idea is made achievement.
- It comes to be able to do putting out of the idea of the design.



Thank you
For your
Kind attention