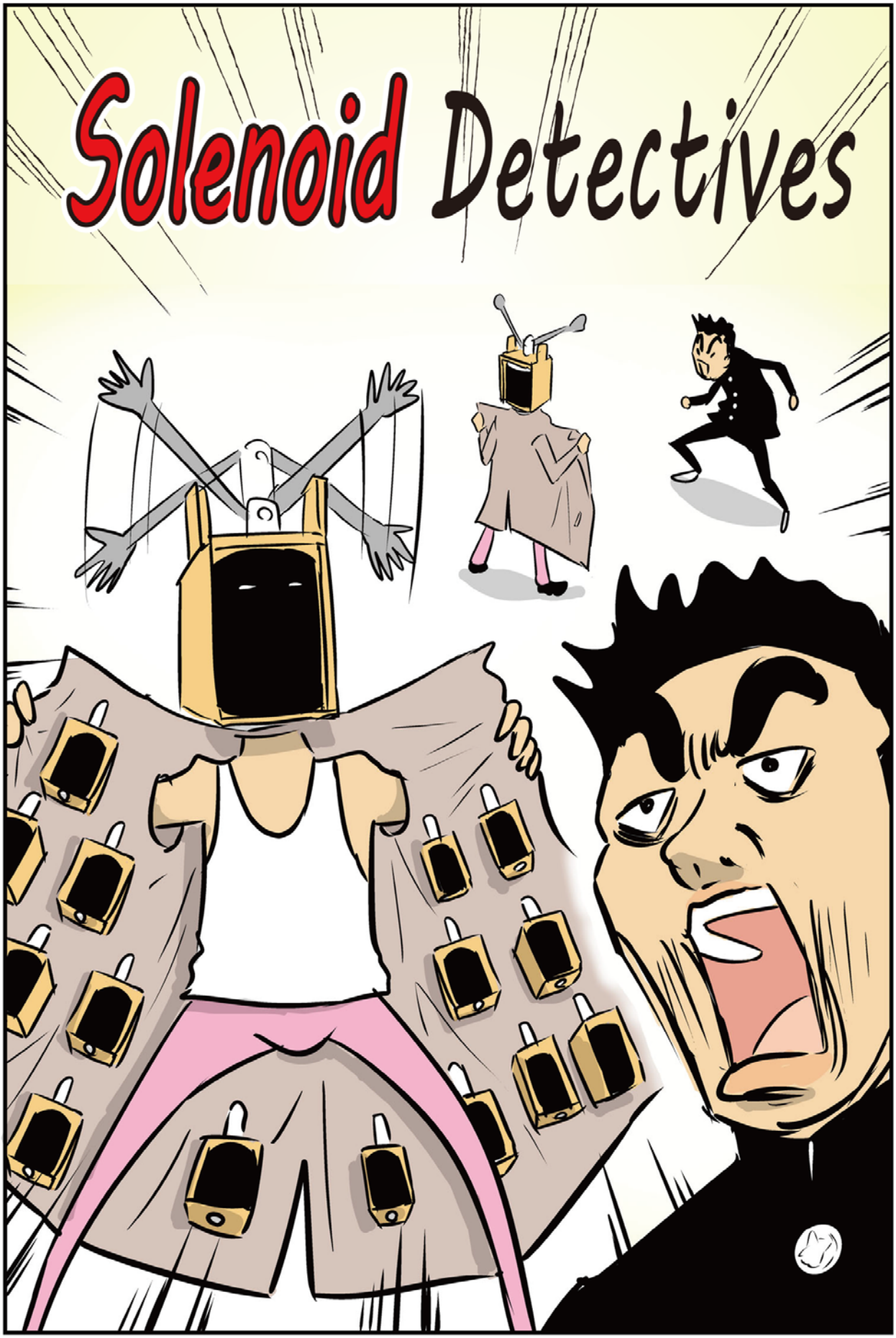
Solenoid Detectives

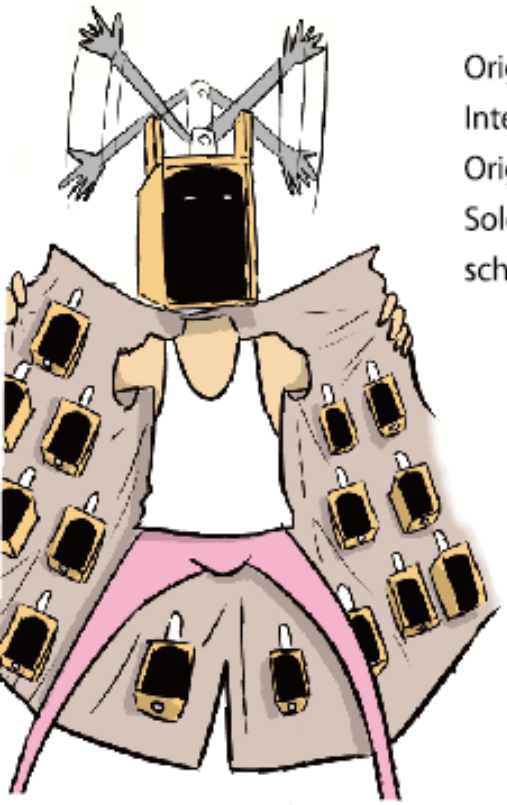


TAKAHA

Takaha Kiko Co., Ltd.

What is Solenoid ?
How do I use it ?

This book, illustrated by a Solenoid manufacturer, Takaha Kiko provides introductory explanation on how to use a Solenoid.
This will allow you to select a Solenoid and use it with ease.



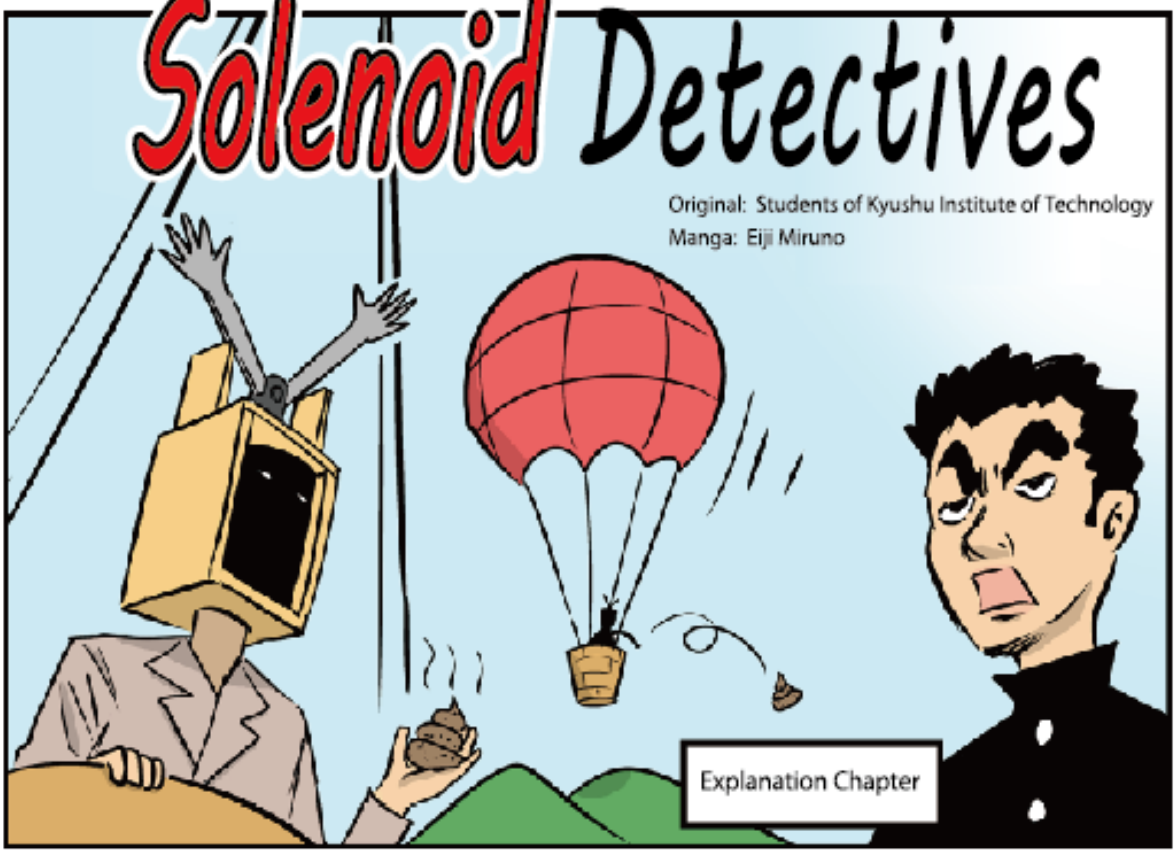
Original Work : Students of Kyushu Institute of Technology Internship students, who did not know anything about Solenoid. Original work was created after hard work of investigating into Solenoid. It is intended so that a student at the 3rd year of junior school can understand.

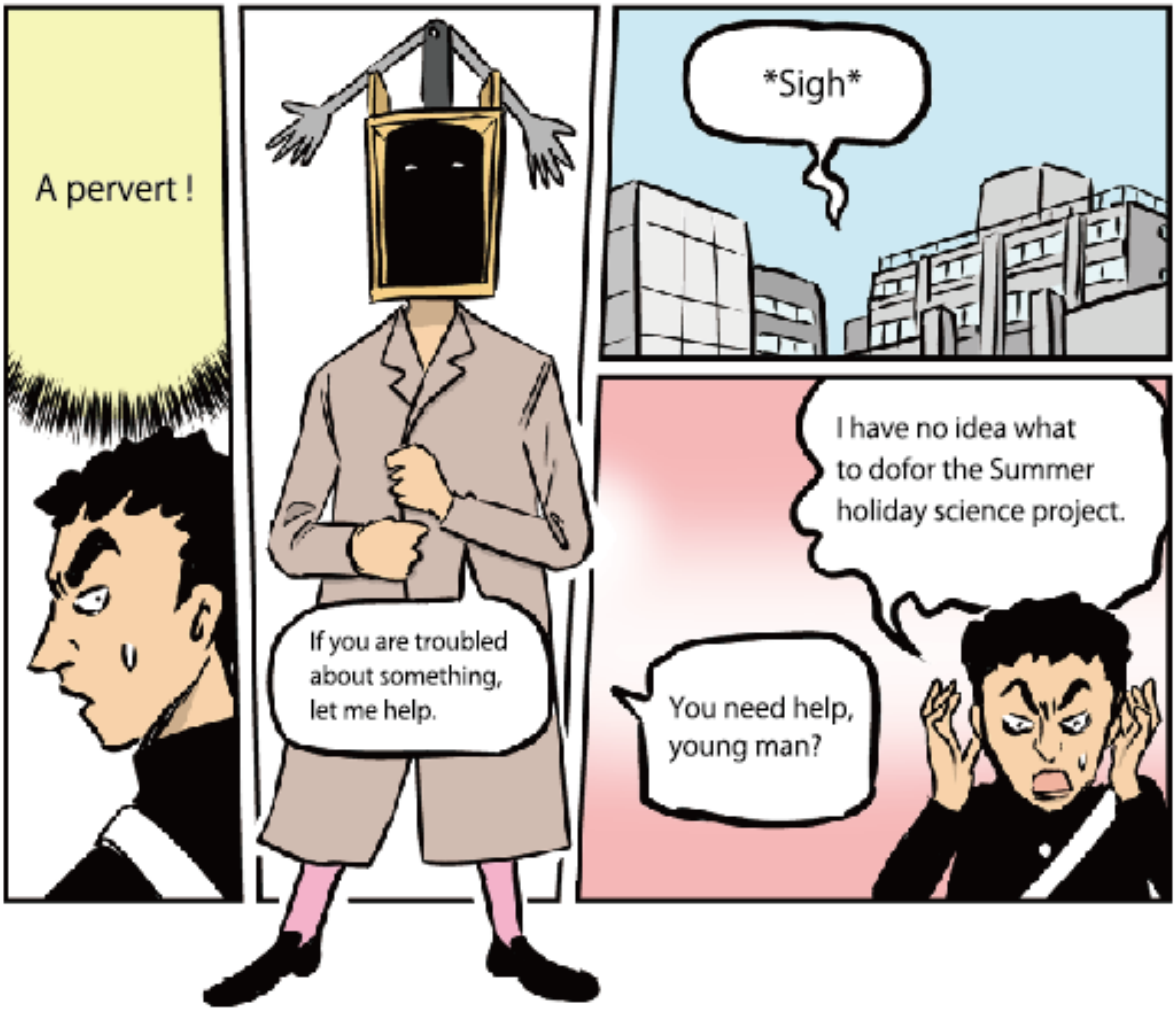
Manga Work : Eiji Miruno
A renowned manga artist, famous for his works in the technical manufacturing industries, such as "Crying on Astringent Technology". With his unique perspective that depicts the manufacturing industries, his works are very popular. He has been collaborating with Takaha Kiko for the "Solenoid Contest" and "Poster Contest".

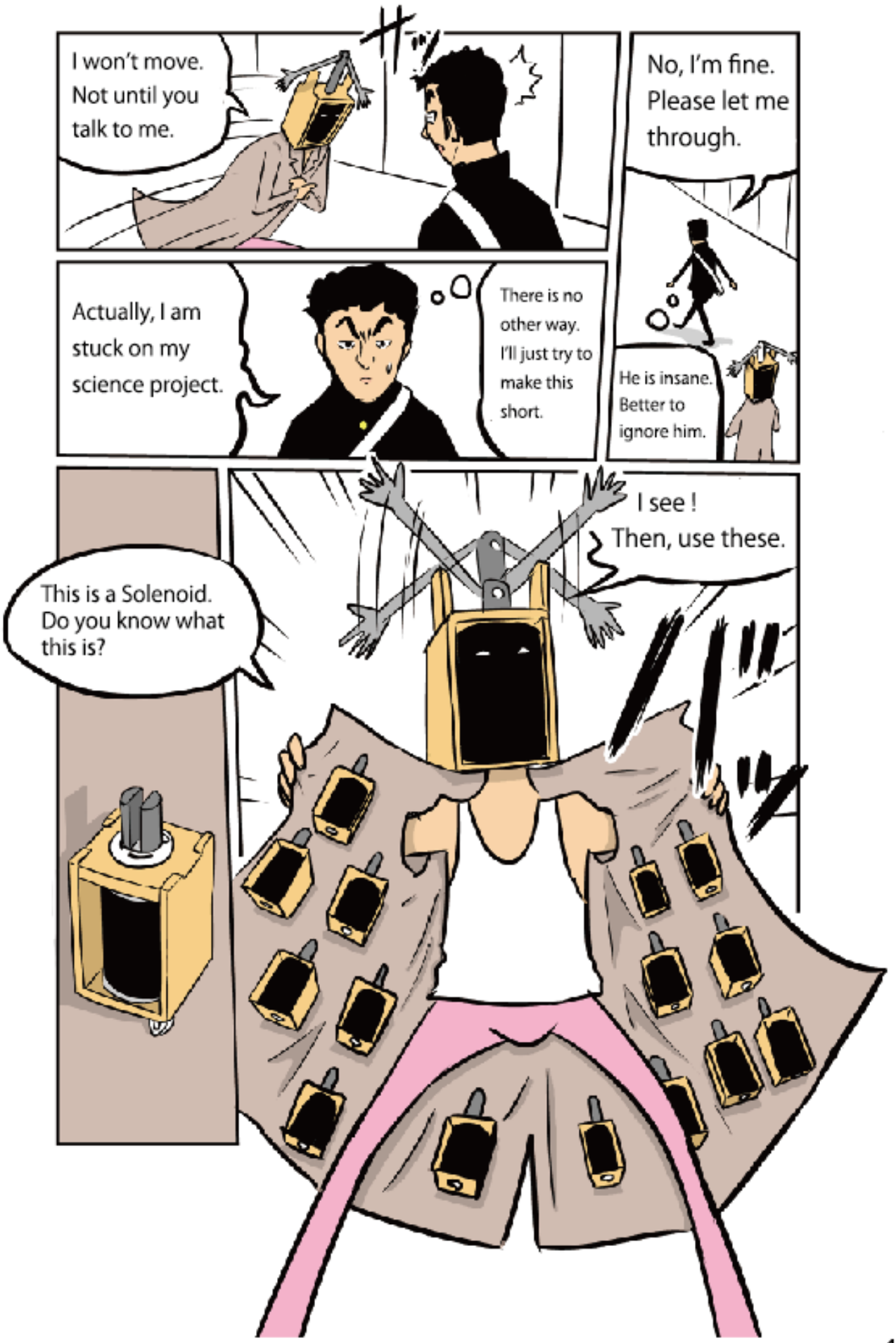
Please read from right to left.

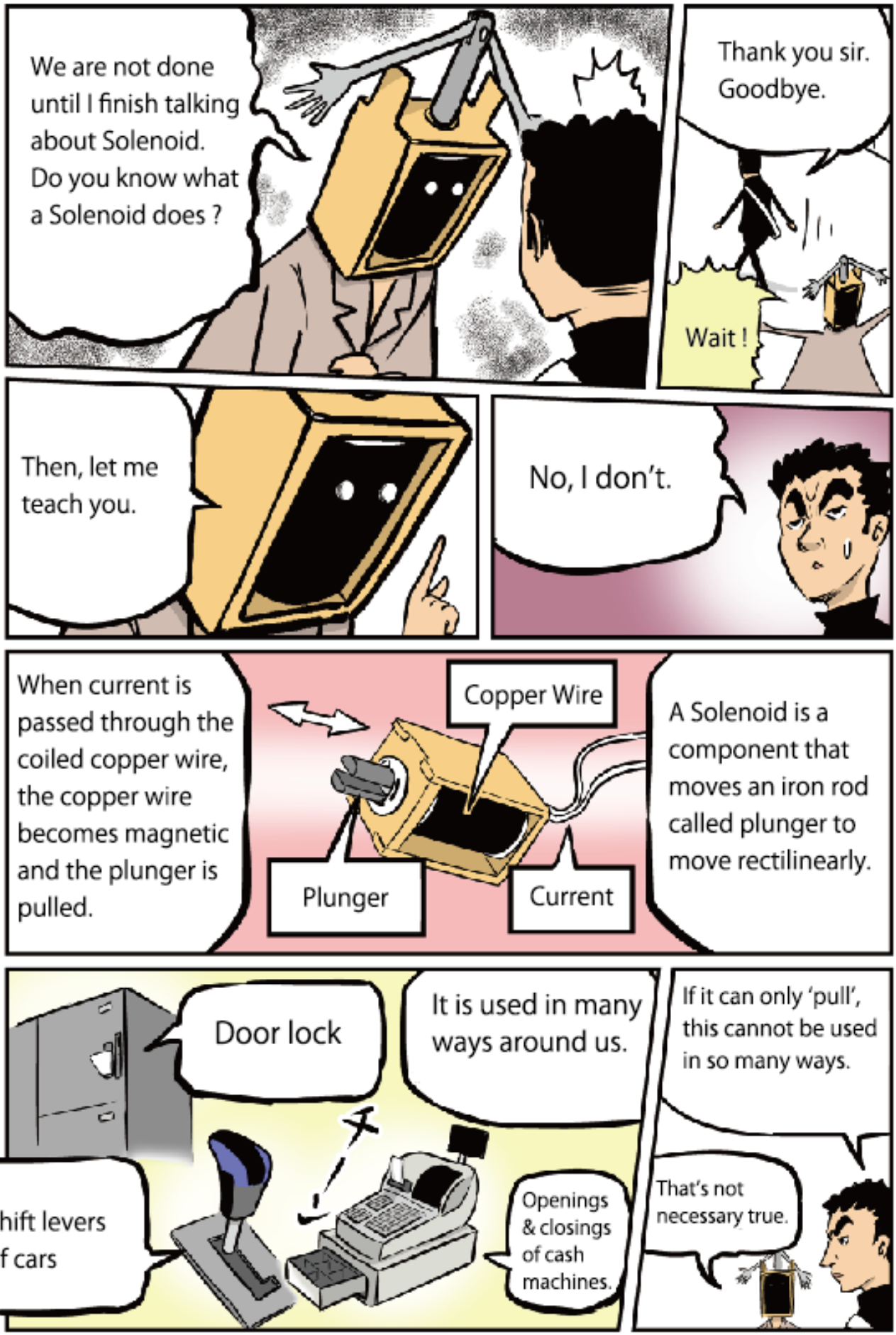
Solenoid Detectives

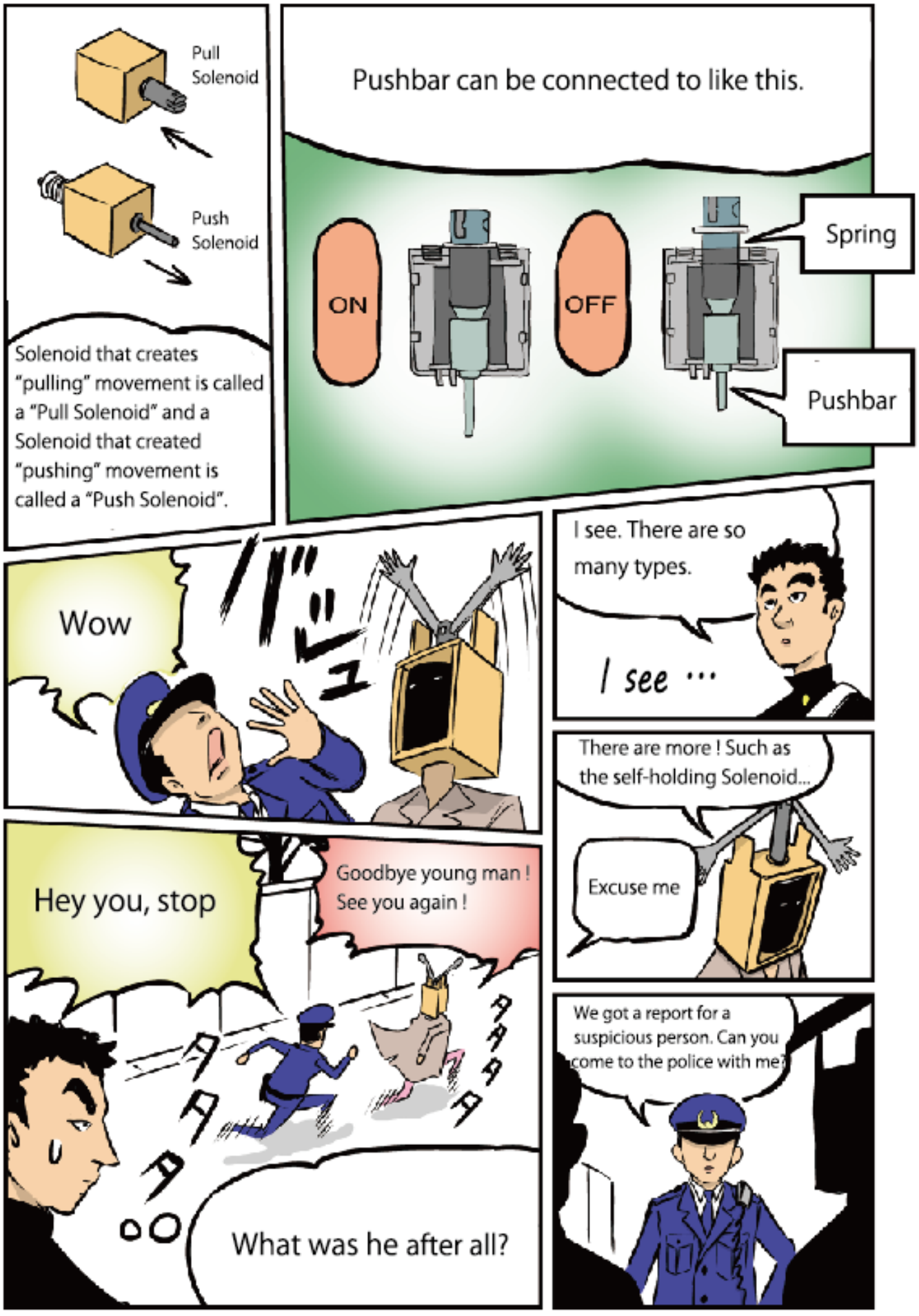
Original: Students of Kyushu Institute of Technology
Manga: Eiji Miruno






I won't move. Not until you talk to me.
No, I'm fine. Please let me through.
Actually, I am stuck on my science project.
There is no other way. I'll just try to make this short.
He is insane. Better to ignore him.
I see ! Then, use these.
This is a Solenoid. Do you know what this is?


We are not done until I finish talking about Solenoid. Do you know what a Solenoid does ?
Thank you sir. Goodbye.
Wait !
Then, let me teach you.
No, I don't.
When current is passed through the coiled copper wire, the copper wire becomes magnetic and the plunger is pulled.
Copper Wire
Plunger
Current
A Solenoid is a component that moves an iron rod called plunger to move rectilinearly.
Door lock
It is used in many ways around us.
If it can only 'pull', this cannot be used in so many ways.
Shift levers of cars
Openings & closings of cash machines.
That's not necessary true.



Explanation Chapter END

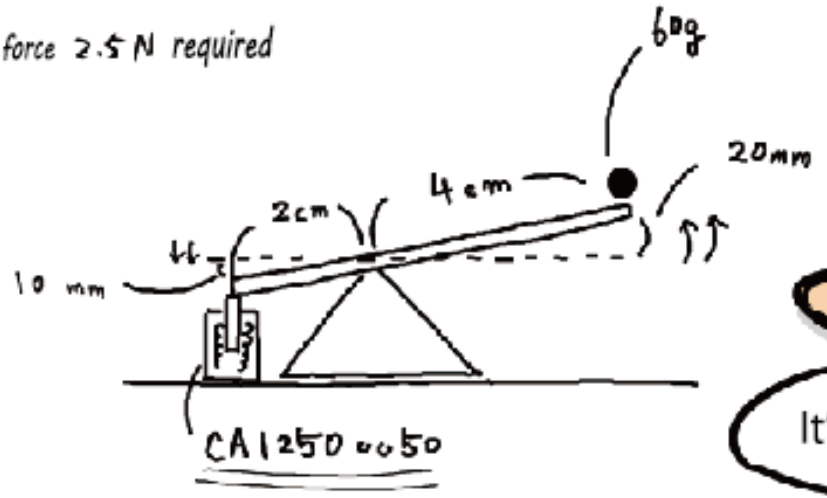
Selection Chapter

You think now

Then, you think.
Now, you think.

But I haven't figured out what to make yet.

1 hour later



It's done

Why don't you use this ?

Using a pull Solonoid.
It is pretty good.

フフン

Such a snob.

First, I will let you know the 4 most important elements for choosing a Solenoid.

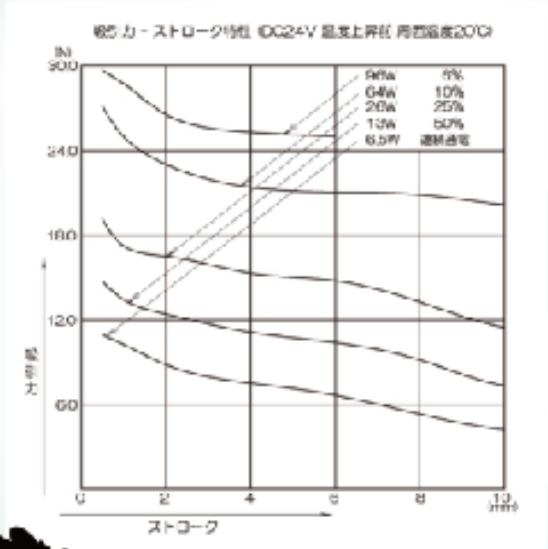
What is the difference ?

A Solenoid called CA12570060.

Now, I am lost

- Pull force and stroke
- Duty cycle
- Type of power source
- Size

Ok, I will explain from the beginning



This is a pull force characteristic chart that shows the relationship between pull force and stroke

"Stroke".. What is that ?

I see. With the principle of leverage, the necessary pull force is

0.6[N] x 4 [cm] ÷ 2 [cm] = 1.2 [N]
Stroke 10mm.
So it meets the condition.

※1[N]=100g

With the rise of the temperature, the pull force decreases. So you do need 1.5 times the normal pull force, which is 1.8 [N].

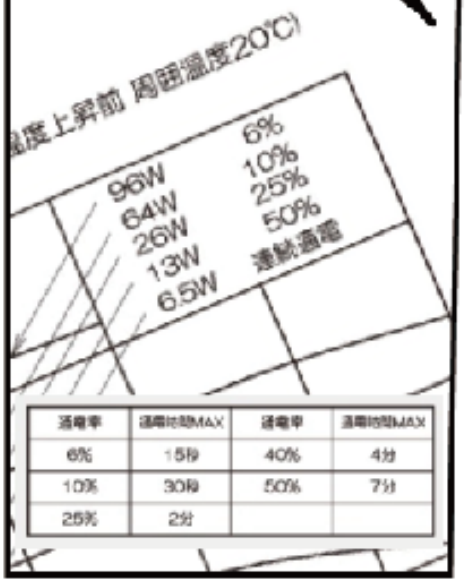
Stroke "0", when not pulled.

10mm

Stroke "10"

"Stroke" is the distance of the plunger movement.

That's right ! The figure displayed with % at the upper right of the table is the duty cycle . Certain duty cycle has limitation on the amount of electricity you can transmit in one go, so you better watch out.



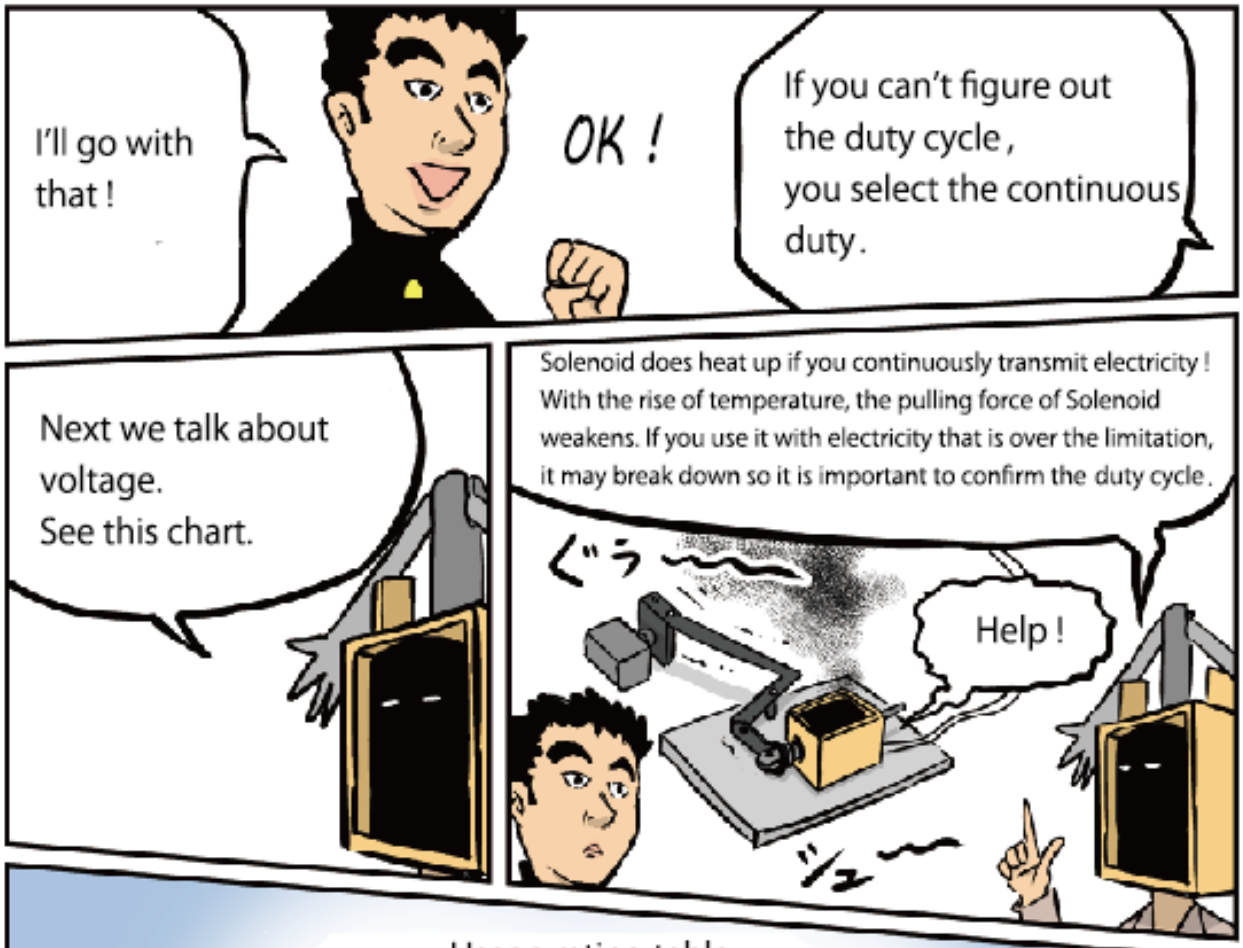
通電率	通電時間MAX	通電率	通電時間MAX
6%	15秒	40%	4分
10%	30秒	50%	7分
25%	2分		

Next, we talk about duty cycle . This is the time required to transmit electricity to Solenoid.

$$\text{Duty cycle} = \frac{\text{Duty time}}{\text{Duty time} + \text{Recess time}}$$

You can use this to calculate

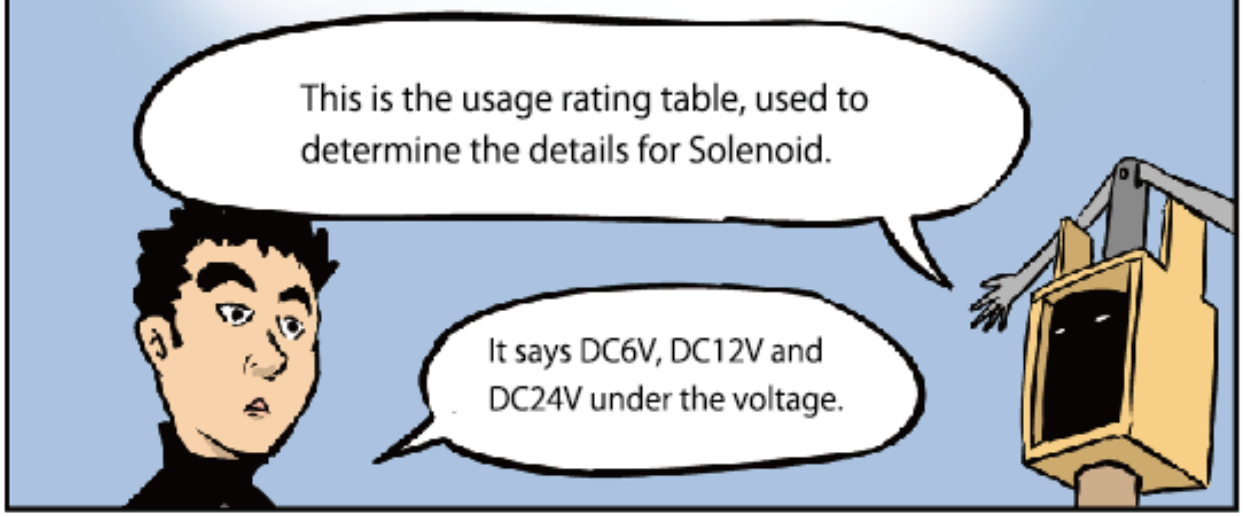
Say you transmit electricity with the duty cycle of 50% for 1 min, do I need to the recess time of 1 min as well ?

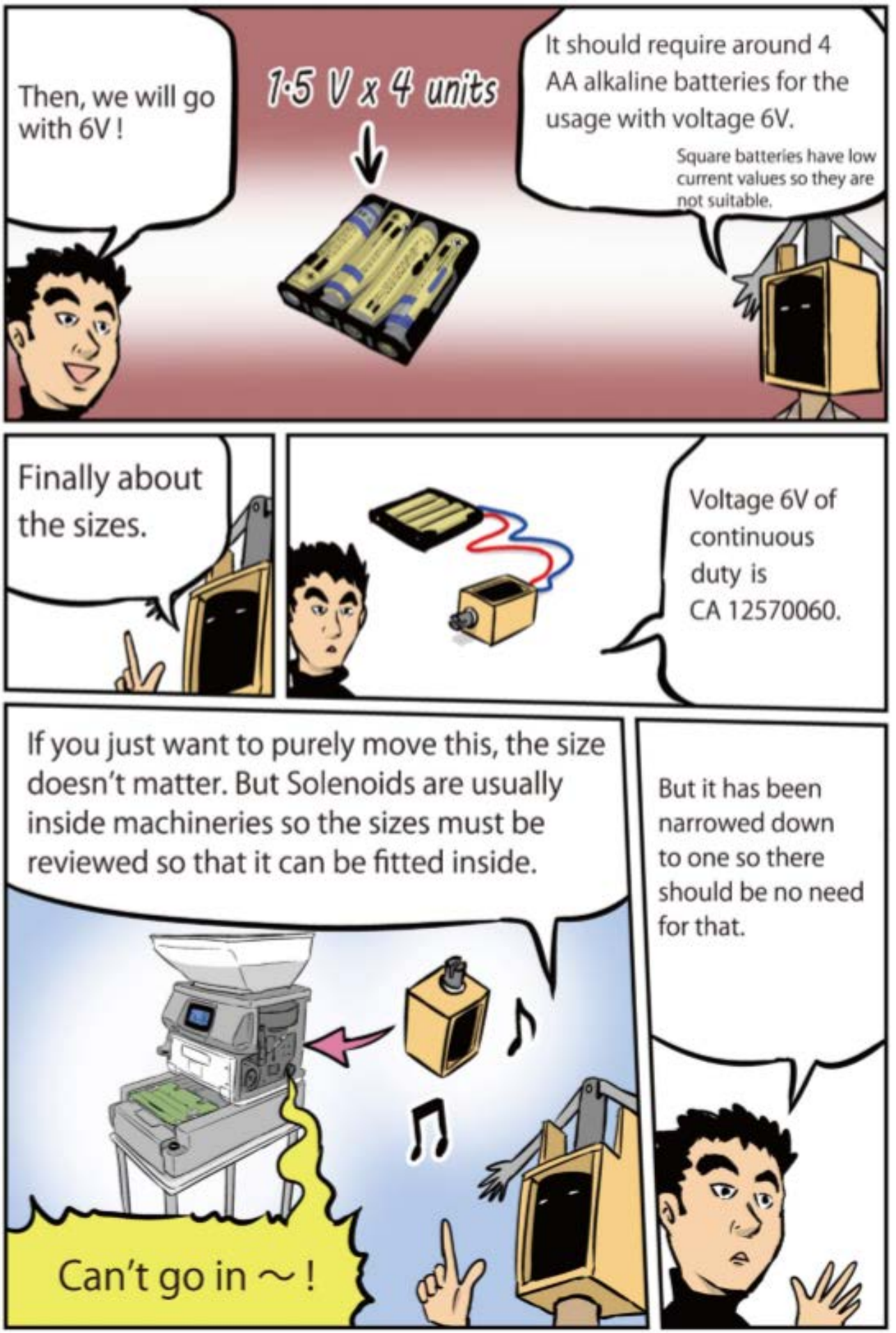


Usage rating table

Standard Class A Insulation

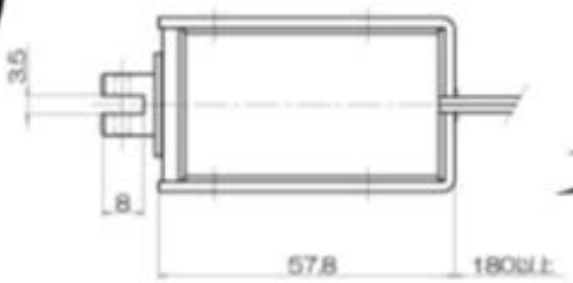
No.	Resistance value (Ω)	DC6V	DC12V	DC24V
CA12570060	6	Continuous energization	25%	6%
CA12570090	9	—	40%	10%
CA12570220	22	—	Continuous energization	25%
CA12570440	44	—	—	50%
CA12570880	88	—	—	Continuous energization

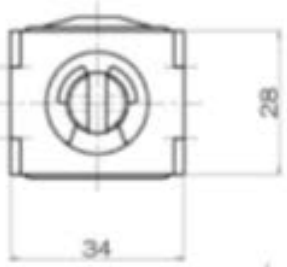


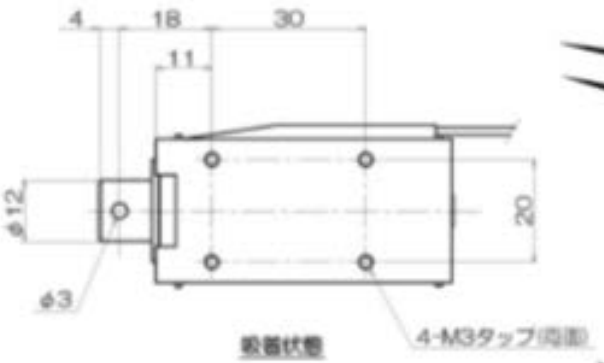

Then, we will go with 6V !
1·5 V x 4 units
It should require around 4 AA alkaline batteries for the usage with voltage 6V.
Square batteries have low current values so they are not suitable.
Finally about the sizes.
Voltage 6V of continuous duty is CA 12570060.
If you just want to purely move this, the size doesn't matter. But Solenoids are usually inside machineries so the sizes must be reviewed so that it can be fitted inside.
Can't go in ~ !
But it has been narrowed down to one so there should be no need for that.

てん

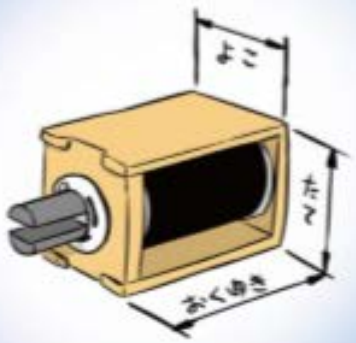
The sizes of the Solenoid are all here.







All dimensions of Solenoid are displayed here.



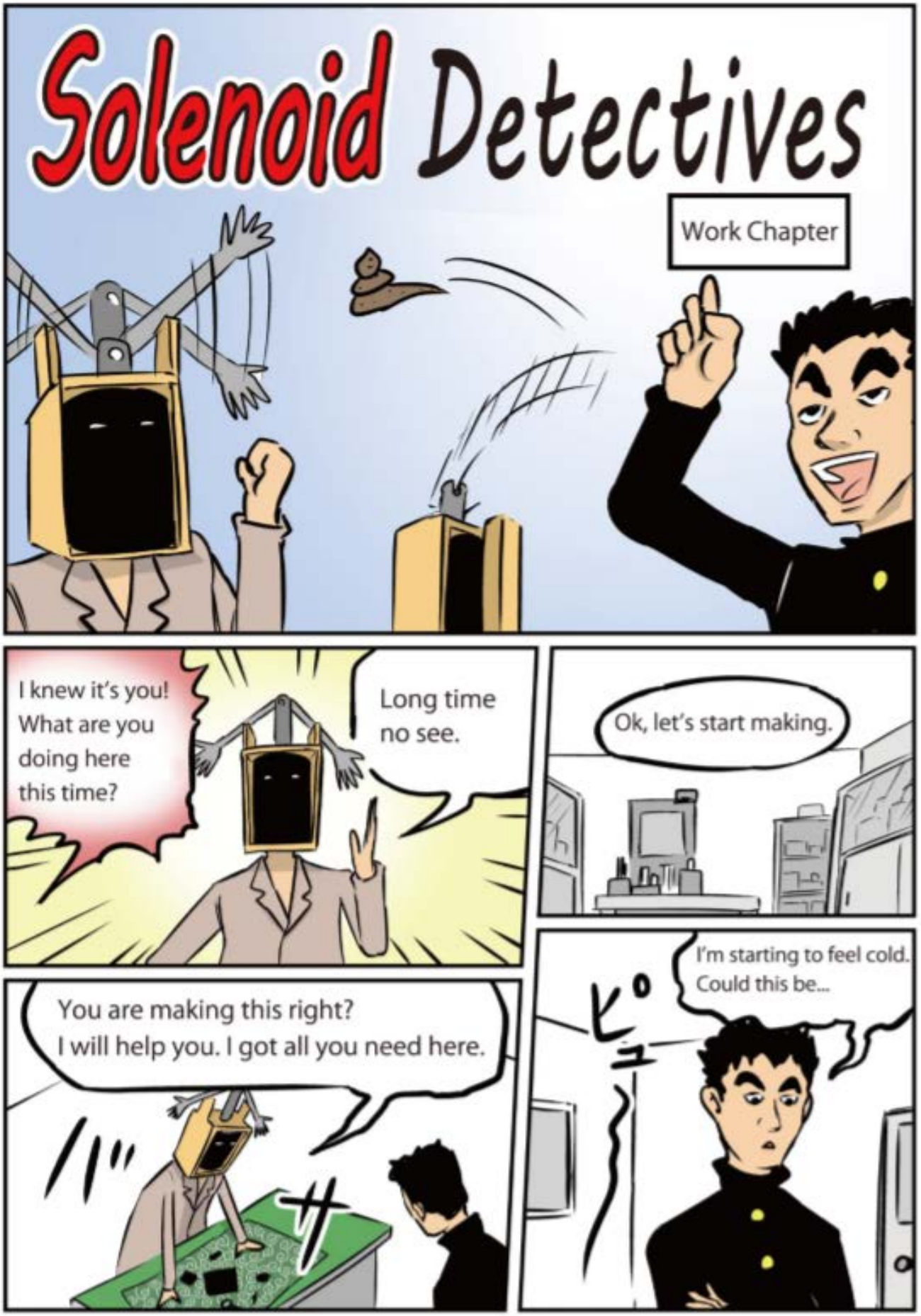
Wow!
Too many numbers.

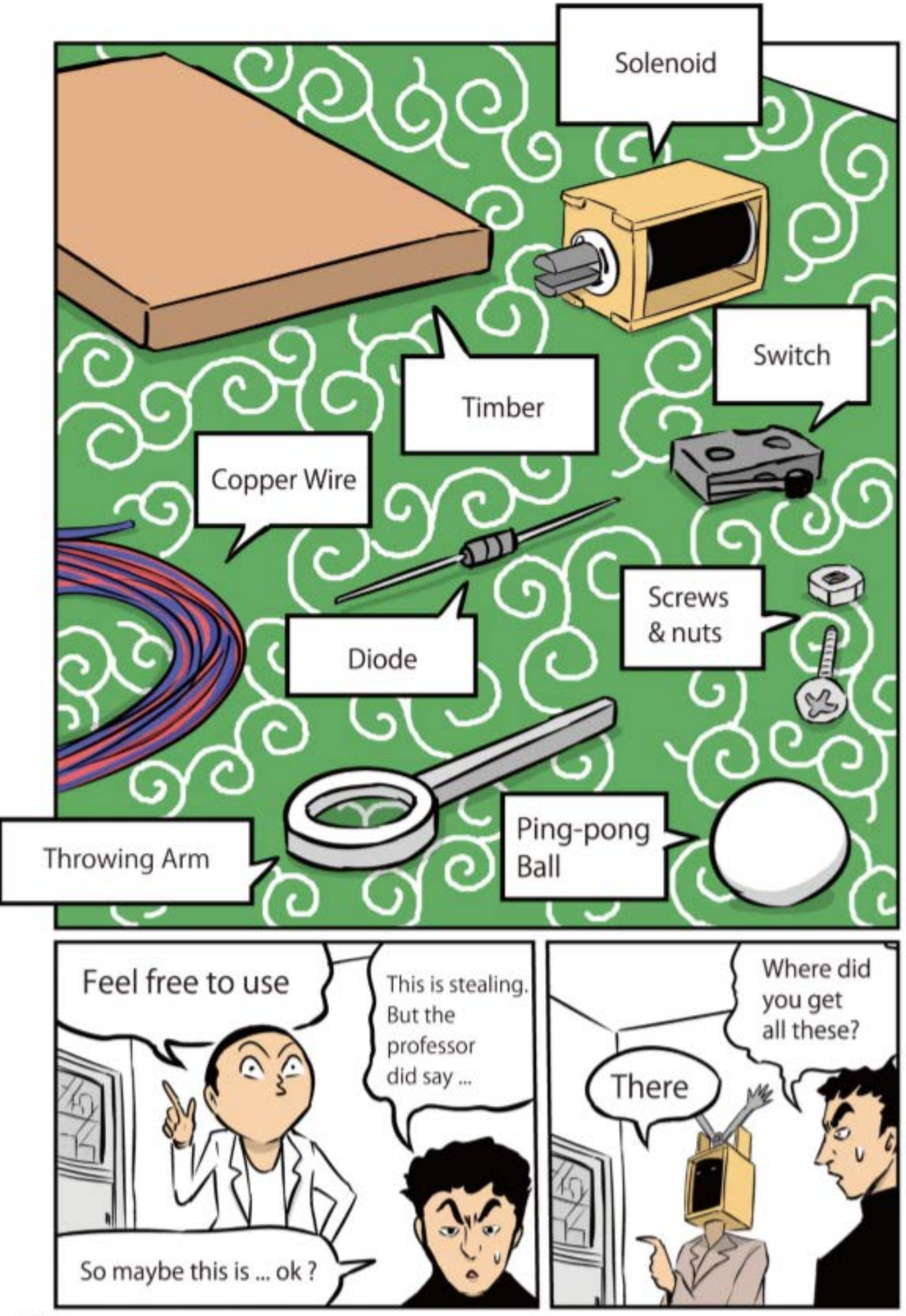
These are all external dimensions, displaying all the required sizes.


Help
Solenoids might not function satisfactorily, when water drops attach to the surface or when it freezes due to temperature decrease.
It is better to consider, where you place them.
あと。
Who is this guy?
Shut up!
It is difficult even to choose a Solenoid.
Sis !
When do you stop talking to yourself !

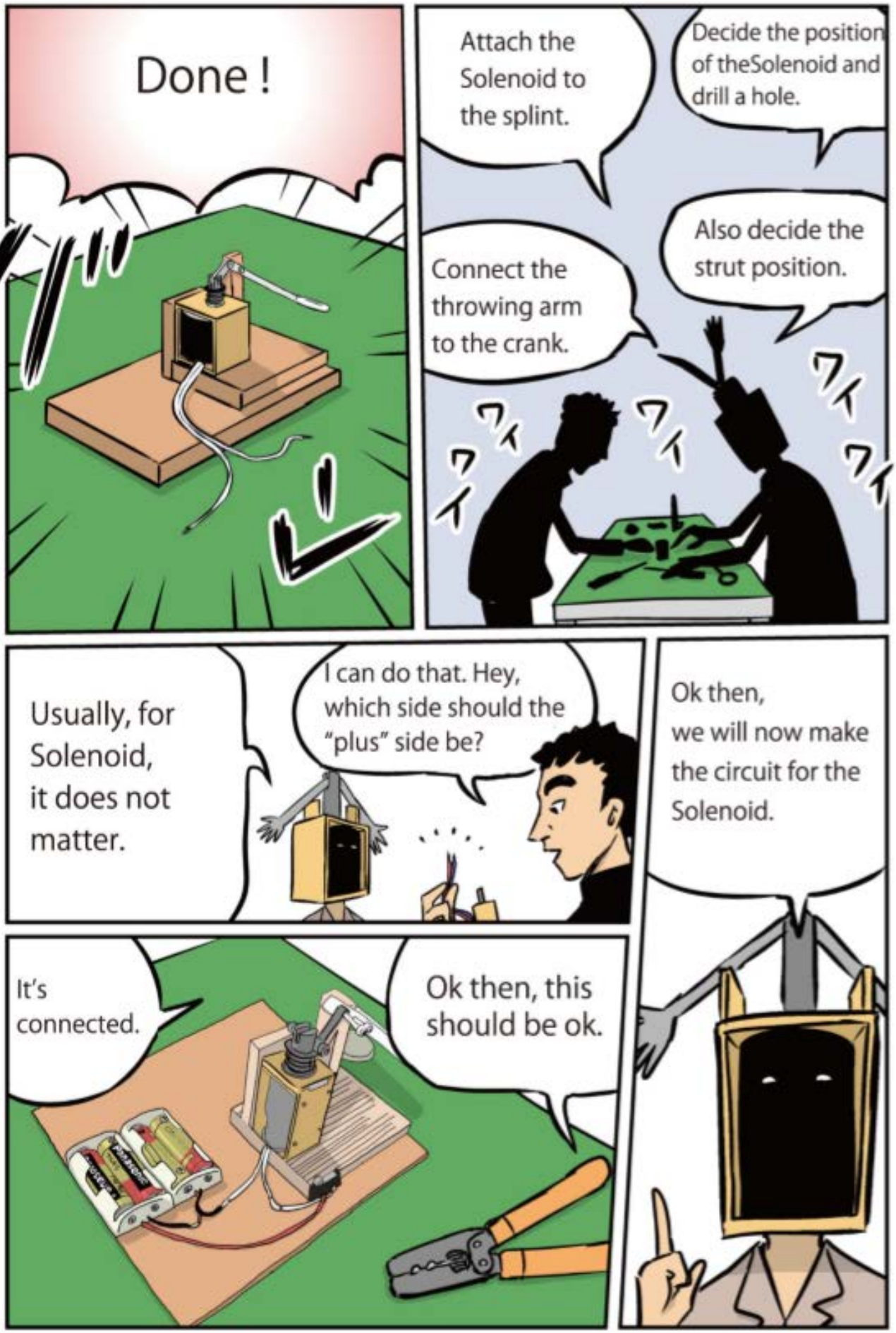

Is this the police? We have an intruder in our house...
Hello.
! !
Don't know...
You won't trick me again ! Goodbye young man!
See you... again... in the "work chapter" .....
Aw. This is the second floor...
バキッ
バキ

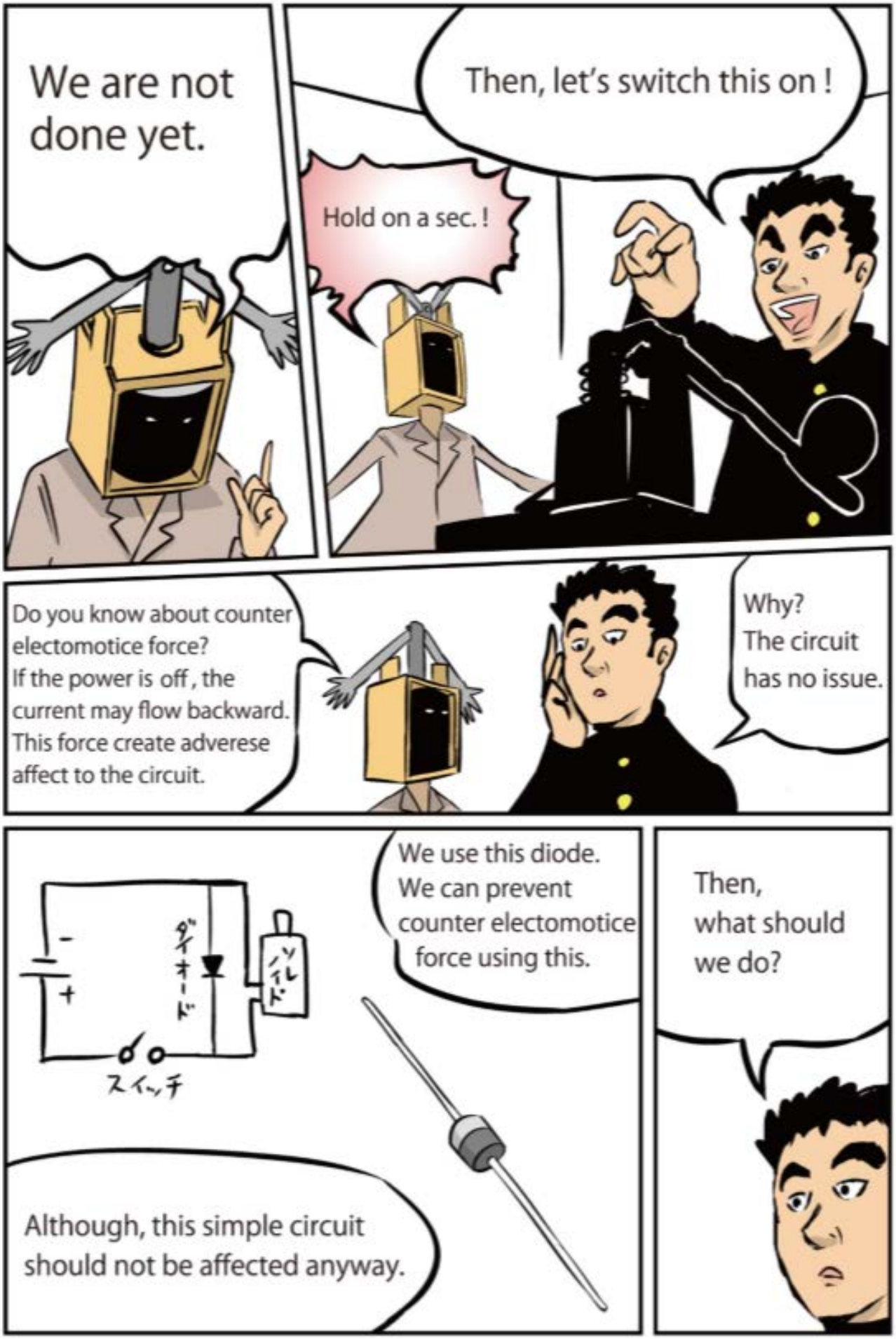
選定の章 END


Solenoid Detectives
Work Chapter
I knew it's you! What are you doing here this time?
Long time no see.
Ok, let's start making.
You are making this right? I will help you. I got all you need here.
I'm starting to feel cold. Could this be...
ピュー


Solenoid
Timber
Switch
Copper Wire
Diode
Screws & nuts
Throwing Arm
Ping-pong Ball
Feel free to use
This is stealing. But the professor did say ...
So maybe this is ... ok ?
Where did you get all these?
There


First, we make the base and strut.
All the materials are here. Let's start making.
ジャコ
ジャコ
ジャコ
Next, we drill a hole to the strut.
ドル
ドル
ドル
What do you mean, "you don't know" ?
Don't know.
I have been wondering. What is this?
The component, where it throws the ping-pong balls were going to be made out of plastic. But I found this by chance and decided to use this.
Is that so?


Done !
Attach the Solenoid to the splint.
Decide the position of theSolenoid and drill a hole.
Also decide the strut position.
Connect the throwing arm to the crank.
Usually, for Solenoid, it does not matter.
I can do that. Hey, which side should the "plus" side be?
Ok then, we will now make the circuit for the Solenoid.
It's connected.
Ok then, this should be ok.


We are not done yet.
Then, let's switch this on !
Hold on a sec. !
Do you know about counter electomotice force?
If the power is off , the current may flow backward.
This force create adverese affect to the circuit.
Why?
The circuit has no issue.
We use this diode.
We can prevent counter electomotice force using this.
Then,
what should we do?
Although, this simple circuit should not be affected anyway.
ダイオード
ソレノイド
スイッチ


It's ok to switch on now.
It's done now.
This should be connected now.
Go !
カチッ
Here we go !
ぴょ
ん
Yes !
Got you !
We are using the lever principle. You can even change the pushing force by moving the support and the Solenoid position.
コロ
コロ


Why are you here ?
Professor !
I wanted you to know more about the Solenoid.
Sorry for tricking you.
You should stop this. It is embarassing, even for me.
How did you find it? Using Solenoid by yourself?
It was fun. I do want to make another one. But..
There must have been another way.

END

Solenoid Detectives

Original Concept	Students of Kyushu Institute of Technology
Manga Work	Eiji Minoru
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