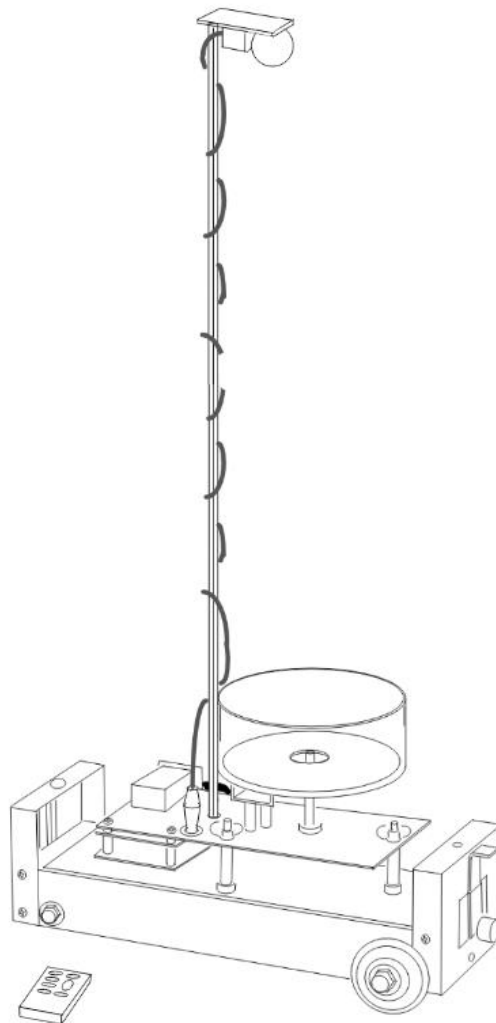


Instruction Manual

C15-2962-W0 Law of Inertia Experiment Apparatus IN-T

C15-2962-W1 Ball-Launcher for Law of Inertia Experiment



NaRiKa Corporation

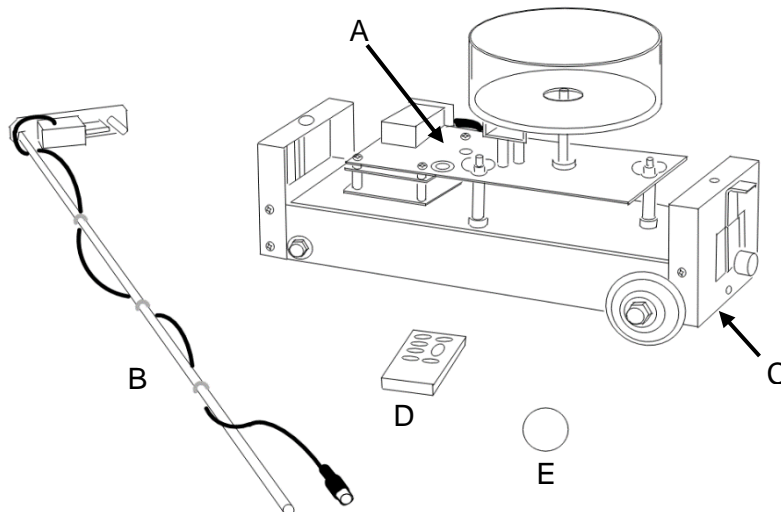
Feb. 2021

⚠ Safety Precaution

- ⊘ Do not disassemble, repair, or remodel this product. This product might stop working and warranty will be void.
- ⊘ When you find that something is broken, please do not repair the product by yourself and contact your distributor.
- ⊘ Do not expose the product to water. If that happens, the launcher unit might not work well as it uses electricity to operate.
- ⊘ Teacher or trainer must instruct students about the safe ways of conducting experiments with this product before actually conducting experiments.
- ⊘ Do not get on the product or do not use the product as a skate.
- ⊘ Make sure to take measures against the product falling down from a table during experiments. It might cause damage to the product.

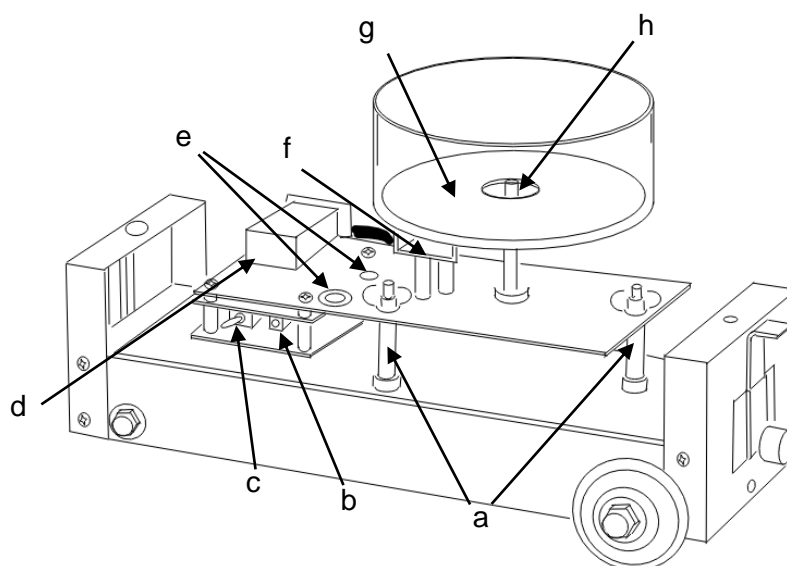
Component parts and Name of them

1. Component parts



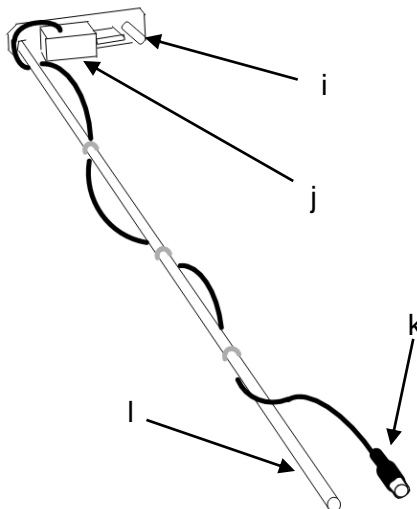
	Name	Major specification
A	Ball launcher device	Spring launcher method with electromagnetic switch
B	Free-fall device	Height: 500mm, Electromagnetic switch method.
C	Metallic Dynamic Cart DY-5	Size: 303 x 102 x 95mm, Mass: 1kg (± 0.002 kg)
D	Remote controller	Infrared (IR) method, Battery: Type CR2025 x 1pc
E	Plastic ball	Diameter 25mm

2. Ball launcher device



	Name	Descriptions
a	Long double side bolt	Assemble the apparatus, by using three long double side bolts to connect Ball launcher device (A) and Metallic dynamic cart (C) together.
b	IR detector	When IR detector detects IR signal from Remote controller (D), it transmits the signal to Ball launcher device (A) or Free fall device (B) to control the launch timing of the ball.
c	Main switch	This switch turns whole ball launcher device on/off.
d	Battery case	This case is for a 9V dry cell battery 006P.
e	Connection jack and threaded screw hole	These are for assembling the free fall device (B), put its pole into the threaded screw hole to fix, and connect its power plug with the connection jack.
f	Ball plunger	The plunger unlocks the spring launcher with electromagnet and launches the ball.
g	Ball receiver cup	Launched ball or a falling ball should land into the cup.
h	Ball insertion guide	The guide helps a ball to be set at a correct position.

3. Free-fall device



	Name	Descriptions
i	Ball insertion guide (2)	The guide is for setting a ball at a correct position for free-fall.
j	Ball plunger (2)	The plunger controlled by an electromagnet is for setting a ball on top of the device at first, and then for releasing a ball from the top of the device to fall down to the cup.
k	Power plug	This power jack is for electromagnet ball plunger (j), to control the timing of the free fall by switching the plunger (j) on or off.
l	Threaded rod (bar)	Length: 500mm. This is a threaded square rod to fix itself on Free-fall device (B).

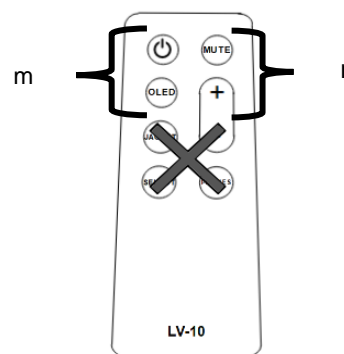
4. Remote controller

This remote controller is a generic remote controller and is used to control the law of inertia experiment apparatus. The apparatus requires two remote control functions to do the experiments. One is to control the timing of ball launch from ball launcher device (A), the other is to control the timing of ball fall from free fall device (B).

m: These two buttons control the fall of the ball from the free fall device.

n: These two buttons control the timing of the ball launch from the ball launcher device.

* It does not matter which one of the 2 buttons will you press; both have the same function. Other buttons on the controller do not work with the apparatus.



Preparation

1. Assemble the law of inertia experiment apparatus

1) Fix the ball launcher device (A) on the Metallic dynamic cart (C).

There are three long double side bolts and a wing nuts (a) in the package. If these long double side bolts have already been attached on the ball launcher device, remove them from the launcher first (see Fig. 1).

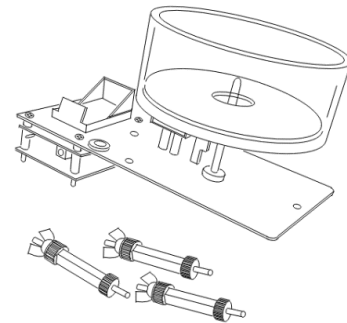


Fig. 1 Ball launcher device (A)

Screw these three long double side bolts to three screw holes on the metallic dynamic cart, which has four screw holes on its platform (see Fig. 2 and Fig. 3). If it is hard to screw them, please use a tool, for example a wrench.

[Caution] Do not remove two thumb nuts from the long double side bolts because the thumb nut is necessary leveling adjustment for the launcher device.

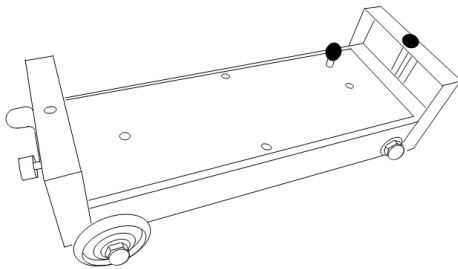


Fig. 2 Metallic Dynamic Cart DY-5 (C)

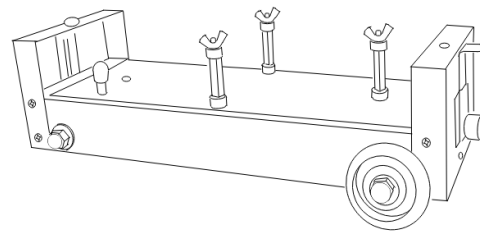


Fig. 3 The platform with the long spacers

2) Place and fix the ball launcher device on the dynamic cart

Remove three wing nuts from each long double side bolt and place the ball launcher device on the long double side bolts. Then fix it with wing nuts on the long double side bolts to tighten the upper part to the cart.

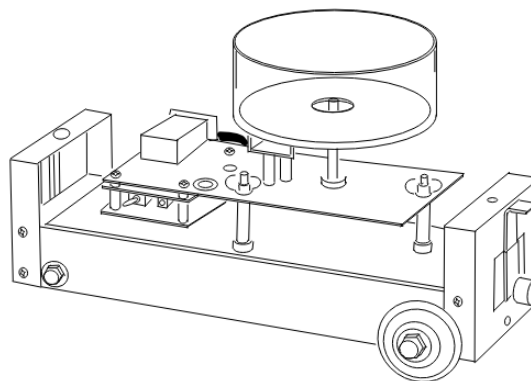


Fig. 4 The law of inertia experiment apparatus

2. Equip the Free-fall device to the inertia experiment apparatus

Prepare a threaded rod hole and a connection jack on the ball launcher device (see Fig. 5), screw the threaded rod (l) into the hole. If it is hard to screw it, please use a tool, for example a wrench. After that, insert the power plug (k) into the jack.

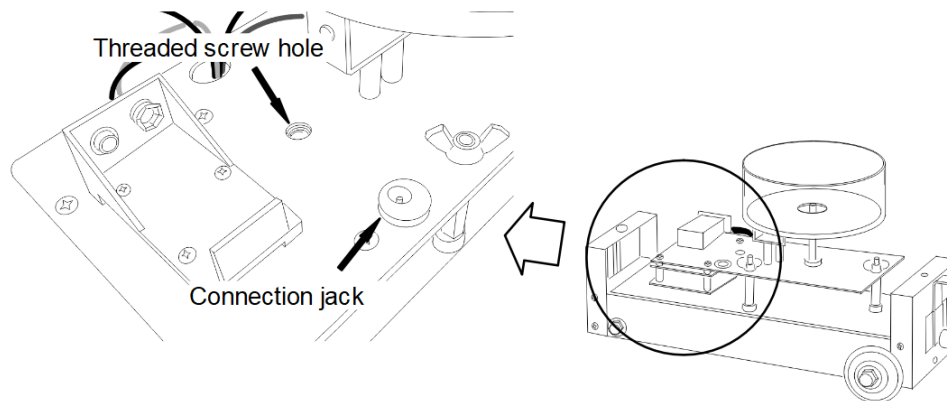


Fig. 5 Threaded screw hole and connection jack



Fig. 6 Completed free-fall device

Experiment guide

1. An experiment of a launched ball on the moving cart

- 1) Set a 9V dry cell battery 006P into the battery case (d) on the ball launcher device (see Fig. 7).
- 2) Turn the main switch (c) on, so that the IR detector (b) lights on and off.
- 3) Press the button (n) on the remote controller to confirm if the ball plunger (f) works or not, you should hear the sound of the ball plunger unlocking. If you cannot hear any sound of the ball plunger unlocking, change the battery for a new one.

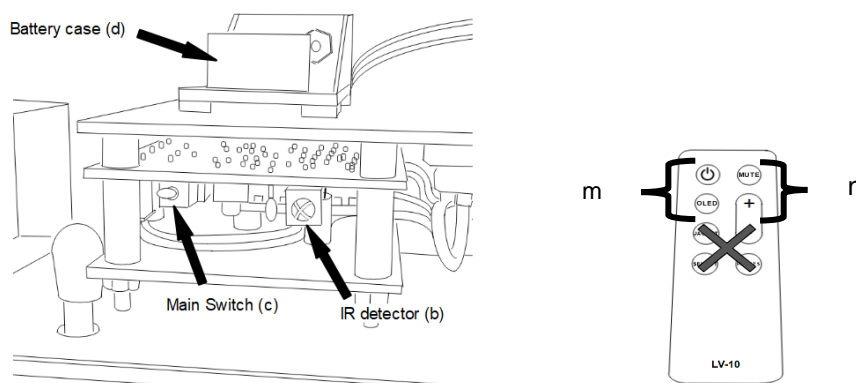


Fig. 7 Battery Case, Main Switch, IR Detector and Remote Controller

- 4) Set the inertia experiment apparatus on a flat and horizontal surface (table), use the anti-moving stopper if needed.
- 5) Insert the plastic ball to the Ball insertion guide (h) and push the ball until it makes a click sound.
- 6) Launch the ball from the inertia experiment apparatus in the stationary position by pressing the button on a remote controller.
- 7) If the ball after release does not land into the ball receiver cup often the table or the ball launcher device may not be in horizontal condition. Please check if the

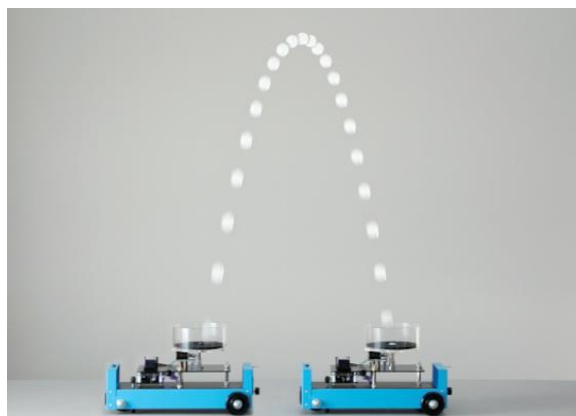


table is in horizontal condition or adjust the ball launcher device into horizontal condition with its thumb nuts of the long double side bolts.

8) Push forward the inertia experiment apparatus slowly on the table. Then, activate the launcher device using the remote controller to launch the ball. The ball will fall back into the receiver cup. Do not forget to return the anti-moving stopper to its original position if you have used it earlier.

Additional information, students have a smartphone equipped with a video camera that can record in high-speed photography mode. Students can shoot video in this mode by themselves and then playback it for better understanding.

2. An experiment of a free-falling ball on the moving cart

- 1) Set a 9V dry cell battery 006P into the battery case (d) on the free-fall device (see Fig. 8).
- 2) Turn the main switch (c) on, so that the IR detector (b) lights on and off.
- 3) Press the button (n) on the remote controller to confirm if the ball plunger (f) works or not, you should hear the sound of the ball plunger unlocking. If you cannot hear any sound of the ball plunger unlocking, change the battery for a new one.

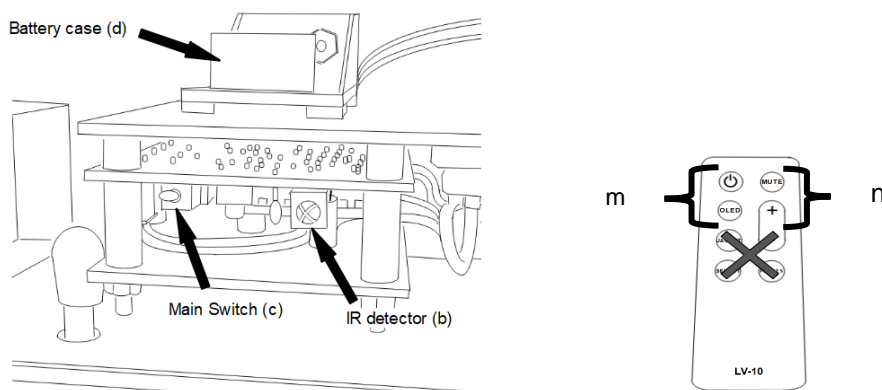


Fig. 8 Battery Case, Main Switch, IR Detector and Remote Controller

4) Set the inertia experiment apparatus on a flat and horizontal surface (table), use the anti-moving stopper if needed.

5) Insert the plastic ball to the Ball insertion guide (2) (i) on the top and push the ball until it

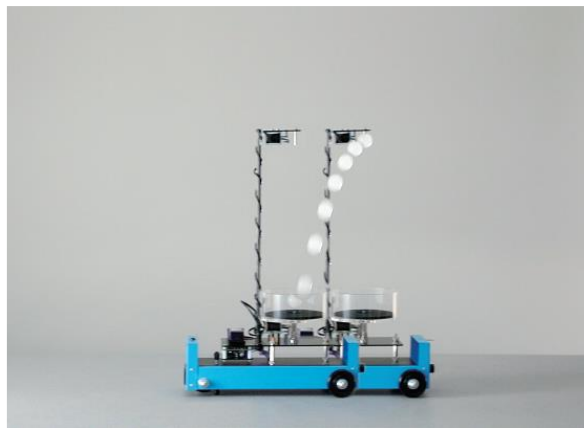
locks.

6) Release the ball from the inertia experiment apparatus in the stationary position by pressing the button on a remote controller.

7) If the ball after release does not land into the ball receiver cup often the table or the ball launcher device may not be in horizontal condition. Please check if the table is in horizontal condition or adjust the ball launcher device into horizontal condition with its thumb nuts of the long double side bolts.

8) Push forward the inertia experiment apparatus slowly on the table. Then, activate the launcher device using the remote controller to release the ball. The ball will fall back into the receiver cup. Do not forget to return the anti-moving stopper to its original position if you have used it earlier.

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