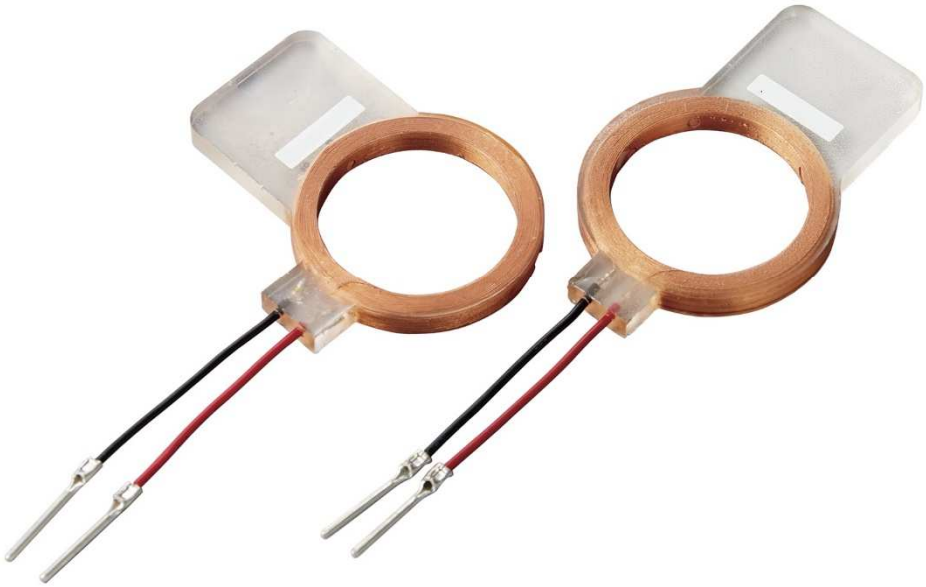
Flat Coils Molded in Plastic

Cat. No. B10-4711-W0



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Safety Precautions

- **Do not directly plug the built-in lead(s) into an electric outlet because it can be damaged or lead to an electrical accident.**
- **Do not forcefully pull the lead(s). Although the coil and leads are integrally molded, the leads can get disconnected.**
- **Do not use the coil in a high-temperature environment that exceeds 70 degrees Celsius because the mold resin may deform and make the product unusable.**
- **The lead cannot be replaced. If the lead is cut off, you will need to purchase the whole product again.**

Introduction

Product's Feature

The 600 turns coil is molded into a flat shape with opaque curing resin, which prevents the coil from becoming unwound.

[Overall Advantages to Users]

[To all users]

- ✓ Versatile because of its flat and compact shape.
- ✓ Durable because its coil and leads are integrally molded into a plastic body.

[To teachers]

- ✓ Easy to carry various types of students' experiments, such as electromagnetic induction, formation of electromagnetic field, and electric pendulum. Furthermore, compatible with experiments using sensor(s) and data-logging system.

[To students]

- ✓ Easy to connect the coil with an electric circuit and/or other types of equipment without worrying about cutting off the leads and unwinding the coil.
- ✓ Possible to set up, as students wish, safely and instantly because of the flange adjacent to the coil that can easily be clamped to a support stand freely.

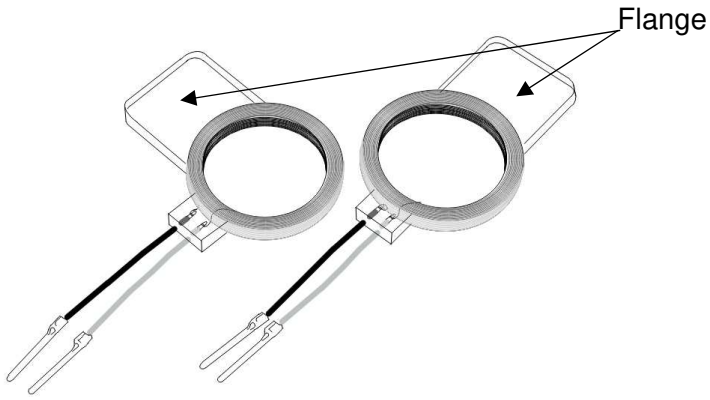
[Keywords]

*Faraday's law *Electromagnetic induction *Induced electromotive force
*Mutual induction *Ampere's law *Generating a magnetic field by current
*Mutual inductance

Contents & Specification

Pair of flat coils molded in plastic: 1) Straight-line-shaped type, 2) Right-angle shaped type.
(When stacked up, flange of each type will be perpendicular to each other.)

Size: Inner diameter: 40 mm, Outer diameter: 50 mm, Thickness: 7 mm
Coil: φ 0.2mm copper wire, 600 turns
Resistance value: ca. 50 Ω



Examples of Experiment

Faraday's Law of (Electromagnetic) Induction

[What to prepare:]

1 Flat Coil Molded in Plastic (Straight-line shaped type)
By yourself:
1 Galvanometer (Sensitive center-zero type, if available)
1 Bar alnico magnet
1 Pair of leads (red and black) with clips

[How to set up:]

Connect the built-in leads of the coil to a galvanometer through a pair of leads (red and black) with the clips.

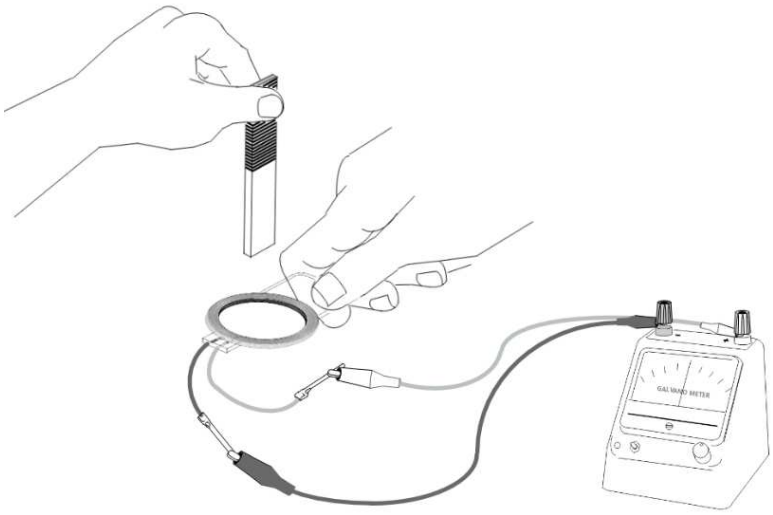
[Observation of Electromagnetic Induction]

1. Hold either of the south or north pole of a bar magnet with your fingers. Hold the flange of the coil, too, with your fingers of the other hand.
2. Move the bar magnet into and out of the coil.
3. Keep moving the coil as described in above 2 and observe any deflection on the galvanometer.
4. Hold the bar magnet upside down (hold the other pole of the magnet). Move the magnet likewise. Then, observe any deflection on the galvanometer.
5. Furthermore, change the speed at which the magnet is inserted into or withdrawn from the coil. Then, observe any change in the deflection on the galvanometer.

It is possible to demonstrate Faraday's law of electromagnetic induction based on such an experimental setup including a commonly available galvanometer, however, Narika's (A05-7120) "Galvanometer GM-6000" is more recommended because it has a built-in amplifier circuit, thus it has thousandfold sensitivity than any conventional type galvanometer.

[For students' advanced learning:]

- Prepare an ampere/voltage sensor able to connect to devices capable of data collection and graphical analysis.
- Students will easily observe the principle of electromagnetic induction that appears and ends in a moment, thus does not last long enough.



Mutual Induction 1

[What to prepare:]

1 Flat Coil Molded in Plastic (Straight-line shaped type)

1 Flat Coil Molded in Plastic (Right-angled type)

By yourself:

1 Galvanometer (Sensitive center-zero type, if available)

1 Size D Battery

1 Holder for Size D Battery

1 Knife switch

1 Lead with clips at both ends

1 Support stand

1 Universal clamp

2 Pair of leads (red and black) with clips

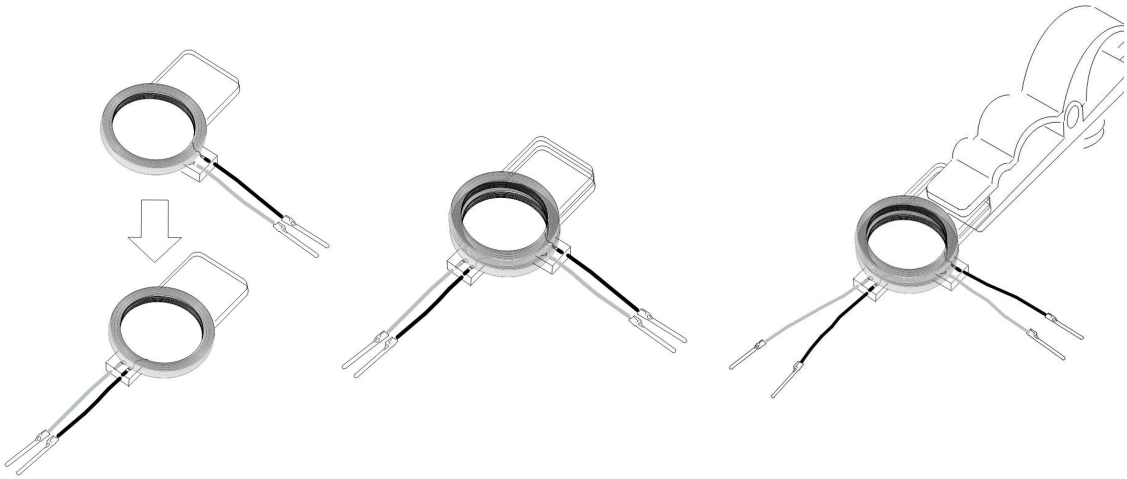
[How to set up:]

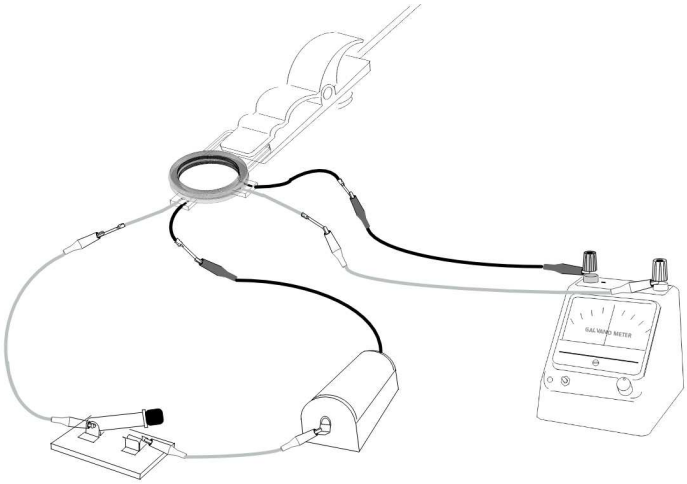
1. Stack the two coils up so that the both flanges are fully overlapped. Consider the lower coil as a primary coil, and the upper one as a secondary coil.

2. Clamp the flanges to a support stand with a universal clamp.

3. Form a simple electric circuit that consists of the primary coil (the lower coil), a size D battery held in its holder, a knife switch, two pairs of leads (red and black) with clips and a lead with clips at both ends.

4. Connect the secondary coil to a galvanometer through a pair of leads (red and black) with the clips.





[Observation of Mutual Induction 1]

Turn the knife switch on and off repeatedly while observing any deflection on the galvanometer.

If a commonly available galvanometer (without an amplifier circuit) is in use, deflection on it would vary depending on the power source used. Given a dry-cell battery (1.5 V) is in use, the deflection on the galvanometer would be subtle. Therefore, it is recommended to use a power source that generates a voltage up to 10 V and/or to use a sensitive galvanometer such as Narika's A05-7120: Galvanometer GM-6000 with amplifier.

Mutual Induction 2

[What to prepare:]

1 Flat Coil Molded in Plastic (Straight-line shaped type)

1 Flat Coil Molded in Plastic (Right-angled type)

By yourself:

1 Galvanometer (Sensitive center-zero type, if available.)

1 Size D Battery

1 Holder for Size D Battery

1 Knife switch

1 Lead with clips at both ends

1 Support stand

1 Universal clamp

2 Pair of lead (red and black) with clips

[How to set up:]

1. Clamp the flange of a coil (either type is applicable) to a support stand with a universal clamp. Consider this coil as the primary coil, and the other coil as the secondary coil.

2. Form a simple electric circuit that consists of the primary coil, a size D battery held in its holder, a knife switch, two pairs of leads (red and black) with clips and a lead with clips at both ends
3. Connect the secondary coil to a galvanometer through a pair of leads (red and black) with clips.

[Observation of Mutual Induction 2]

Move the secondary coil freely around the primary coil to see how the deflection on the galvanometer changes depending on the positional relationship between the two coils and/or on the state of motion of the secondary coil (when stationary, or moving, etc.).