The magnetic effect of a current-carrying conductor

(Item No.: P1397700)

Curricular Relevance

Area of Expertise: Physics
Education Level: Age 14-16
Topic: Electricity
Subtopic: Electromagnetism
Experiment: The magnetic effect of a current-carrying conductor

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Easy	10 Minutes	10 Minutes	2 Students

Additional Requirements:

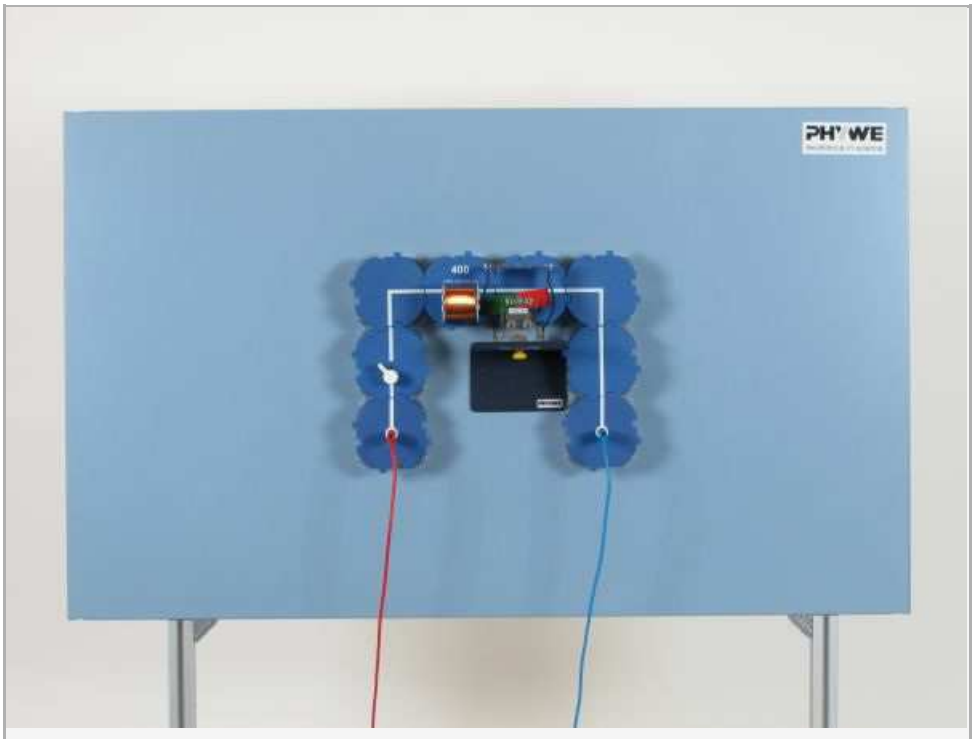
Experiment Variations:

Keywords:

Principle and equipment

Principle

It is to be demonstrated, that a conductor that is carrying current exerts a force on a permanent magnet.



Experimental set-up

Equipment

Position No.	Material	Order No.	Quantity
1	PHYWE power supply, universal DC: 0...18 V, 0...5 A / AC: 2/4/6/8/10/12/15 V, 5 A	13500-93	1
2	Demo Physics board with stand	02150-00	1
3	Motor model f. magnet board	07850-20	1
4	Coil 400 turns, module DB	09472-01	1
5	Switch on/off, module DB	09402-01	1
6	Magn.rotor f.generator model	07850-22	1
7	Junction, module DB	09401-10	2
8	Connector, straight, module DB	09401-01	2
9	Connector, angled, module DB	09401-02	2
10	Holder f.electr.motor,magn.board	07849-00	1
11	Connecting cord, 32 A, 750 mm, red	07362-01	1
12	Connecting cord, 32 A, 750 mm, blue	07362-04	1

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Set-up and procedure

- Set up the experiment as shown in Fig. 1: Remove the pole shoes from the motor model after having unscrewed their holding screws, then insert the magnetic rotor as armature; screw the motor model tight to the holder
- Position the magnetic rotor so that its axis of rotation is at the height of the coil axis
- Switch on the power supply, set it to about 5 V direct current and limit the current to 2 A
- Repeatedly briefly close the switch, bringing the magnet to a different position before each closing of the switch; observe the magnet (1)
- With the switch open, reverse the polarity of the voltage and repeat the switch-closing procedure as above (2)

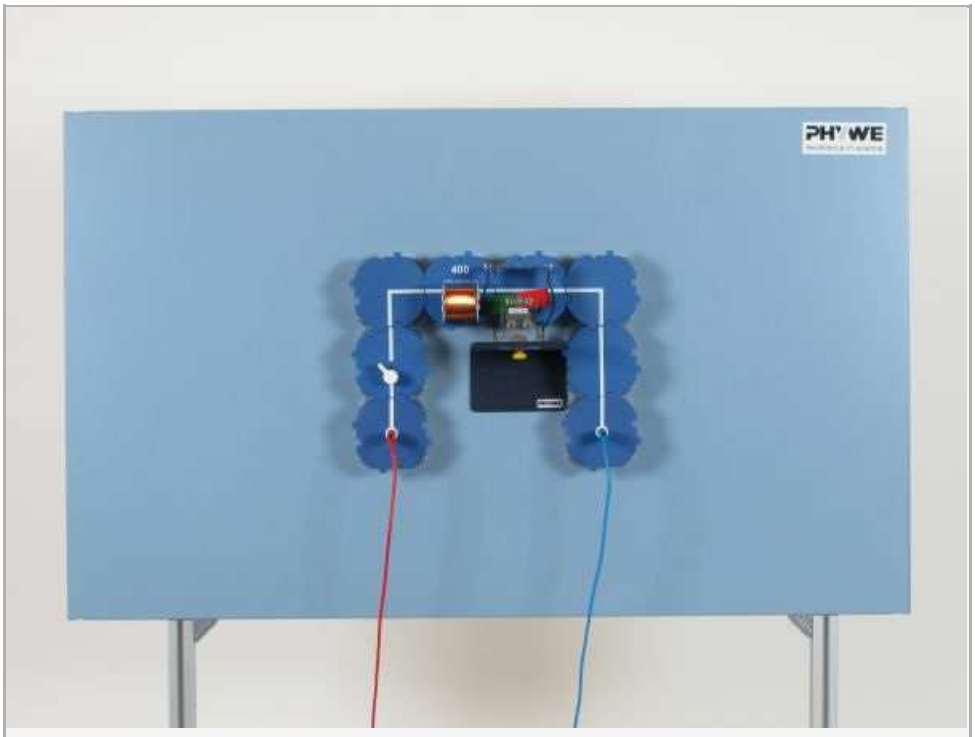

Fig. 1

Observation and evaluation

Observations

1. As long as the circuit is closed, the coil and the same pole of the magnet attract each other.
2. When the current flows in the opposite direction, then the coil and the other pole of the magnet attract each other.

Evaluation

A conductor that is carrying current acts as a magnet whose poles change with the direction of the current. This behaviour can be explained by the build-up of a magnetic field around the current-carrying conductor.

Remarks

Should no power supply with automatic current limitation be available, then the voltage must be so set that the coil, which is designed for a 1 A permanent load, is not damaged; a current of up to 2 A can be briefly applied.