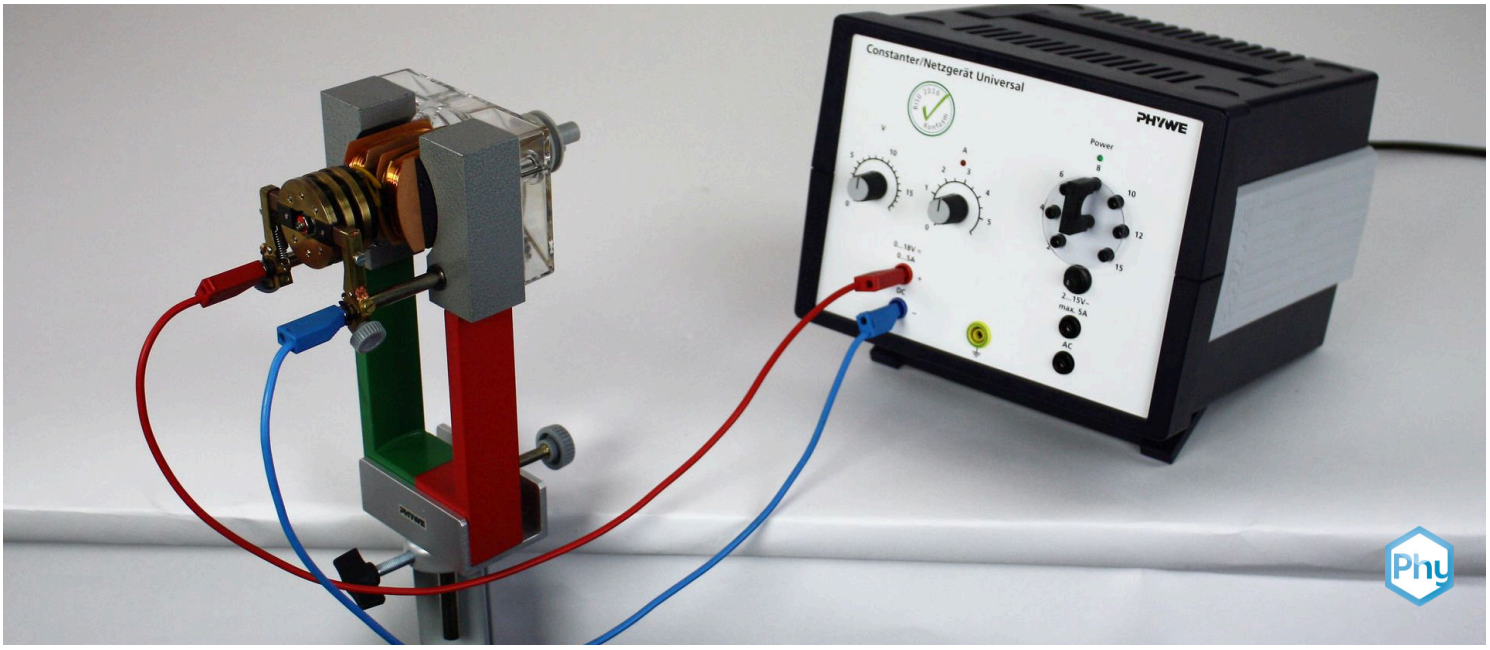
The permanent magnet motor (DEMO)



Physics > Electricity & Magnetism > Electromagnetism & Induction

Physics > Electricity & Magnetism > Electric generator, motor, transformer

Difficulty level	Group size	Preparation time	Execution time
medium	1	10 minutes	20 minutes

This content can also be found online at:

http://localhost:1337/c/617aac088e47ed0003a82b82

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Teacher information

Application

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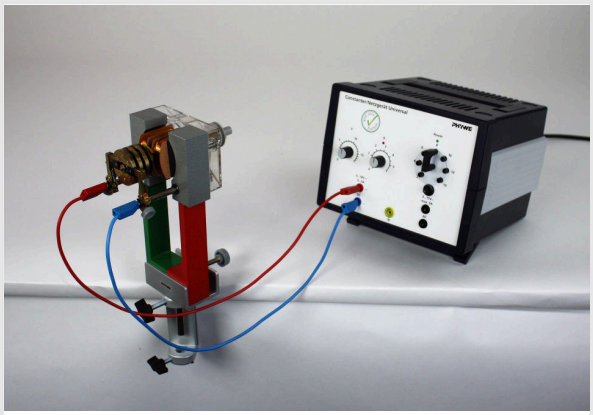

Test setup

Electric motors are installed in many machines. Be it the electric car or the electric toothbrush. In this experiment, the principle of the electric motor is clarified.

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Other teacher information (1/2)

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Previous

No prior knowledge is required.

Principle

The attraction and repulsion of magnetic fields causes the motor to rotate. The external magnetic field is from a permanent magnet and remains constant. The T-armature also forms a magnetic field, which is reversed at the right time by means of a commutator.

Other teacher information (2/2)

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Learning

Students should understand how an electric motor works.

Tasks

Investigate how a permanently excited electric motor works.

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Student Information

Motivation

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Electric motors are installed in many machines. Be it the electric car or the electric toothbrush. In this experiment, the principle of the electric motor is clarified.

An electric car

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Equipment

Position	Material	Item 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	13504-93	1
2	Bench clamp	02012-00	1
3	Plate holder, opening width 2 - 35 mm	06509-00	1
4	U-magnet, large, U-shaped, limb length 130 mm, colored poles	06320-00	1
5	Motor set	06550-00	1
6	Rotor coil, Double-T armature	06554-00	1
7	Cord pulley	06558-01	1
8	Connecting cord, 32 A, 750 mm, red	07362-01	1
9	Connecting cord, 32 A, 750 mm, blue	07362-04	1

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Structure (1/2)

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- Assemble the motor attachment according to Fig. 1 and Fig. 2.
- Slide the axle [1] of the double T-anchor into the bearing bore [3] of the motor attachment and screw it tight with the cord washer [2].
- Place the grinding brushes [4] of the motor attachment against the interrupted copper ring [7]. Pull the knurled screws [5] slightly upwards and tighten them so that the spring of the lever arms is tensioned. This presses the brushes firmly onto the copper ring. The electrical contact between armature coils and connection sockets [6] is established.

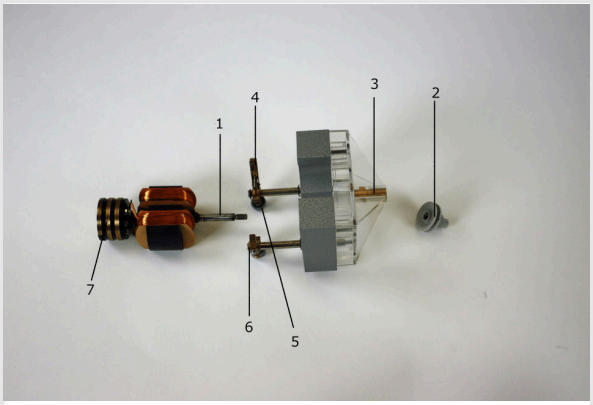

Fig. 1

Structure (2/2)

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- Clamp the U-shaped magnet to the tabletop with the table clamp (Fig.2).
- Place the motor attachment on the U-magnet.
- Set the DC voltage at the power supply unit to 0 V-.
- Connect the electric motor to the power supply as shown in Fig. 2.

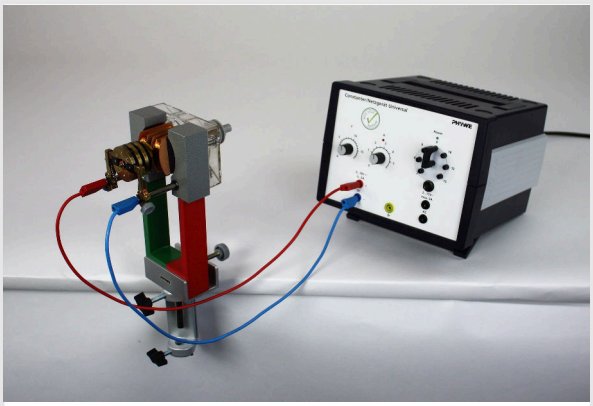

Fig. 2

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Procedure

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- Set the voltage to approx. 8 V-, you may have to "start" the motor by turning it.
- Change the voltage and observe the speed.
- Set the voltage to 0 V- and change the direction of the current through the armature winding. Observe the direction of rotation.
- Set the voltage to 0 V- and disconnect the leads from the armature coil. Remove the motor top.
- Close the magnet by 180° and rebuild the electric motor. Observe the direction of rotation.

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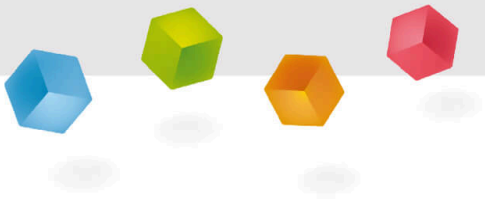

Report

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Task (1/3)

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As the voltage increases, the speed of the motor?

- remains the same
- Larger
- small

Task (2/3)

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Drag the words into the correct boxes!

Current is supplied to the _____ via two sliding brushes and an interrupted copper ring. Since the _____ is freely rotatable between the pole shoes, it adjusts itself so that the coil axes are in _____. At this moment, the brushes pass from one part of the interrupted copper ring to the other part of the ring. This reverses the direction of the _____ in the armature coils.

- armature coils
- current
- armature
- field direction

Check

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Task (3/3)

Drag the words into the correct boxes!

The armature rotates 180° until the coil axes are again in _____. The _____ is reversed again at the interrupted copper ring (current inverter or collector). The process continues, resulting in a uniform _____. _____ and strength of the electric current through the armature coil determine the direction and _____ of the magnetic field of the armature coil.

- field direction
- strength
- current direction
- rotation
- Direction

Check

Slide	Score / Total
Slide 12: Speed and direction of rotation	0/3
Slide 13: Principle of the DC motor 1	0/4
Slide 14: Principle of the DC motor 2	0/5

Total score 0 / 12

Show solutions Repeat

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