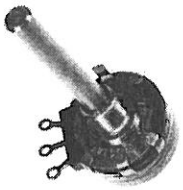
Variable resistor (directed laboratory)

The variable resistor is a much used part in electronics. You have surely had the opportunity to use one many times. Every time you turn a knob to regulate the sound volume of a device, it is highly likely that you are turning a variable resistor. There are also variable resistors whose cursors move in a straight line, like the controls of some audio systems.



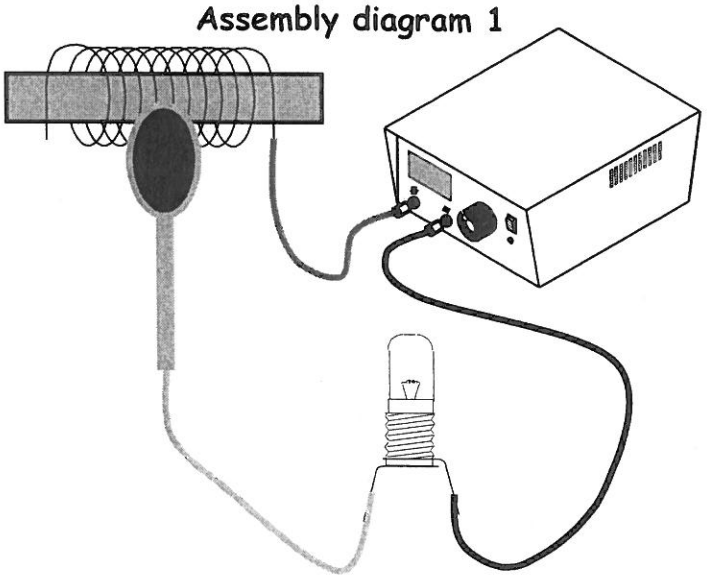
It is possible to simulate a variable resistor using rolled nichrome wire and a small metallic spoon.

Using a variable resistor (2 contacts)

Materials 1

- 1 power supply (10 volts)
- 3 alligator clip wires
- 1 (non coloured) 12 volt incandescent light bulb
- 1 roll of n° 28 nichrome[2] wire
- 1 small metal spoon

Assembly diagram 1



Manipulation 1

1. Assemble the above circuit.
2. Press the spoon to the rightmost extremity of the wire roll.
3. Turn on the power and adjust it to the maximum.
4. Slide the spoon towards the left, keeping it in constant contact with the wire roll.
5. Observe the light intensity of the bulb and note your observations.

[2] Nickel chrome alloy used as a heating element.

Observations (manipulation 1)

Analysis of phenomenon 1

Question 1
When the spoon is slid over the roll, at which extremity is the light intensity greatest?

Question 2
Why does the light intensity weaken when moving the spoon to the left?

Question 3
What would happen if the roll had twice as many turns of wire?

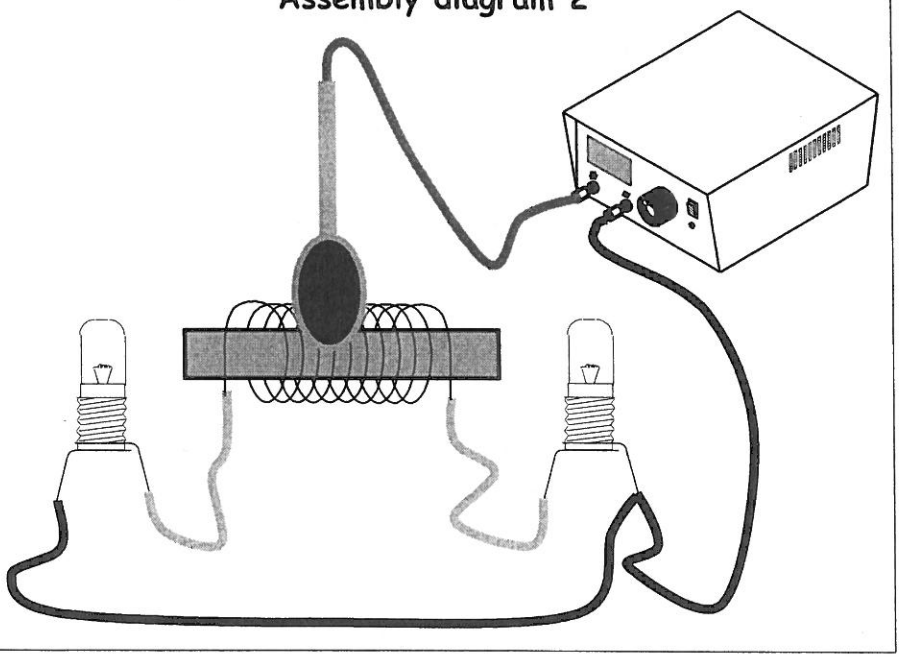
Question 4
Nichrome conducts electrical current relatively poorly when compared to copper. What result would we obtain if we replaced the nichrome wire with copper wire of the same length and width?

Using a variable resistor (3 contacts)

Materials 2

- 1 power supply
- 5 alligator clip wires
- 2 non coloured incandescent light
- 1 roll of n° 28 nichrome[3] wire
- 1 small metal spoon

Assembly diagram 2



Manipulation 2

1. Assemble the above circuit.
2. Press the spoon to the rightmost extremity of the wire roll.
3. Turn on the power and adjust the light intensity of the right hand bulb to the maximum.
4. Slide the spoon from left to right while maintaining contact with the wire roll.
5. Observe the light intensity of the bulbs and note your observations.

Observations (manipulation 2)

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[3] Nickel chrome alloy used as a heating element.

Analysis of phenomenon 2

Question 1

Describe the distribution of the electric current at the contact point between the wire roll and the spoon. What promotes one path rather than the other?

Conclusion

In the case of our variable resistor, the nichrome roll is replaced with a carbon substrate and the spoon, by a rotary pad. Using letters, associate the resistor terminals to: its simplified drawing, its model and its symbol.