Electromagnetic Fields – Laboratory 03

#	Student ID	Student Name	Grade (10)	Instructor signature
1				
2				

Delivery Date	

Experiment 01: Relay

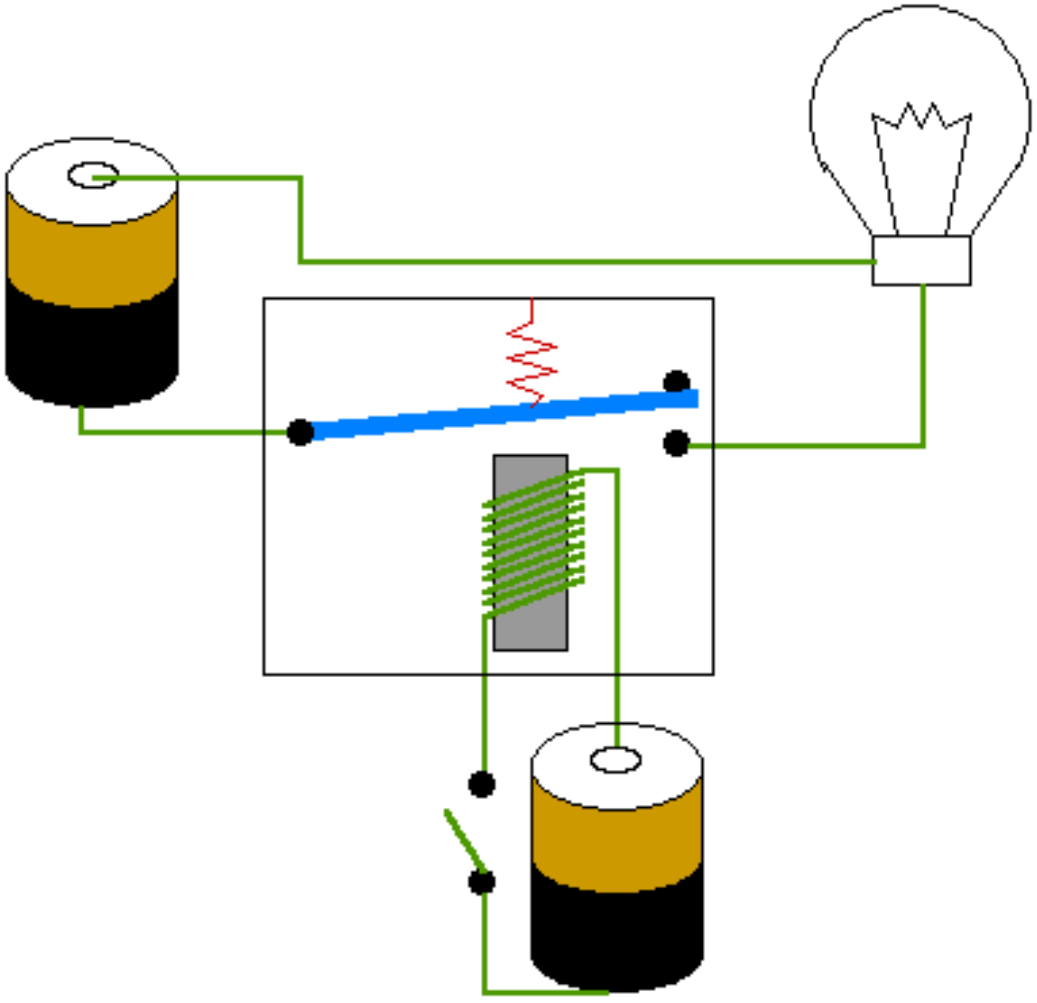
Objective

This model is intended to make it easier for students to understand how a relay operates.

Theory Overview

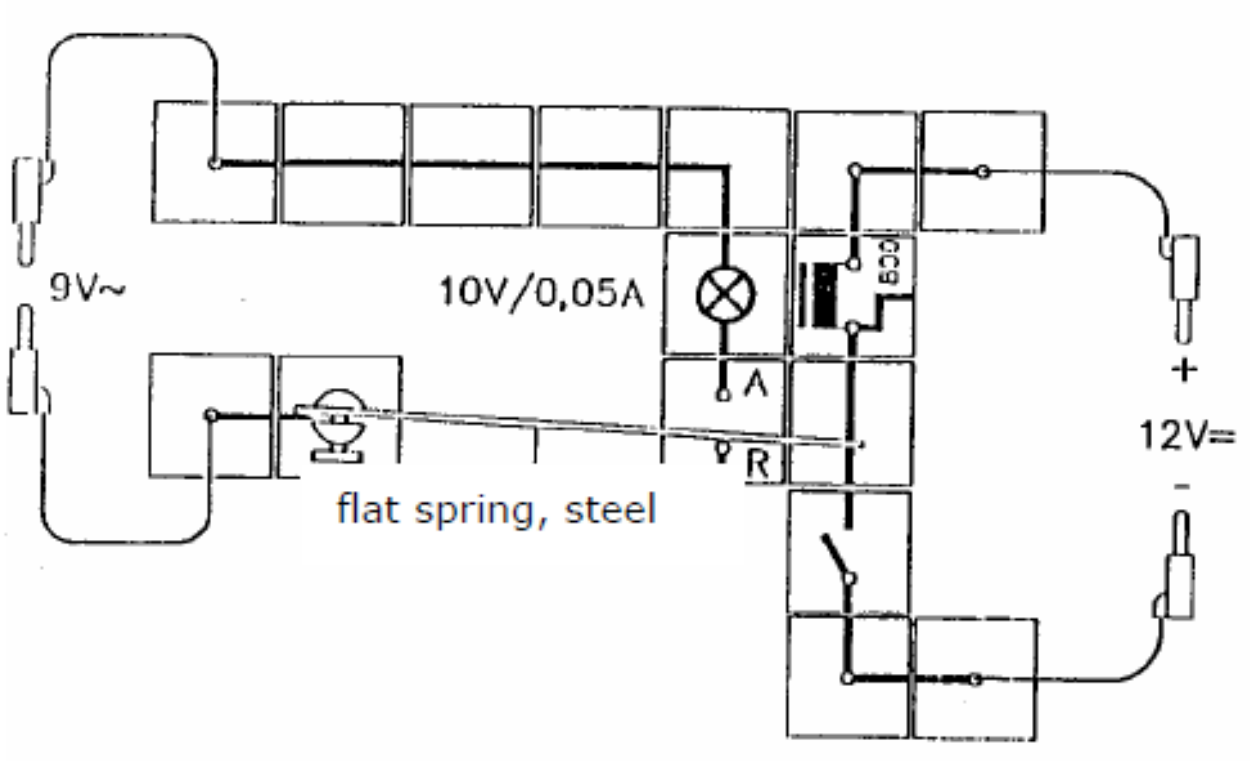
A relay is an automatic electric switch.
Switching one circuit causes one or more other circuits to be switched. A small current sent through the relay's coil makes the relay switch on (or switch off) a big current. Or a small current may make a different relay connect up several other circuits.

A relay hands a switching signal on from one circuit to another. That is why it is called a relay, after a relay race in which one runner hands the torch on to the next.
Relays were once found by the thousand in telephone exchanges. There are huge relays in a power station, and controlling relays in many factories with automated manufacturing systems. But these functions are increasingly performed by solid-state electronic devices.

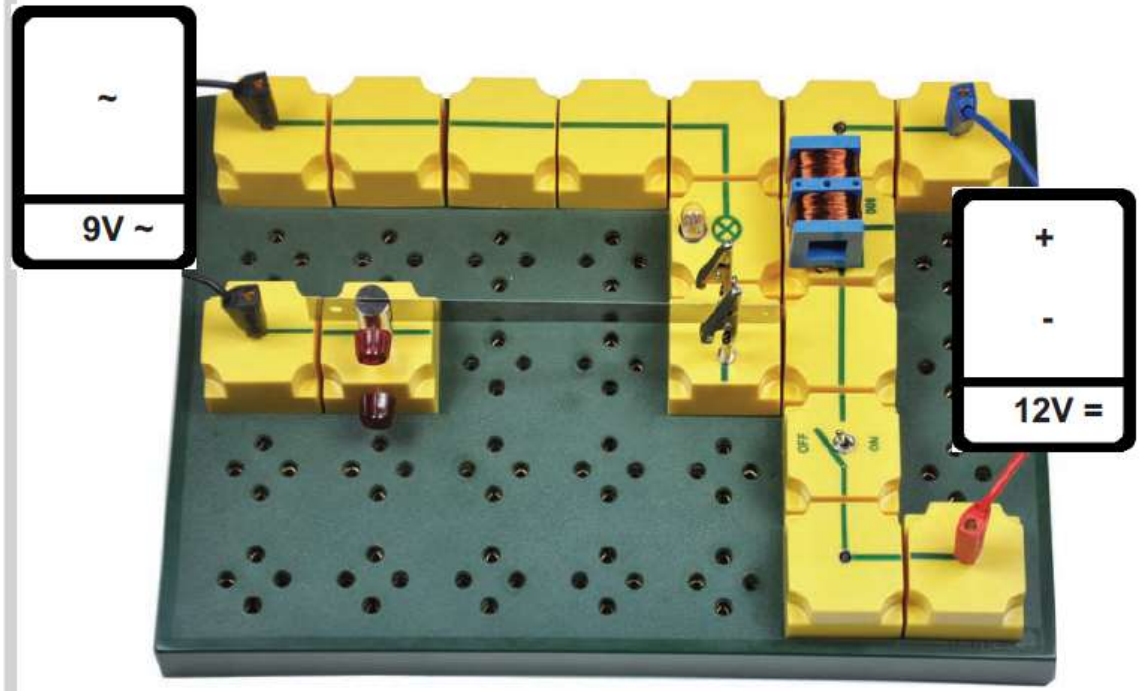


Procedure

Arrangement according to the illustration



Crocodile clips with plug pins are inserted in the PIB-lead interrupted.
The flat spring made of steel is clamped in the holder with slits and holes in such a way that it touches the crocodile clip R.
When 9 volts AC is applied the lamp does not glow, because the electrical circuit is not closed.
The coil with 800 turns is in the right, second circuit („pilot circuit").
The cylindrical iron core is inserted in the coil.
12 volts DC is applied to the circuit.



The switch is closed.
Thus the coil with the iron core becomes a magnet.
The flat spring is attracted by the iron core of the coil.
The lamp glows.

Questions and Conclusions

1. Inverse the voltage polarity that is applied to the coil. What will happen when you close the switch? Justify?

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2. Adjust the lamp circuit connection to bring it back to work? Draw the new layout?

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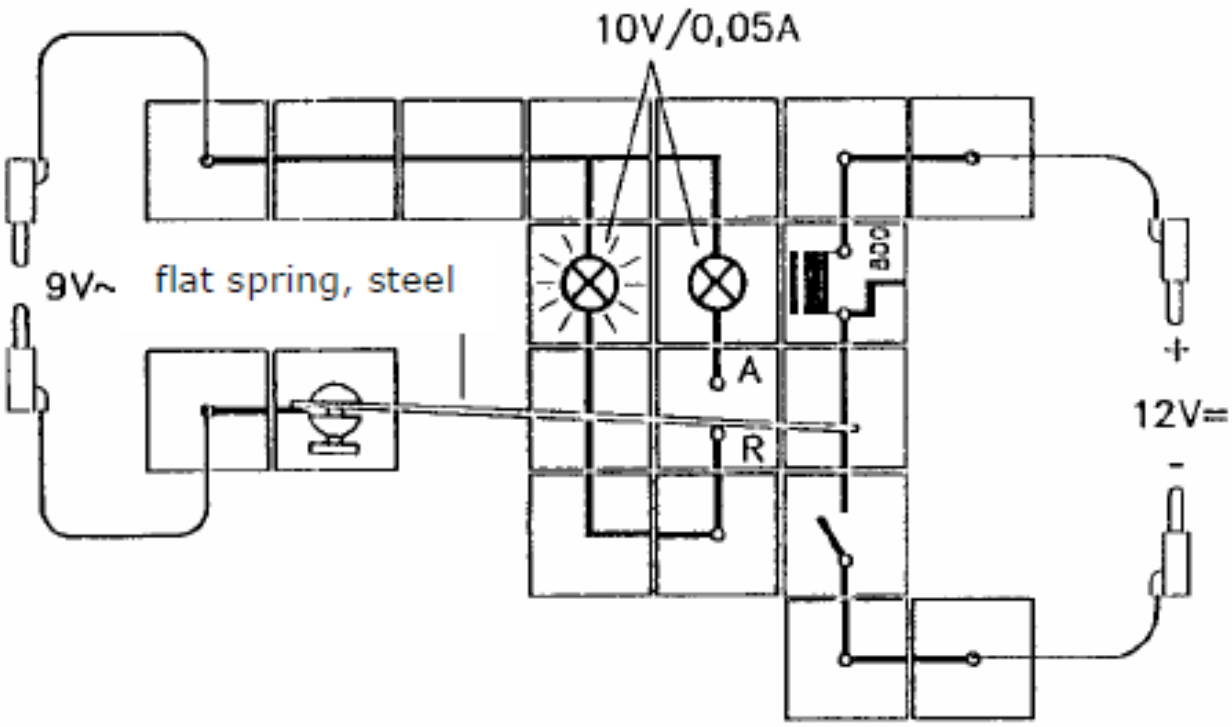
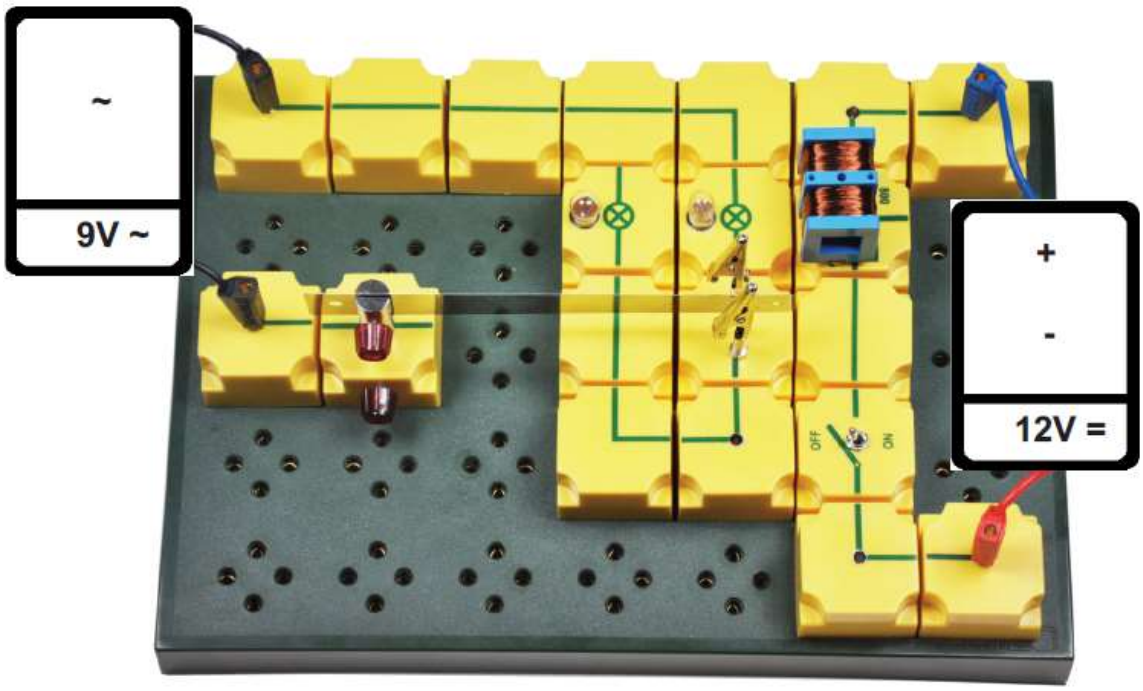
Experiment 02: Relay with operating point and normal contact

Procedure



Arrangement according to the illustration.
Crocodile clips with plug pins are inserted in the PIB-lead interrupted.
The flat spring made of steel is clamped in the holder with slit and hole in such a way that it touches the crocodile clip R.
When applying 9 volts AC the right lamp ought to glow.
The coil with 800 turns is in the right, second circuit (pilot circuit).
The cylindrical iron core is inserted in the coil.



12 volts DC is applied to the right circuit which contains the coil.
After closing the switch the flat spring is attracted by the iron core of the coil.
The right lamp goes out. The left lamp glows.

Questions and Conclusions

1. Inverse the voltage polarity that is applied to the coil. What will happen when you close the switch? Justify?

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2. Adjust the coil circuit connection to bring it back to work? Draw the new layout?

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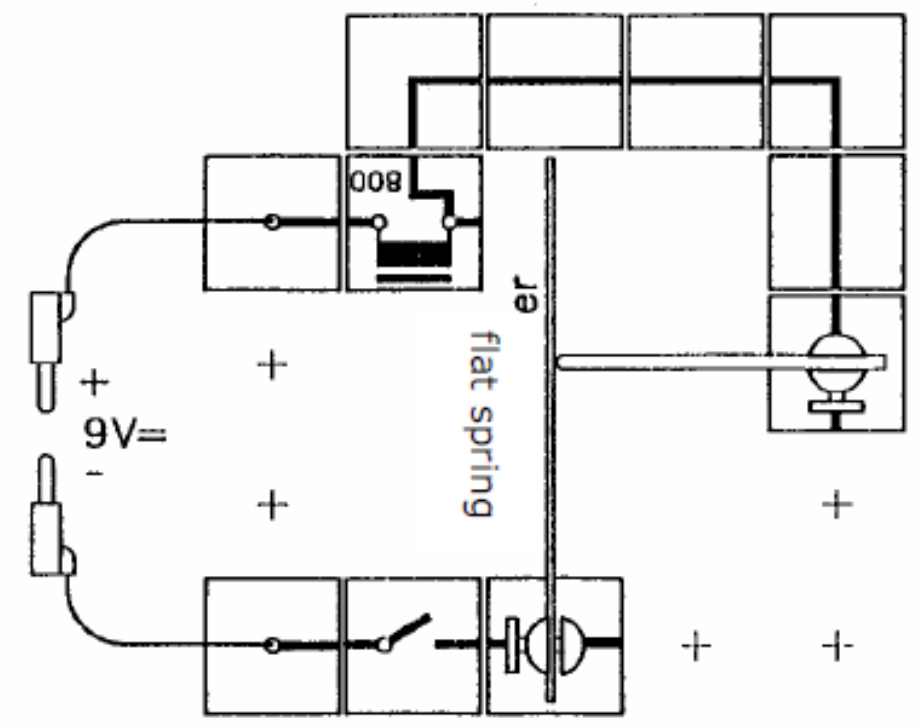
Experiment 03: Self-opening switches

Objective

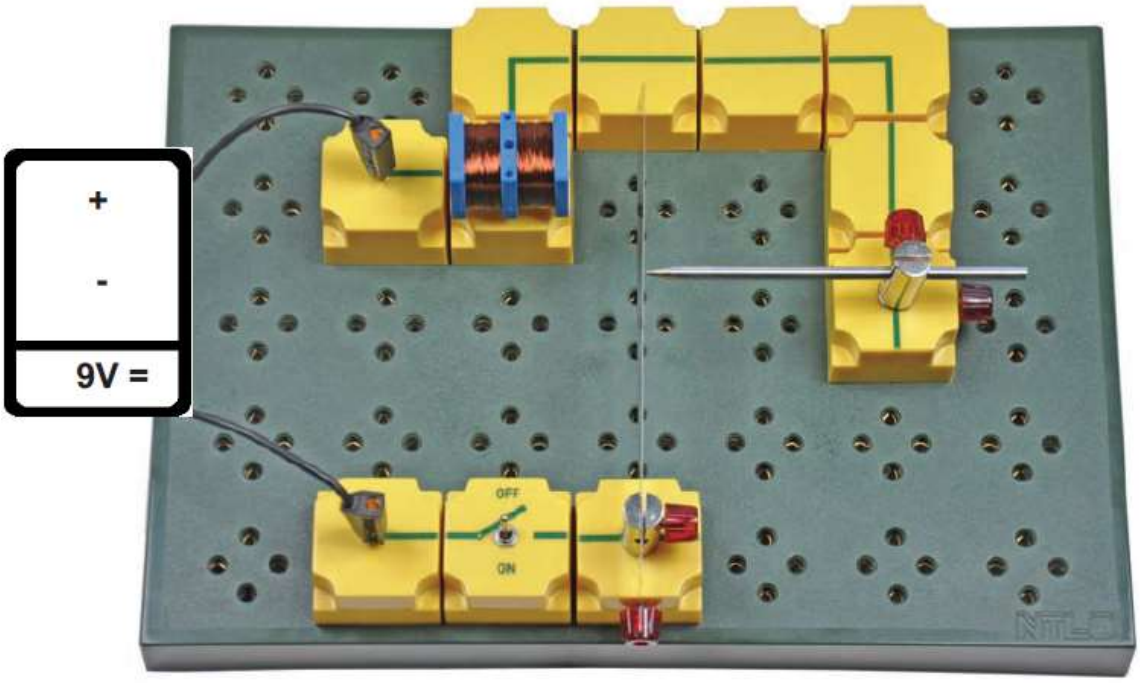
This model is intended to make it easier for students to understand how to make use of electromagnetic switch as a self-triggered switch.

Procedure



Arrangement according to the illustration.
The coil (with inserted iron core), the contact pin, the flat spring made of steel, and the switch are connected in series.
The flat spring ought to be placed about 7 mm from the iron core.
9 volts DC is applied.
The contact pin presses against the flat spring and the circuit is closed.

The switch is closed. The flat spring is attracted by the iron core of the coil.
Thus the circuit is opened.
The iron core releases the flat spring again, the circuit is closed again.
The flat spring vibrates.
It closes and opens the circuit again and again.
A crocodile clip with plug pin can be connected to the end of the flat spring for slowing down the vibrations of the flat spring.



Questions and Conclusions

1. Connect a 9V AC instead of 9 V DC to the coil. Describe what happens?

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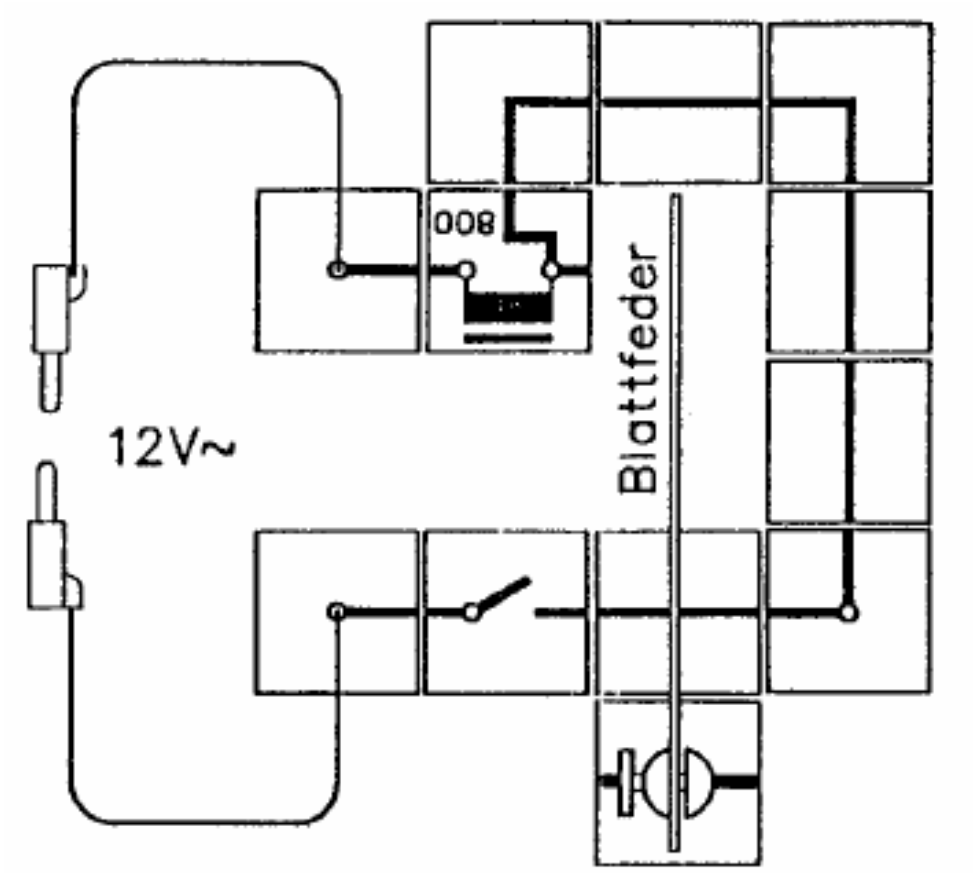
Experiment 04: AC Buzzer

Objective

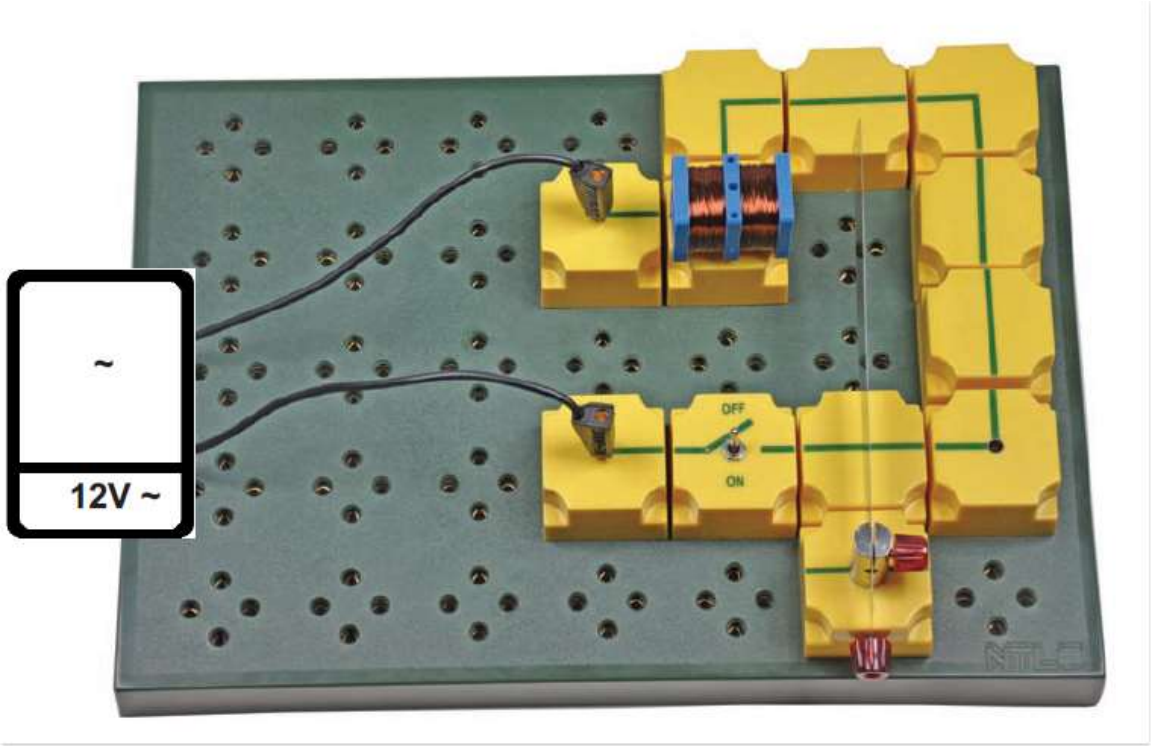
This model is intended to enable students to understand how to build AC buzzer using the concept of electromagnetic mechanical switch

Procedure



Arrangement according to the illustration.
The flat spring is not connected with the circuit.
It is placed about 8 - 10 mm in front of the cylindrical solid iron core which is inserted in the coil.
12 volts AC is applied.

The switch is closed.
The flat spring is attracted by the coil bearing current, but immediately released.
This process is repeated a hundred times per second according to the hundred alternations of the alternating current.
The flat spring produces a rattling sound.



Questions and Conclusions

1. Connect a 9V DC instead of 9 V AC to the coil. Describe what happens?

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2. What is the frequency of sound produced by the buzzer?

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