# Lecture-19

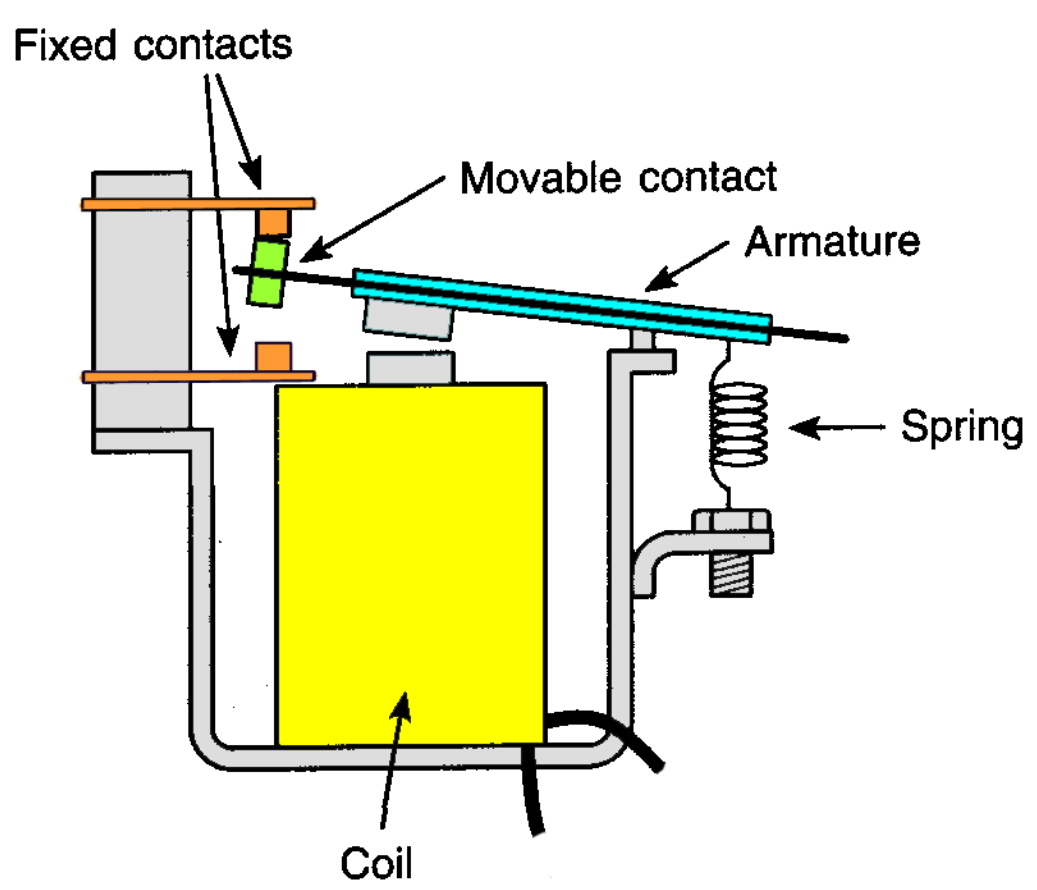
principal types of electromagnetic relays, distance relays, Buchholz relay

# Topic Covered

- Electromagnetic Relays
- Distance Protection
- Buchholz Relay

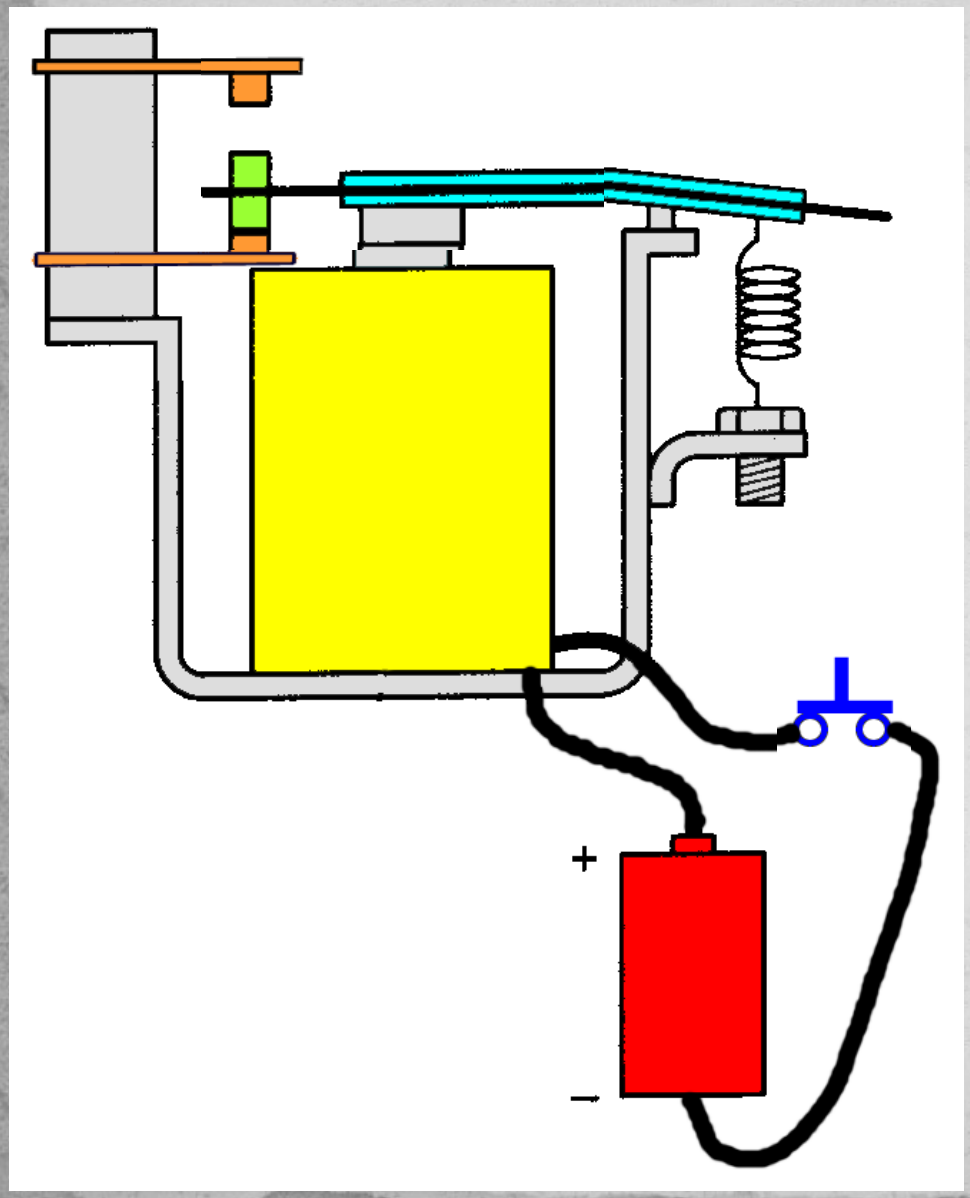
# Electromagnetic Relay Operation

**An electromagnetic relay is a magnetic switch. It uses electromagnetism to switch contacts.**




**A relay will usually have only one coil but may have any number of different contacts.**

# Electromagnetic Relay Operation

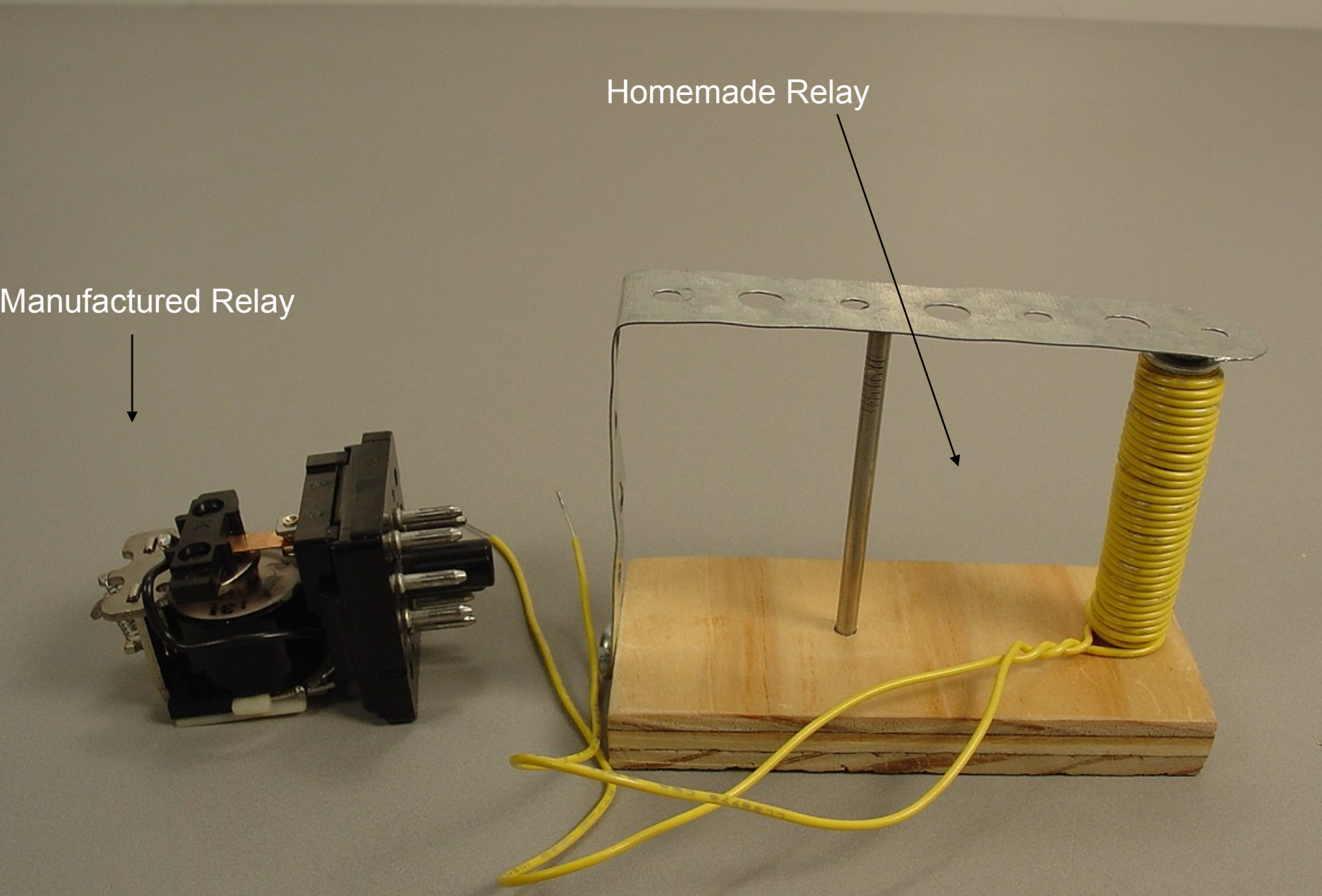



With no current flow through the coil (coil de-energized), the armature is held away from the core by spring tension.

When the coil is energized, the electromagnetic field moves the armature causing the contact points of the relay to open or close.

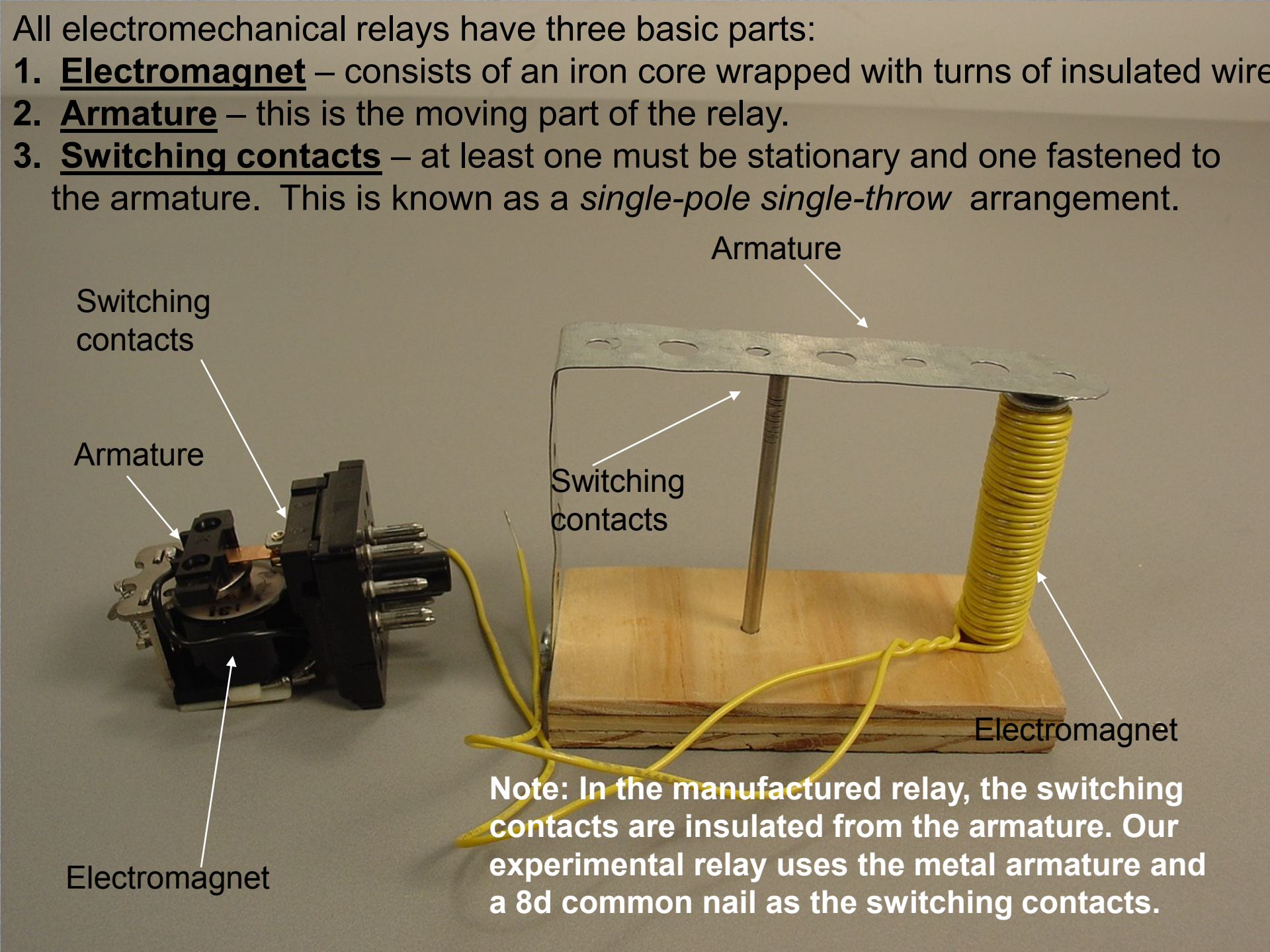
- In a microwave oven, the push of a few tiny buttons on the keypad gives commands to a microcontroller, which can produce only very small output voltages. Those small voltages turn on a relay, which is capable of controlling the large voltages and currents required to produce the heating effect that takes place.
- In a television, the tiny impulses from the hand-held remote unit control a relay in the power supply.

# Examples of Electromechanical Relays



All electromechanical relays have three basic parts:

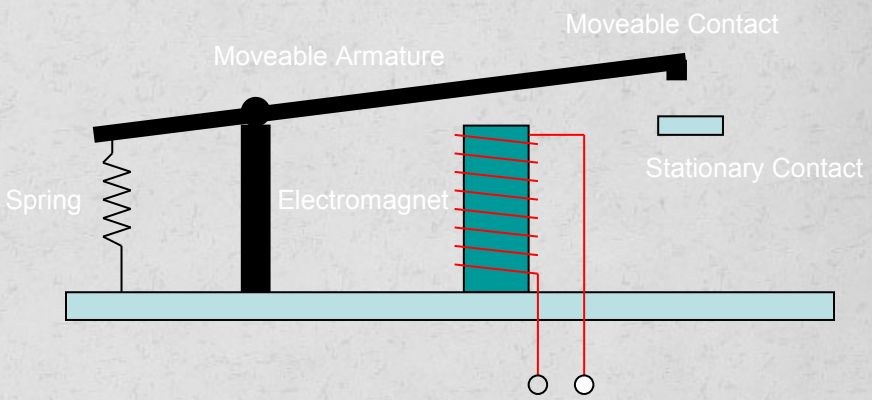
1. **Electromagnet** – consists of an iron core wrapped with turns of insulated wire
2. **Armature** – this is the moving part of the relay.
3. **Switching contacts** – at least one must be stationary and one fastened to the armature. This is known as a *single-pole single-throw* arrangement.




**Note: In the manufactured relay, the switching contacts are insulated from the armature. Our experimental relay uses the metal armature and a 8d common nail as the switching contacts.**

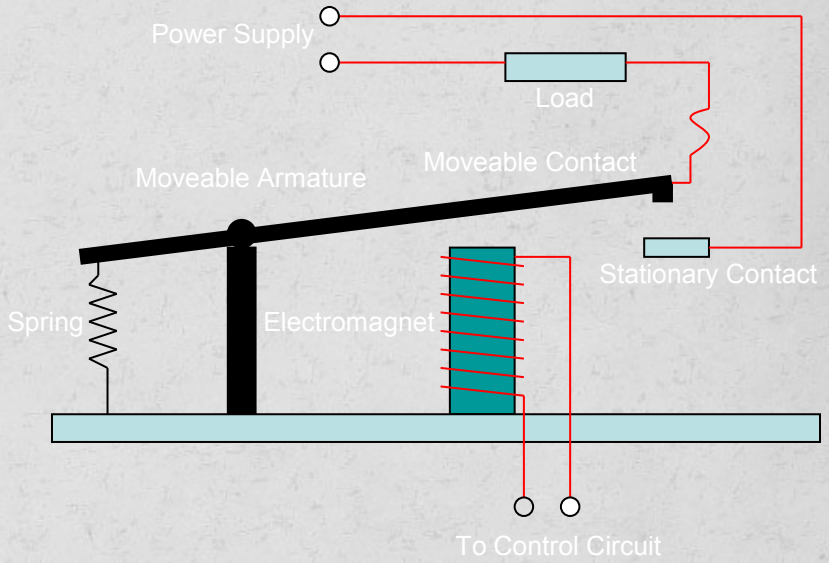
# Electromechanical Relays: What's Inside

This diagram shows the basic parts of an electromechanical relay: a spring, moveable armature, electromagnet, moveable contact, and stationary contact. The spring keeps the two contacts separated until the electromagnet is energized, pulling the two contacts together.



# Wiring Up an Electromechanical Relay

This diagram shows how to wire an electromechanical relay. When the control circuit turns the electromagnet on, the moveable armature is drawn towards the electromagnet and connects the moveable contact and the stationary contact. This completes the circuit and delivers power to the load.



# Applications of Electromechanical Relays

- Relays are used for:
- Amplifying a digital signal, switching a large amount of power with a small operating power. Some special cases are:
  - A telegraph relay, repeating a weak signal received at the end of a long wire
  - Controlling a high-voltage circuit with a low-voltage signal, as in some types of modems or audio amplifiers,
  - Controlling a high-current circuit with a low-current signal, as in the starter solenoid of an automobile,
- Detecting and isolating faults on transmission and distribution lines by opening and closing circuit breakers (protection relays),

# Distance Protection

- Whenever over-current relay is not selective or circuit requirements change, then distance protection is preferred.
- Problem with over current relaying is that fault current depends upon ckt condition and generating capacity.
- If these conditions changes, then overall protection needs to be changed.

# Buchholz Relay

- Gas actuated relay immersed installed in oil immersed transformer for protection against all kinds of faults.
- In the field of electric power distribution and transmission, a **Buchholz relay** is a safety device mounted on some oil-filled power transformers and reactors, equipped with an external overhead oil reservoir called a *conservator*.
- The Buchholz Relay is used as a protective device sensitive to the effects of dielectric failure inside the equipment.