Magnetic Effect of Current

Introduction

Electric current can produce a magnetic field, which was first observed by the Danish physicist Hans Christian Oersted in 1820. He discovered that a current-carrying wire deflects a nearby magnetic compass, demonstrating the magnetic effect of electric current. This principle is the foundation of electromagnetism and has numerous applications in modern technology.

Electromagnets

The experiment above highlights that electric current has a magnetic effect. This effect can be used to convert soft iron into a temporary magnet by winding a coil of wire around it and passing an electric current. Such a magnet is known as an electromagnet.

Uses of Electromagnets

Electromagnets play a crucial role in various applications. Some important uses include:

i. **Electric Motors:** Used in devices like fans, mixers, and washing machines.

ii. **Industrial Cranes:** Used to lift heavy loads such as steel girders and scrap iron.

iii. **Metal Sorting:** Used in junkyards to separate iron and steel from other metals.

iv. **Medical Applications:** Doctors use electromagnets to remove tiny iron particles from a person's eye.

v. **Communication Devices:** Used in electric bells, telegraphs, telephones, loudspeakers, and microphones.

Working of an Electric Bell

An electric bell operates using an electromagnet and consists of several components:

- Battery (power source)
- Switch (to control the circuit)
- Electromagnet (to create a magnetic field)
- Soft iron armature (movable part attracted by the electromagnet)
- Spring (returns the armature to its original position)
- Gong & Hammer (produces sound)

Working Mechanism:

i. When the switch is turned ON, current flows through the circuit, energizing the electromagnet.

ii. The electromagnet attracts the soft iron armature, causing the hammer to strike the gong and produce sound.

iii. As the armature moves, the circuit breaks, stopping the current flow and deactivating the electromagnet.

iv. The armature returns to its original position due to the spring, re-establishing the circuit.

v. The cycle repeats, producing a continuous ringing sound.

Key Terms and Definitions

Magnetic Field: The region around a magnet where magnetic forces are observed.

Soft Iron Armature: A piece of soft iron used in electromagnets to focus the magnetic field efficiently.

Electromagnet: A temporary magnet created by passing electric current through a coil wound around a core (usually iron).

Summary

- Electric current produces a magnetic field, as discovered by Hans Christian Oersted.
- A current-carrying wire can deflect a magnetic compass needle, demonstrating the magnetic effect of current.
- Electromagnets are created by winding a wire around an iron core and passing an electric current through it.
- The strength of an electromagnet depends on the number of wire turns and the amount of current.
- Electromagnets are widely used in industrial applications, medical fields, and household devices.
- The electric bell functions using an electromagnet that repeatedly attracts and releases a soft iron armature to produce sound.