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Electromagnetic Coils- an important electrical device by James Blee

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An electromagnet, also referred as inductor, is a magnet in which flow of electric current produces the magnetic field. In 1820, Danish scientist Hans Christian Orsted discovered that electric current creates a magnetic field around the conductor. In 1824, British scientist William Sturgeon invented electromagnet. A magnetic field around a straight wire is not so strong. A strong magnetic field is produced by coiling the wire around a piece of soft iron. Soft iron is used because it is a ferromagnetic material. Ferromagnetic materials have a high magnetic permeability which causes significant increase in magnetic field. Electromagnetic coils are formed by wounding a conductor around a core spirally. Insulated copper wires are mostly used as conductor.

The advantage of using electromagnet over permanent magnet is that the produced magnetic field can be controlled by changing several factors, albeit a continuous electric supply is required. The intensity of the magnetic field produced by electromagnetic coils depends on three factors, viz. the number of turns within the coil, amount of current flowing in the coil and material of the core. Though a ferromagnetic core can induce a strong magnetic field, its capability is limited to 1.6 Tesla. When a higher magnetic field is required, superconducting electromagnets are used. In this type of magnets, superconducting windings cooled with liquid helium is used. In the system, current is conducted without electrical resistance causing huge current flow and generating enormous magnetic field. From designing a small electric or electronic device like calling bell to giant players like salvage crane, electromagnetic coils are used. These coils are also an important part of sophisticated instruments like particle accelerator which propels subatomic particles from an atom. Other common devices with these coils are speakers, CRT monitors and TVs, analog meters, direct current motors, transformers etc.

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James Blee - About Author:
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