PHY-110 ENGINEERING PHYSICS PROJECT

- TOPIC -

  MAGNETIC SWITCHES AND ITS WORKING AND COMPARED IT WITH MECHANICAL SWITCHES

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What is switch ?

A Switch could be gadget which is planned to hinder the current stream in a circuit. In straightforward words, a Switch can make or break an electrical circuit. Each electrical and gadget application employment at slightest one switch to perform ON and OFF operation of the device.

So, switches are a portion of the control framework and without it, control operation cannot be accomplished.A switch can perform two capacities , to be specific completely ON (by closing its contacts) or completely OFF (by opening its contacts).

MAGNETIC SWITCHES

An electrical switch that's utilized to create or break contact inside a magnetic field is known as a magnetic switch. ,more often then not, the magnetic switch work is to remain actutated in case a solid magnetic field is there adequately & deactivated once the magnetic field is removed. Magnet switch is utilized where moving elements isn't conceivable or not alluring to form coordinate contact through the switch like in unsteady situations,submerged inside fluids,etc.

These switches are encased in glass fabric for keeping up the keenness of the magnetic field & components. So this fabric too secures the switch from outside conditions. When selecting or planning a switch, it is fundamental to consider these parameters like sort of application, control prerequisities, circuitry magnetic affectability, and working environment.

Reed Switches

Hall Effect Switches

Proximity Switches

Magnetic Latching

Types of Magnetic Switches

- Reed Switches
- Hall Effect Switches
- Magnetic Proximity Switches
- Magnetic Latching Switches
- Magnetic Sensors with Variable Outputs

- **Reed Switches:** These consist of two ferromagnetic, flexible metal reeds encapsulated in a glass tube. When a magnetic field is applied, the reeds come in touch, finishing the circuit. When the magnetic field is removed, they return to their original position, breaking the circuit. Reed switches are used in applications like sensors, proximity detectors, and security systems.
- **Hall Effect Switches:** These switches use the Hall Effect—a phenomenon where a voltage difference is produced across a conductor when subjected to a magnetic field perpendicular to the current flow. Hall Effect switches detect the presence or absence of a magnetic field and produce a digital output, making them useful in automotive applications, industrial settings, and electronic devices.
- **Magnetic Proximity Switches:** These switches operate based on the proximity of a magnetic field. They're commonly used in automation and control systems to detect the presence or absence of nearby objects. They come in different forms, such as reed-based proximity switches and solid-state Hall Effect sensors.

- **Magnetic Latching Switches:** These switches have two stable states and require a magnetic field of a particular polarity to change between those states. They retain their state even after the magnetic field is removed, making them suitable for applications requiring power-efficient operation or memory functions.
- **Magnetic Sensors with Variable Outputs:** Some magnetic switches provide variable output signals based on the strength of the magnetic field detected. These sensors can measure changes in magnetic fields and are used in applications like automotive speed sensors, rotation sensing, and position detection.

➢ Each type of magnetic switch has its advantages and specific use cases. The choice of switch depends on factors like sensitivity, power consumption, environmental conditions, and the desired application.

MECHANICAL SWITCHES

- Mechanical switches are physical switches characterized by their individual actuation mechanisms, offering a tangible and often customizable typing or actuation experience. They are commonly used in keyboards for both typing and gaming due to their distinct tactile feedback, durability, and responsiveness.

Types of Mechanical Switches

- Clicky Switches
- Tactile Switches
- Linear Switches
- Hybrid Switches
- Low-Profile Switches
- Custom or Specialty Switches

- **Clicky Switches:** These switches provide both tactile feedback and an audible click when actuated. They have a noticeable bump in the middle of the keypress, signaling that the input has been registered. Examples include the Cherry MX Blue switches.

- **Tactile Switches:** Tactile switches offer a noticeable bump during actuation but without the audible click. They provide tactile feedback without the noise, making them a good option for those who want feedback without the sound. Cherry MX Brown switches come into this group.

- **Linear Switches:** Linear switches have a smooth keystroke without any tactile bump or audible click. They provide a consistent and uninterrupted keystroke, making them popular among gamers and typists who prefer a smooth feel. Examples include Cherry MX Red and Black switches

- **Low-Profile Switches:** These switches have a shorter actuation distance and are designed to be thinner, making them suitable for slim keyboards and devices where space is limited. They often come in clicky, tactile, or linear variations.

- **Custom or Specialty Switches:** Beyond the mainstream switches, there's a growing market for custom or specialty switches made by various manufacturers. These switches might offer unique characteristics in terms of actuation force, sound, or tactile feedback, catering to niche preferences.

- Each type of mechanical switch has its own feel and characteristics, influencing the typing experience based on individual preferences for gaming, typing comfort, noise levels, and the intended use of the keyboard or device.

Difference between Magnetic Switches and Mechanical Switches

Aspect	Magnetic Switches	Mechanical Switches
Operation	Use magnetic fields to make or break contacts	Use physical actuation (pressing keys/buttons)
Actuation Type	Non-contact actuation	Contact-based actuation
Durability	Generally more durable due to no physical wear	Durability depends on mechanical parts
Lifespan	Typically longer lifespan	Lifespan can vary based on usage and quality
Response Time	Generally faster response time	Slightly slower due to physical actuation
Noise Level	Often quieter	Can produce audible clicking or clacking
Complexity	May be simpler in design	Often more complex due to moving parts
Usage	Common in environments sensitive to debris	Popular in gaming, typing, and various devices
Examples	Reed switches, Hall effect switches	Cherry MX, Razer, and other mechanical brands

Thank You!