Module - 2

ELECTRICAL CONTROL SYSTEM COMPONENTS

Lecture - 1

MECHANICAL SWITCHES

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Module 2 - Objectives

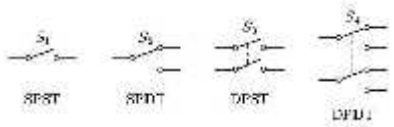
- State the functions of control system components
  - switches,
  - relays,
  - circuit breakers
  - Contactors
  - Etc..
- Describe the principles of operation of different types of manual and automatic motor starters.

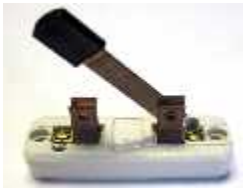
Switches

- A switch is an electrical control device which is used to make, break or change the connections in an electric circuit.
- At the instant of breaking or changing connections it should break the current, so that there is no formation of an arc between the switch blades and contact terminals.
- Types:
  - Knife Switch
  - Disconnecting Switches
  - Push button Switch
    - Industrial Switch
    - Selector Switches
  - Master Switches

Knife Switch …

- A knife switch consists of blades hinged at one end and are arranged to go into forked terminals or jaws at the other end.
- fixed over an insulating board or on switch board panel.
- Two types:
  - Single throw switch
  - Double throw switch

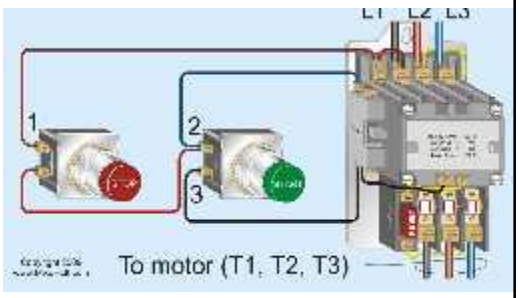


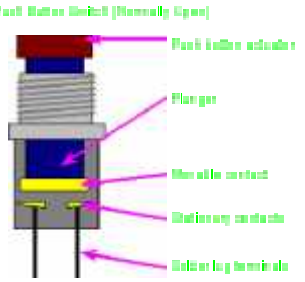


Disconnecting switches

- Disconnecting switch isolates the motor circuit from the power source.
- It consists of three knife switches and three line fuses enclosed in a metallic box.
- An external handle is provided to open and close all three switches simultaneously.
- An interlocking mechanism prevents the hinged cover from opening when switch is closed.
- These switches are designed to carry full load current indefinitely and to withstand short circuit currents for short period of time.

Push Button Station





Push Button ….

- A push button is a switch activated by finger pressure.
- Push buttons are usually spring loaded so as to return to their normal position when pressure is removed
- A pushbutton station is a device that can provide complete control of a motor with the pressing of the appropriate pushbutton.
- The start, forward, reverse, fast, slow, and stop operations of a motor may be controlled by pushbuttons.

Push Button - classification

- Based on contact current capacity
  - Standard Duty

    3.0 Amperes, 120 Volts
    1.5 Amperes, 240 Volts
    0.75 Ampere, 480 Volts
    0.6 Ampere, 600 Volts
  - Heavy Duty

A-C	D-C
6 Amps, 120 Volts	1.1 Amps, 115 Volts
3 Amps, 240 Volts	0.55 Amp, 230 Volts
1.5 Amps, 480 Volts	0.2 Amp, 550 Volts
1.2 Amps, 600 Volts	

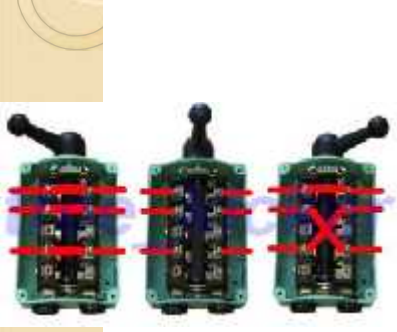
- Based on Enclosure
  - heavy-duty oil tight
  - Multi light-control oil tight

Heavy-Duty Pushbuttons

- Heavy-duty pushbutton stations are found in many industrial applications.
- They have approximately twice the current rating of the standard-duty station.
- They come with any combination of pushbuttons, selector switches, jogging buttons, and pilot lights.
- Pushbuttons are available with flush, extended, or mushroom heads.
- They may have either momentary or maintained contacts.

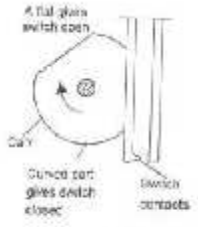
Master Switches - drum and cam types

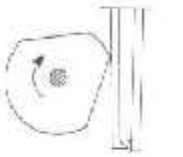
- Drum Switch
- Designed to be operated manually by rotating a lever
- a drum switch is constructed to open and close contacts on segments or surfaces on the periphery of a rotating cylinder or selector
- They are made in a variety of ways,
  - with few or many contacts,
  - for non reversing or reversing service,
  - for use in d-c or a-c circuits
- As the drum is rotated, segments and contact fingers touch at various designated positions to establish conducting paths to electrical devices.

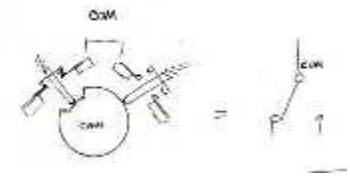


Cam Switch

- electrical contacts are opened and/or closed by a mechanical action of a group of cams







Master switch - Advantages

- useful in control systems, where numerous functions such as acceleration, deceleration, reversing, braking, speed adjustment, and others must be provided.
- capable of withstanding considerable abuse.
- Excellent arc-blowout protection and heat-resisting insulation
- heavy contact pressure - to prevent contact burning and poor electrical continuity.
- can be arranged with a multiple contacts which can be opened and closed to perform almost any desired sequencing and timing operations.
- readily adapted to the most complicated circuits

Next Lecture

Circuit Breakers

Thank You