

Module – 2

CONTROL SYSTEM COMPONENTS

Lecture - 5

Motor Starter Pilot Devices

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TYPES OF MOTOR STARTERS

- A motor starters in its simplest form consists of some means of connecting and disconnecting the motor loads from the power line plus overload protection of the motor.
- Two types
 - Manual
 - Automatic

Manual Motor Starter

- depend upon the operator closing the line contacts by pushing a button or moving a lever which is physically linked to contacts in some manner.
- The chief disadvantage is the lack of flexibility of control
- must be operated from the starter location
- Three types for ac motor
 - Thermal switch - for very small single-phase motors
 - size 0 / size 1 manual across the line – for 1 and 3 phase IM
 - manual reduced-voltage starter - for large motors
- For dc motors :
 - **Three terminal starters**
 - **Four terminal starters**

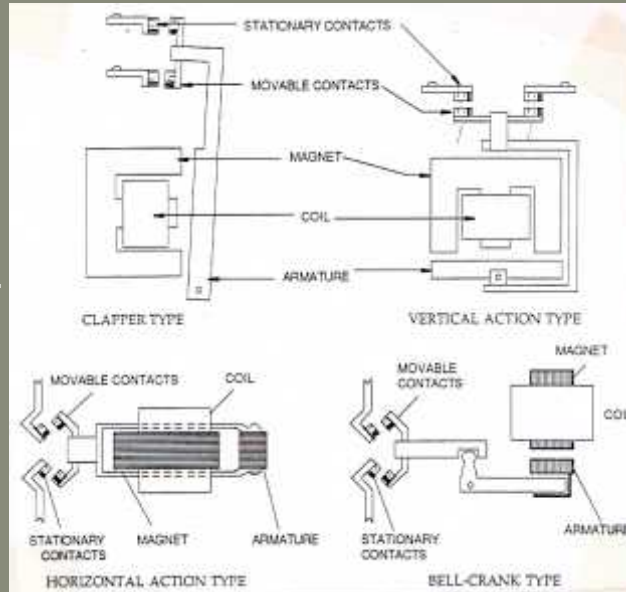


Automatic Motor Starter

- also known as **magnetic starter**
- operate motors from a remote location or to operate motors automatically in response to a signal from a thermostat, a pressure float switch, a limit switch or other sensing devices
- consists of a magnetic contactor with the addition of over load protection
- Advantages:
 - unlimited control flexibility
 - dependable
 - long life
 - reasonable maintenance

Types of Automatic Starters

- clapper type,
- vertical type,
- horizontal type,
- bell-crank type.

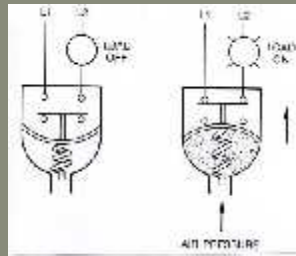


PILOT DEVICES

- A primary control device is one which connects the load to the line, such as a motor starter, whether it is manual or automatic
- **Pilot control devices are those which control or modulate the primary control devices.**
- There may be many pilot devices used in parallel and series combinations to control the function of start and stop performed by the primary control device.
 - **Push Buttons**
 - **Pressure Switches and Regulators**
 - **Float Switches**
 - **Flow Switches**
 - **Limit Switches**
 - **Proximity Switches**
 - **Temperature Switches**

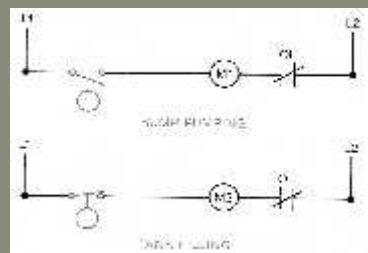
Pressure Switches and Regulators

- Any industrial application which has a pressure sensing requirement can use a pressure switch
- welding equipment, machine tools, high pressure lubricating systems, and motor-driven pumps and air compressors
- Pressure regulators provide accurate control of pressure or vacuum conditions for systems.
- used as pilot control devices with magnetic starters,
- to control liquid pump or air compressor motors



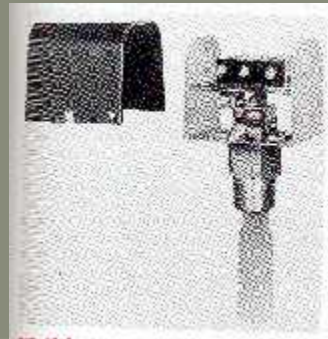
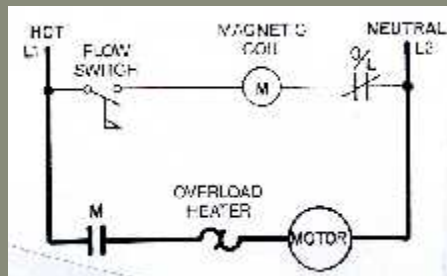
Float Switches

- A float switch is used when a pump motor must be started and stopped according to changes in the water (or other liquid) level in a tank or sump.
- The operation of a float switch is controlled by the upward or downward movement of a float placed in a water tank



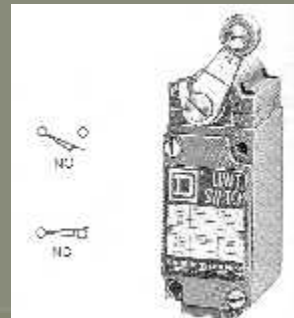
Flow Switches

- A flow switch is a device which can be inserted in a pipe so that when liquid or air flows against a part of the device called a paddle, a switch is activated
- This switch either closes or opens a set of electrical contacts.
- The contacts may be connected to energize motor starter coils, relays, or indicating lights.



Limit Switches

- The limit switch is used to convert this mechanical motion into an electrical signal to switch circuits
- operation of a limit switch begins when the moving machine or moving part of a machine strikes an operating lever which actuates the switch.
- used as pilot devices in the control circuits of magnetic starters to start, stop, speed up, slow down or reverse electric motors



Proximity Switches

- Can be switched by a nearby or passing object
- No physical contact is necessary
- **Types**
 - **Capacity Proximity Sensor**
 - designed to detect both metallic and nonmetallic targets.
 - **Solid-State Proximity Switches**
 - **Inductive Proximity Sensors**
 - designed to detect the presence of all metals without making contact.
 - operates on the eddy current principle
 - Used
 - to detect metal objects through nonmetal barriers
 - where metal objects must be differentiated from nonmetal objects
 - for counting

- **Temperature Switches**
 - designed to provide automatic control of temperature regulating equipment.
 - used to control circuits in order to operate heaters, blowers, fans, solenoid valves, pumps, and other devices
- **Solid-State Temperature Control Systems**
 - designed with three high-accuracy thermistor temperature sensors.
 - sensors transmit the internal coil temperatures to a microprocessor (minicomputer)
 - The temperature will be displayed in degrees on the front panel of the control module
 - The processor will give the signal to switch the contacts.
 - can be used to protect three-phase transformer coils from overheating.



Thank You