Lecture-21

mho, reactance,Impedance Relays

Topic Covered

- Distance protection

- Impedance relay

- Directional impedance relay

- Mho relay

- Reactance relay

Distance protection

➤Distance protection is based on principle that impedance of a line remains almost constant at normal conditions.

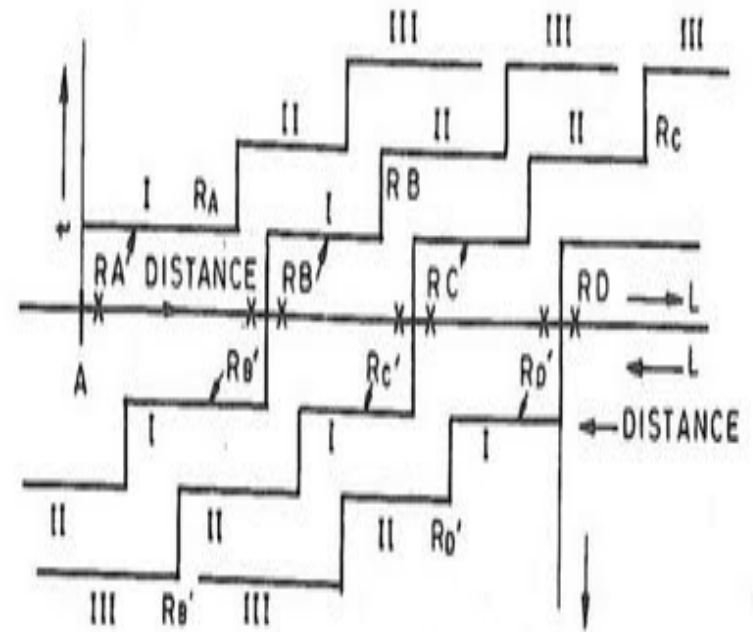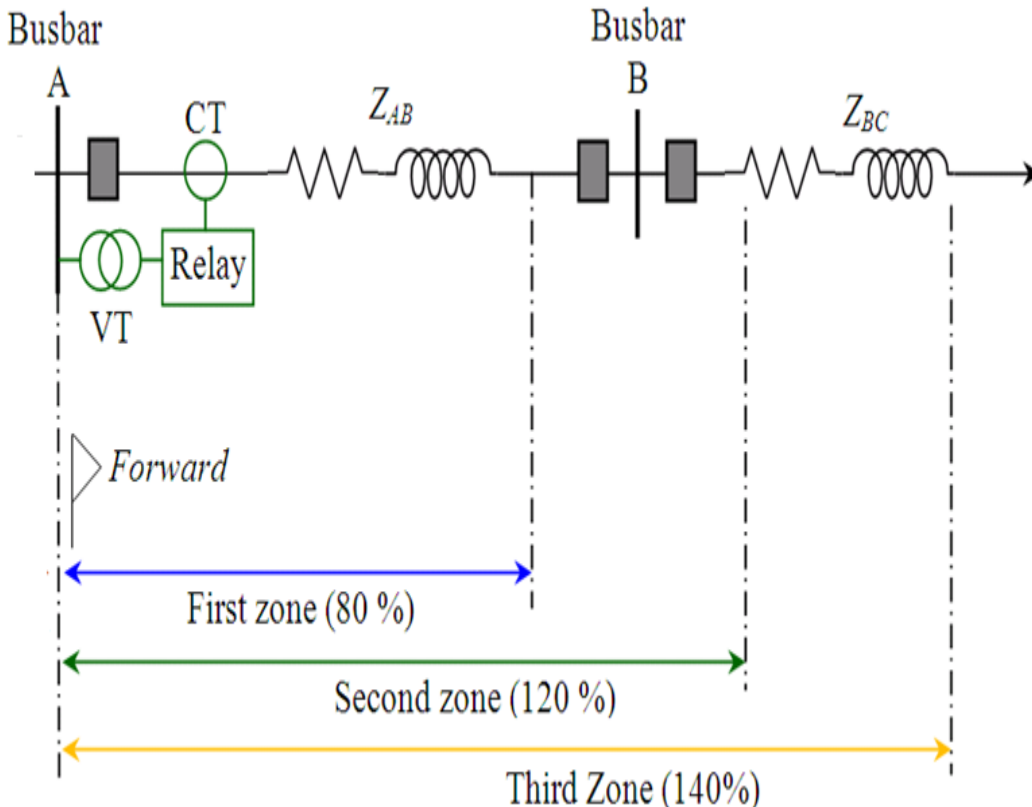➤The relay measures the impedance by voltage and current ratio at relay point and operates based on setting value .

Fig. .16. Co-ordination of 3-step time characteristics at Station A, B, C for forward and opposite directions.
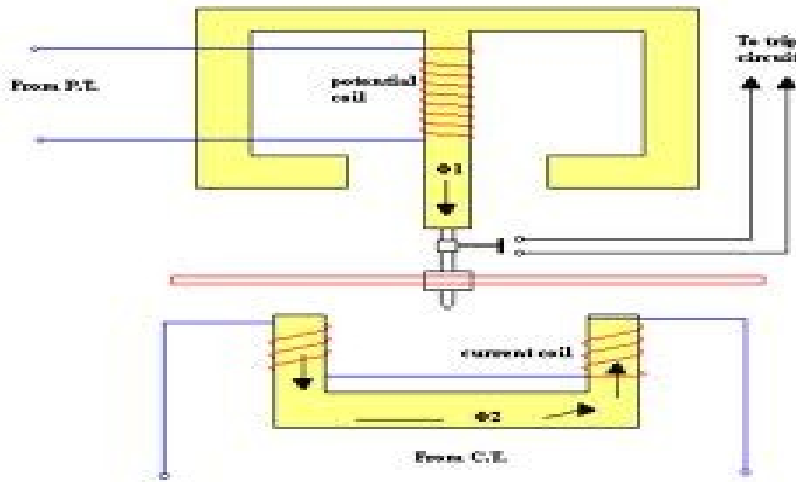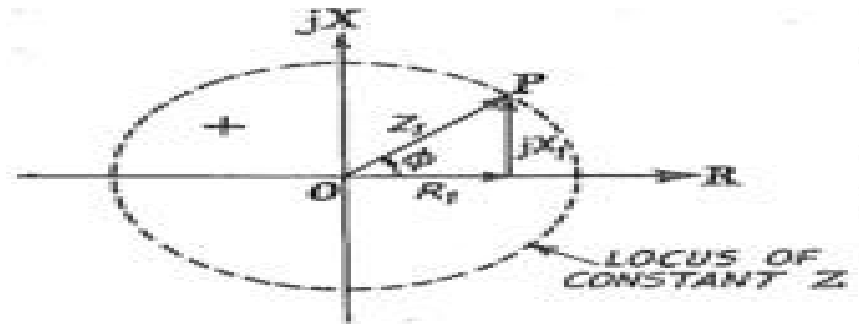
Impedance relay

Fig: induction disc type relay

Fig: characteristics of impedance relay

➢It is a voltage restrained over current relay.

➢It measures the voltage to current ratio of faulty path and operates based on impedance value.

➢So the locus of impedance is obtained as a circle on R-X diagram.

Reach:

➤ Reach is the distance of the tr. line up to which the distance relay protects the line from the faults.
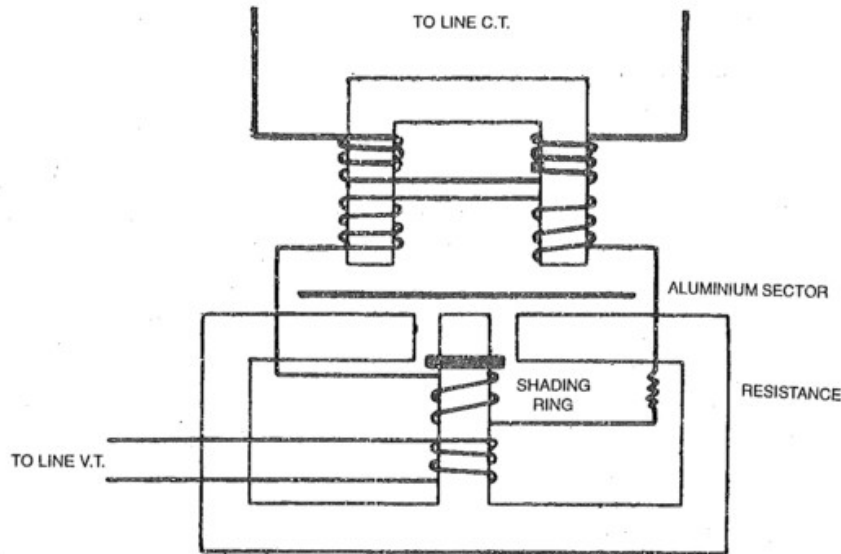
over reach

➤ Relay measured impedance less than the actual fault Impedance. i.e effective reach of the relay increases

Under reach

➤ Relay measured impedance is more than actual impedance. i.e. Effective reach of the relay decreases

Directional impedance relay

Fig: induction disc type relay

Fig: directional impedance relay characteristics

➢Here directional element is added to impedance relay to form directional impedance relay.
➢The operational characteristics is obtained as shown in figure.

Mho relay

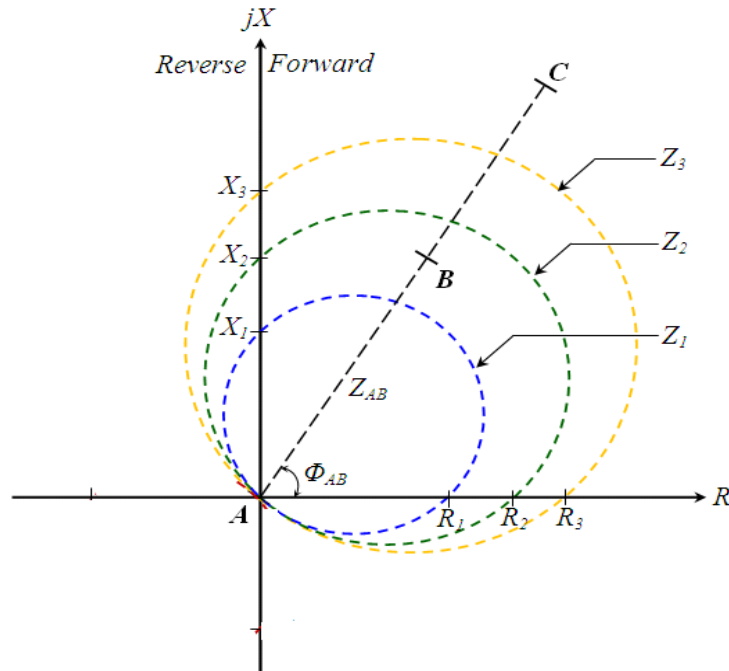Fig: characteristics of mho relay

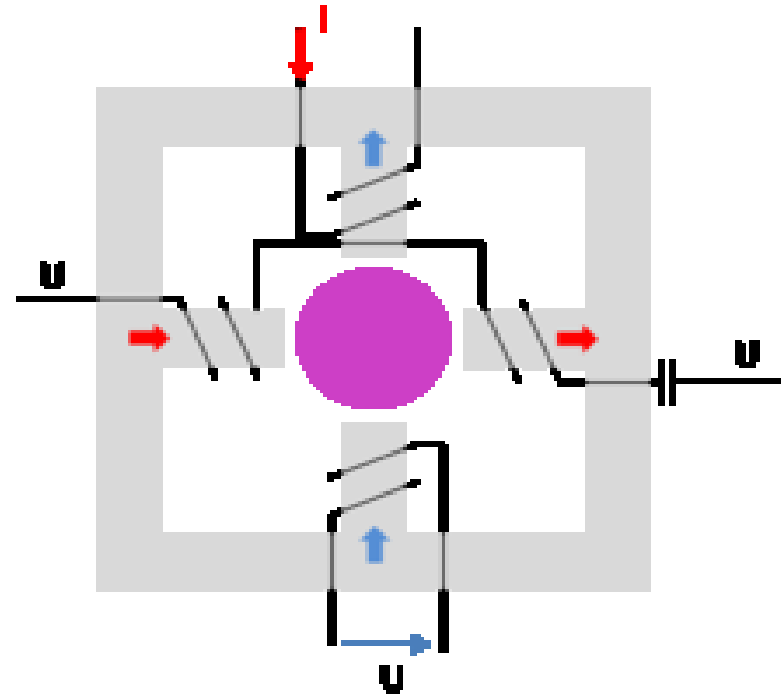
Fig: induction cup type relay

➢Mho relays are used in long transmission lines as they are very fast. Operating characteristics are as shown in figure.

Reactance relay

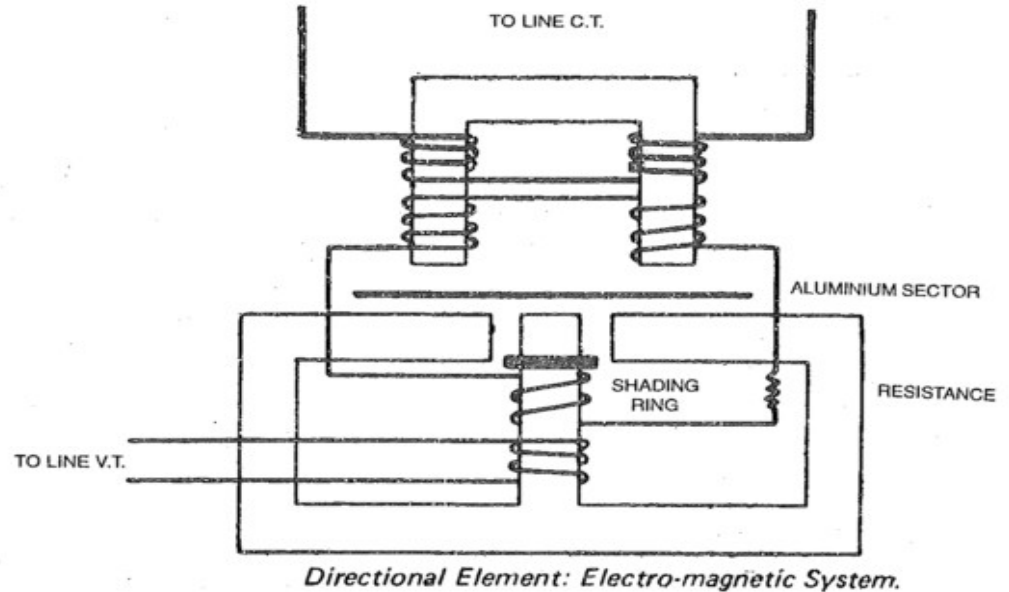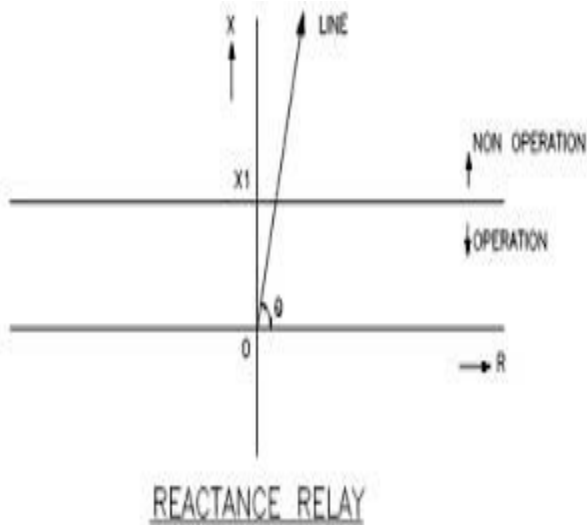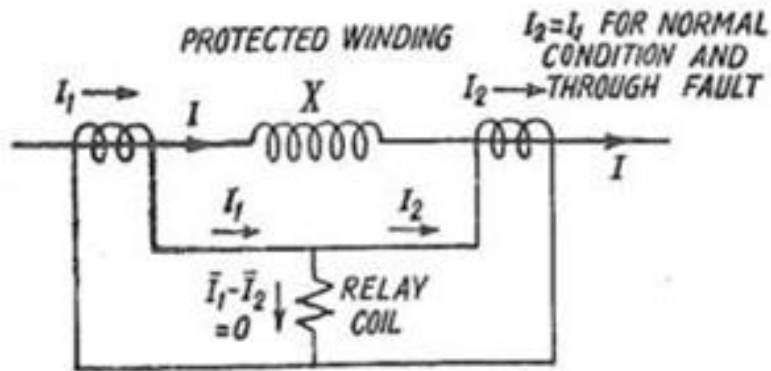fig: operating characteristics of reactance relay   Fig: basic diagram of reactance relay

➢Operating torque is produced by current and restraining torque by both sine component of current and voltage.

➢Characteristics of reactance relay is shown in figure.

Non unit type protection

Differential protection:

For Through Fault
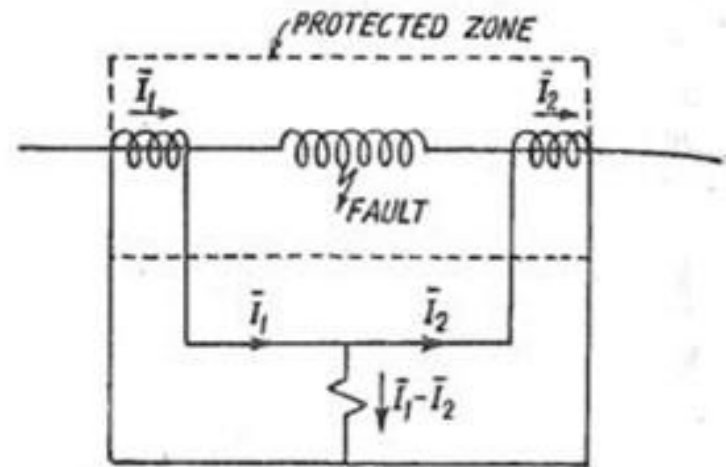Fig. 1 (a). Principle of circulating current relay of generators, transformers.

Fig. 1 (b). Internal Fault : $I_1 - I_2 \neq 0$.

➤It is based on the principle that under normal operating conditions the incoming current is equal to outgoing current through any equipment.

➤It requires two operational quantities of similar type to operate.

Difficulties:

➢ Difference in the length of pilot wires

➢ CT ratio error during short circuits

➢ Saturation of magnetic circuits of CT's under short circuit conditions

➢ Tap-changing