3.8 WELDING TRANSFORMER

Now a days we have many ac power supplies. So, the usage of welding transformer has significant role in welding compared to a motor generator set. When we need to use a motor-generator set for welding we need to run it continuously which produces a lot of noise. With the help of welding transformer weld is done with a less noise. Now let us see in detail about welding transformer.

Construction of welding transformer

1. Welding transformer is a step-down transformer.
2. It has a magnetic core with primary winding which is thin and has large number of turns on one arm.
3. A secondary winding with a smaller number of turns and high cross-sectional area on the other arm.
4. Due to this type of windings in primary and secondary it behaves as step down transformer. So, we get less voltage and high current from the secondary winding output. This is the construction of AC welding transformer.
5. A dc welding transformer also has same type of winding the only difference is that we connect a rectifier at the secondary to get dc output.
6. Inductor or filter is used to smooth the dc current.

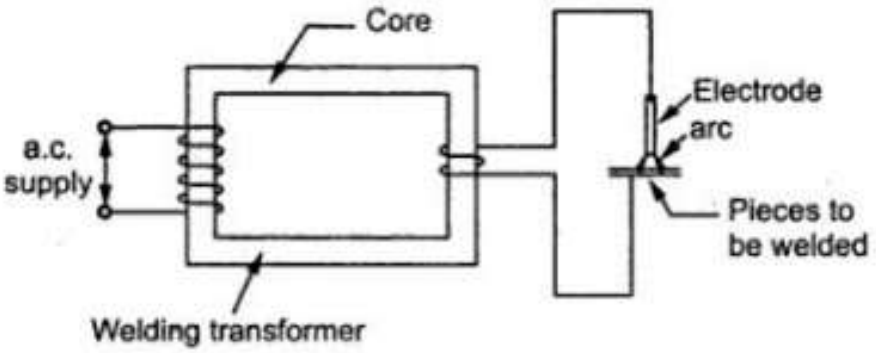

Figure 3.8.1 Welding transformer

[Source: "https://electriciantheory.blogspot.com", Page: 1]

Working of welding transformer

a) As it is a step-down transformer, we have less voltage at secondary which is nearly 15 to 45 volts and has high current values which is nearly 200 A to 600 A it can also be higher than this value.

b) For adjusting the voltage on secondary side there are tappings on secondary winding by this we can get required amount of secondary current for welding.
c) These tappings are connected to several high current switches.
d) Now one end of secondary winding is connected to the welding electrode and the other end is connected to the welding pieces as shown in fig 2.
e) When a high current flows a large amount of I^2R heat is produced due to contact resistance between welding pieces and electrode.
f) Because of this high heat the tip of electrode melts and fills the gap between the welding pieces.

Volt – ampere characteristics of welding transformer

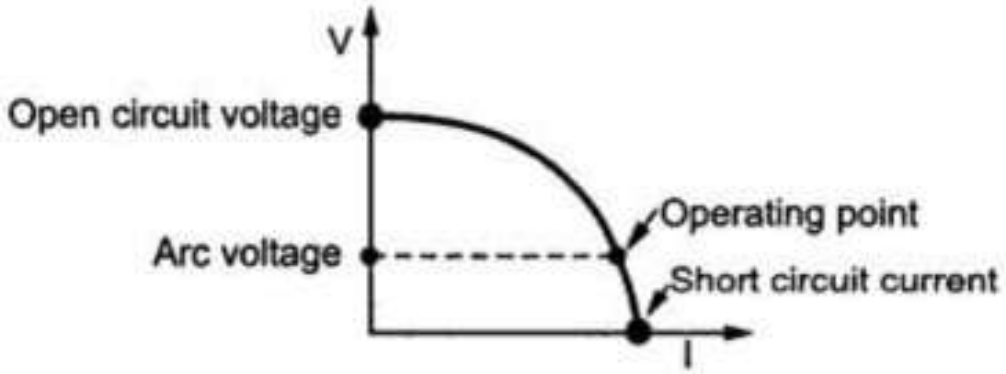

Figure 3.8.2 Volt-ampere characteristics of welding transformer

[Source: "https://electriciantheory.blogspot.com", Page: 1]

Arc control of welding transformer

The impedance of welding transformer must be higher than the normal transformer to control arc and also to control current. We can use different reactors for controlling the arc. They are

a) Tapped reactor
b) Moving coil reactor
c) Magnetic shunt reactor
d) Continuously variable reactor
e) Saturable Reactor

1. Tapped reactor

In this, output current is regulated by taps on the reactor. This has limited number of current settings.

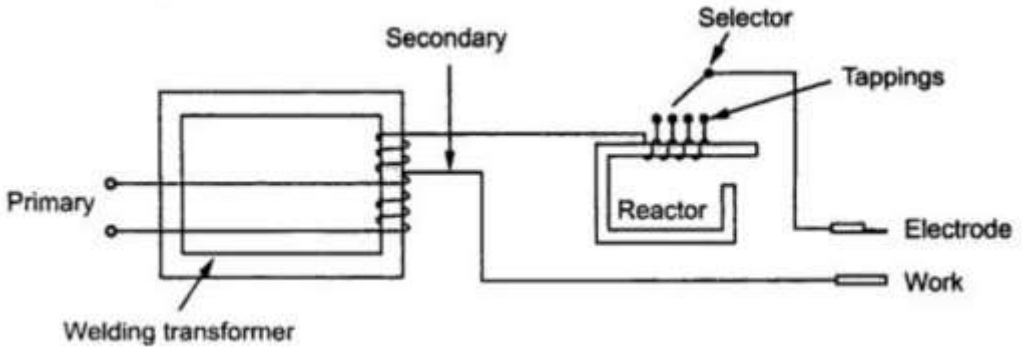

Figure 3.8.3 Tapped reactor

[Source: "https://electriciantheory.blogspot.com", Page: 2]

2. Moving coil reactor

Below is the circuit for arc control using moving coil reactor.

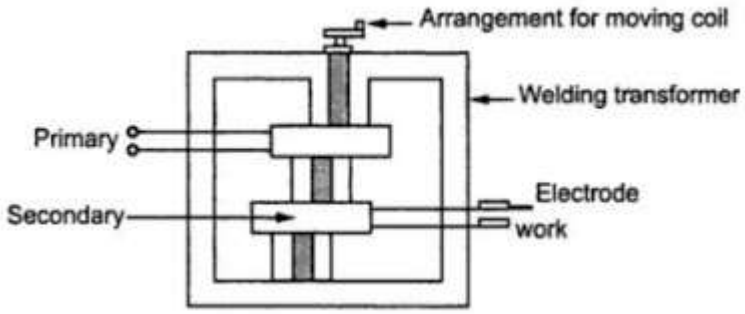

Figure 3.8.4 Moving coil reactor

[Source: "https://electriciantheory.blogspot.com", Page: 2]

The distance between primary and secondary decides the amount of current. If the distance between the primary and secondary is high then the current is less.

3. Magnetic shunt reactor

Below is the circuit for arc control using magnetic shunt reactor. By adjusting the central magnetic shunt flux is changed. By changing the flux current can be changed.

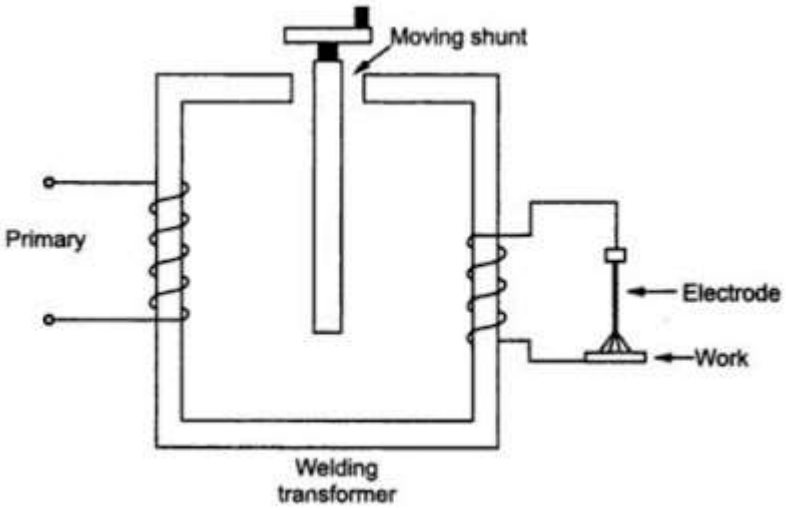

Figure 3.8.5 Magnetic shunt reactor

[Source: "https://electriciantheory.blogspot.com", Page: 3]

4. Continuously variable reactor

The height of the reactor is continuously varied in this method. Greater the core insertion greater is the reactance and less is the output current.

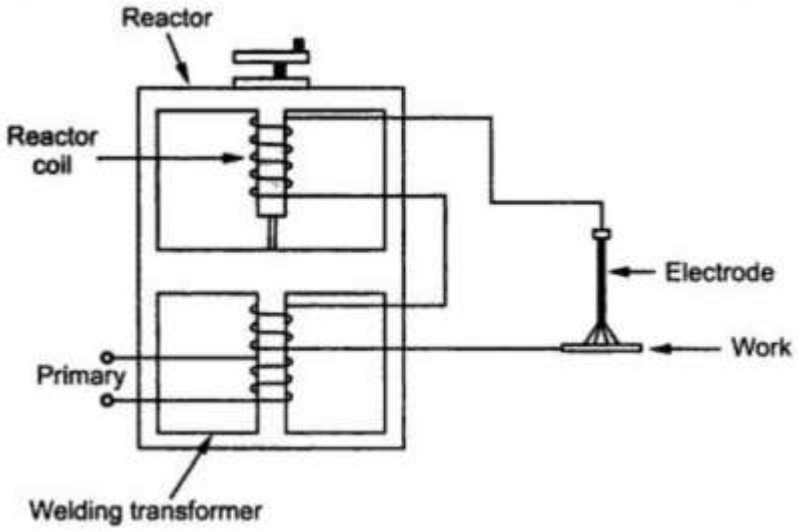

Figure 3.8.6 Continuously variable reactor

[Source: "https://electriciantheory.blogspot.com", Page: 3]

5. Saturable reactor

Below is the circuit for arc control using saturable reactor. The reactance of the reactor in this is adjusted by changing the value of d.c. excitation which is obtained from d.c. controlled transducer. Higher the d.c. currents, reactor approaches to saturation. This changes the reactance of reactor. By changing the reactance current can be changed. By using above reactors current can be controlled which helps to control the arc.

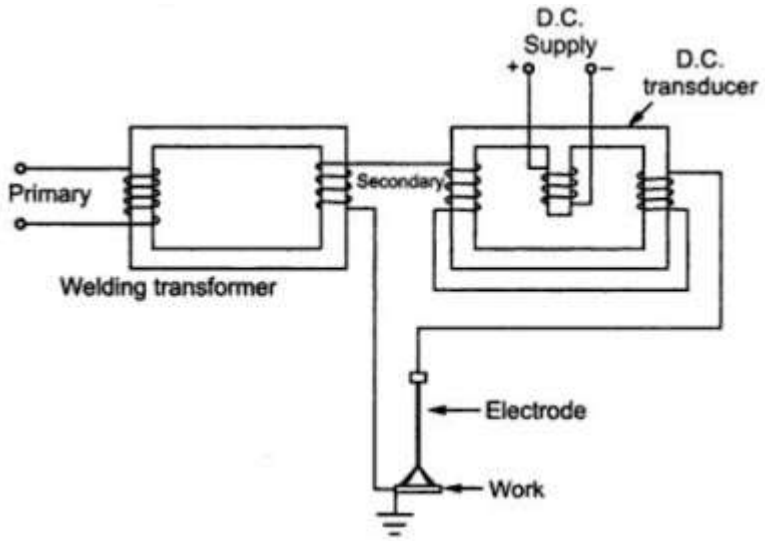

Figure 3.8.7 Saturable reactor

[Source: "https://electriciantheory.blogspot.com", Page: 4]

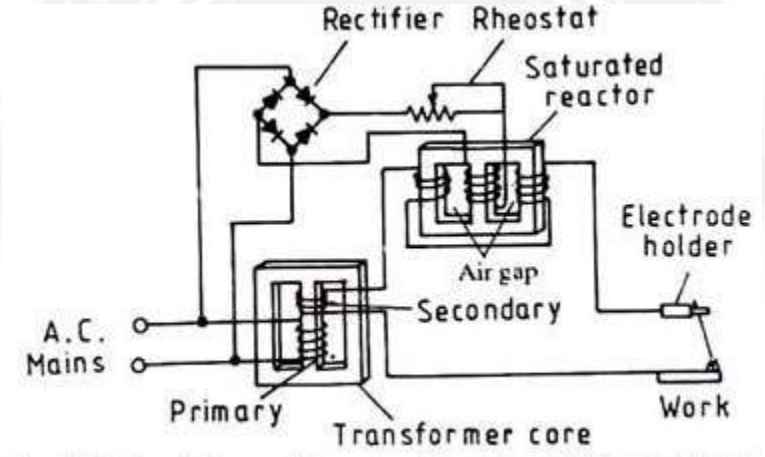

Figure 3.8.8 Saturable reactor welding transformer

[Source: "https://lotap.omit.hyedi.mohammedshrine.org", Page: 1]

Resistance spot welding transformer

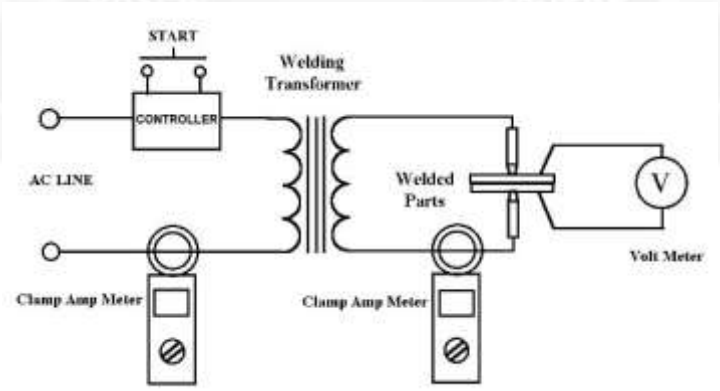

Figure 3.8.9 Resistance spot welding transformer

[Source: "https://www.kicklesscableselectromech.com", Page: 1]

The impedance of a welding transformer may be higher that the impedance of a transformer designed for some other purpose. The transformer impedance may play a role in the process of establishing an arc and controlling the current.

CHARACTERISTICS OF WELDING TRANSFORMER

Stepless current control within single range from front panel for its high permitted load, its ideal for fematic welding. Phase compensation facility optional. It’s a good investment as the primary current and rated output can be reduced, resulting in reduced fuse size and cable diameter provided with wheels and handle for easy mobility. Sturdy design for all working environments. Horizontal shunt core travel ensures precise setting after prolonged use Class 'H' insulation provides longer coil life Multi voltage input supply.