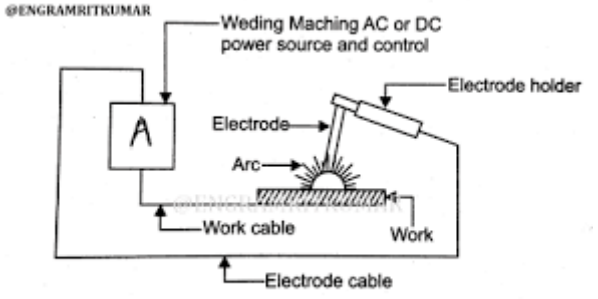
3.Electric arc welding

The welding in which the electric arc is produced to give heat for the purpose of joining two surfaces is called electric arc welding.

Principle:

Power supply is given to electrode and the work. A suitable gap is kept between the work and electrode. A high current is passed through the circuit. An arc is produced around the area to be welded. The electric energy is converted into heat energy, producing a temperature of 3000°C to 4000°C. This heat melts the edges to be welded and molten pool is formed. On solidification the welding joint is obtained.



Basic arc-welding circuit.

Arc welding(للاطلاع)

Welding positions:

Positions are classified as under:

(a) Flat Position

(b) Horizontal Position

(c) Vertical Position

(d) Overhead Position

1. Flat Position: In flat positions the work piece is kept in nearly horizontal position. The surface to be worked is kept on upper side.

2. Horizontal Position: In this position, two surfaces rest one over the other with their flat faces in vertical plane. Welding is done from right side to left side. The axis of the weld is in a horizontal plane and its face in vertical plane.

3. Vertical Position: In this position, the axis of the weld remains in approximate vertical plane. The welding is started at the bottom and proceeds towards top.

4. Overhead Position: the work piece remains over the head of the welder. The work piece and the axis of the weld remain approximate in horizontal plane.

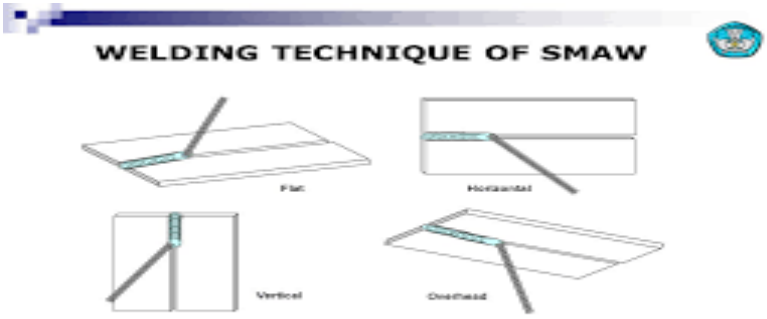


Fig. 1. Four basic welding positions

Types of electrodes;

Electrodes are of two types

1. Coated electrodes: a metallic core is coated with some suitable material. The material used for core is mild steel, nickel steel, chromium molybdenum steel, etc.

2. Bare electrodes: Bare electrodes produce the welding of poor quality. These are cheaper than coated electrodes.

Function of coating;

The coating on an electrode serves the following functions:

1.To prevent oxide.

2. Forms slags with metal impurities.

3. It stabilizes the arc.

4. Increases deposition of molten metal.

5. Controls depth of penetration.

6. Controls the cooling rate.

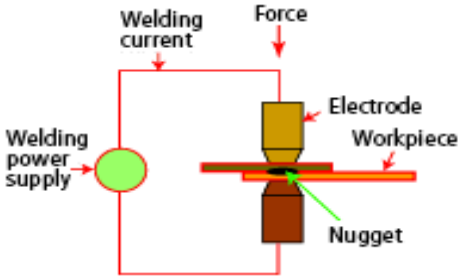
4.Resistance welding

It can be applied to any metals. Electric current passes through the materials being joined. The resistance offered to the flow of current results in raising the temperature of the two metal pieces to melting point at their junction. Mechanical pressure is applied at this moment to complete the weld. Two copper electrodes of low resistance are used in a circuit.

Types of resistance welding;

1. **Spot welding**

The metallic plates are overlapped and held between two copper electrodes. A high current, depending upon plate thickness, at a very low volt-age (4-12 volts), is passed between the electrodes. The contact resistance of the plates causes to heat rapidly to a plastic state. Mechanical pressure is applied. Supply is cut-off for the metal to regain strength. The pressure is released. Spot welding is mainly used in the manufacture of automobile parts refrigerators, metallic toys, racks, frames, boxes, radio chassis, etc.

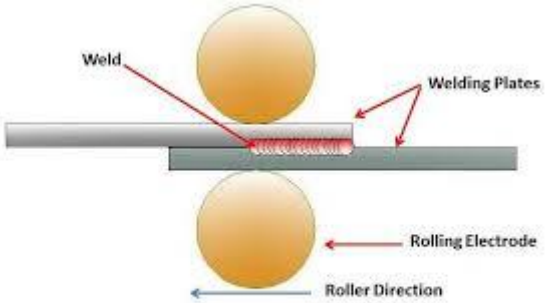


Sot welding

2. **Seam welding**

The metallic plates are held by two copper roller electrodes with one roller driven by motor so that the plates are moved between the rollers at a suitable speed. This is a quicker operation than spot welding and gives a stronger joint. The process is

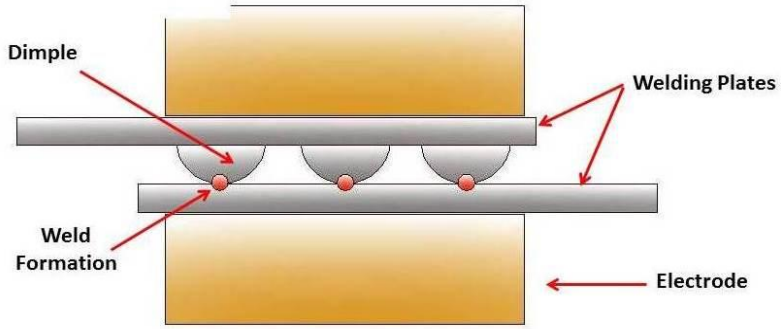
employed for pressure tight joints on oil drums, tanks and boiler water pipes, refrigeration parts, motorcar body, utensils, stoves, etc.



Seam Welding

3. Projection welding

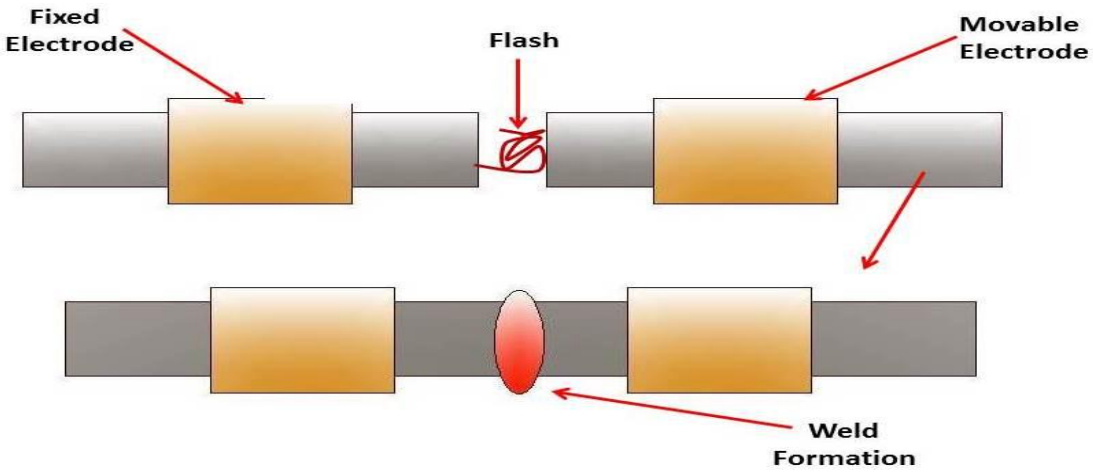
There are raised projections in the workpiece at all points where a weld is desired. As the current is switched on the projection are melted and the workpieces pressed together to complete the weld. The melted projections form the welds. It is used to weld the dissimilar metals such as brass with copper.



Projection Welding

4. Flash welding

The current is switched on and the ends of the workpieces to be welded are slowly brought closer. An arc is produced between the contacting faces of the workpieces and intense heat is generated. The faces are brought rapidly together under high pressure (350 to 1650 kg/cm2). The current is then switched off and the weld is forged. It is used for mass production.

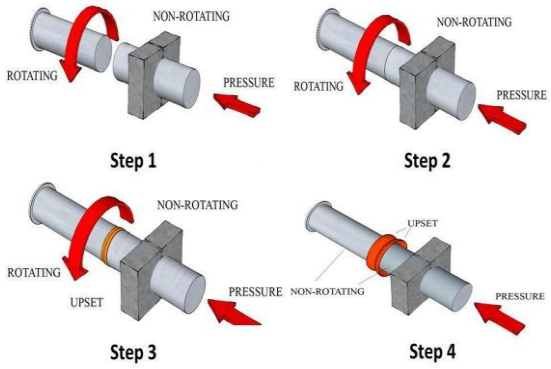


Flash Butt Welding

Non- traditional welding

1. **Friction welding:**

Is a solid state welding process. Because no melting occurs, friction welding is not a fusion process in the traditional sense. Friction welding is used with metals and thermoplastics in a wide variety of aviation and automotive applications. It is used for similar and dissimilar materials.



Friction Welding

Friction welding process(للاطلاع)

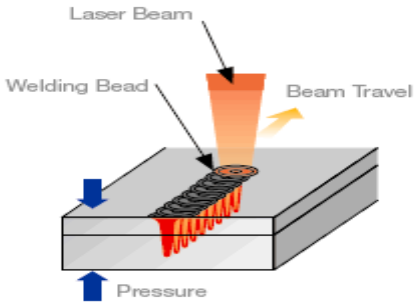
2. **Under water welding:**

Simply means that job is performed directly in water, it involves using special rod and is similar to the process in ordinary air welding.it is used for war ships.

Under water welding(للاطلاع)

3. Laser welding:

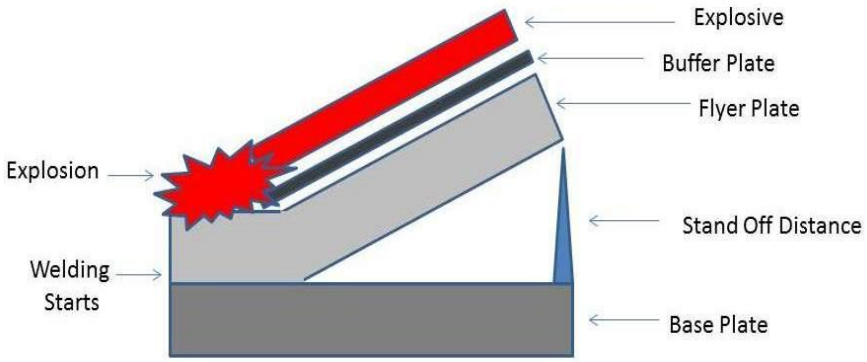
Is a process used to joint together metals or thermoplastics using a laser beam to form a weld. The process has high speed , high accuracy, low heat input and low distortion. This weld is used in turbine fan, electronic manufacturing and space using.



Laser welding(للاطلاع)

4. Explosion welding:

Explosion welding is a solid state process that produces a high velocity interaction of dissimilar metals by controlled detonation. It is used in heat exchangers.



Explosion Welding

(للاطلاع)

There are another non- traditional welding such as ultrasonic welding, electron beam welding, plasma welding and space welding.