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AC/DC Arc & Spot Three In One Welding Machine

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Abstract-*Arc welding is a type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current. Spot welding is a process in which contacting metal surfaces are joined by the heat obtained from resistance to current. Work-pieces are held together under pressure exerted by electrodes. The process uses two shaped aluminum alloy electrodes to concentrate welding current into a small spot and to simultaneously clamp the sheets together.*

Keywords-*Arc welding, Welding Supply, Spot welding, AC/DC arc welding, Process of welding*

I. INTRODUCTION

Welding is fabrication process which isjoins them arterials, Welding is a usually metals or thermoplastics, by causing fusion, which is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal. In addition to melting the base metal, a filler material is often added to the joint to form a pool of molten material (the weld pool) that cools to form a joint that can be as strong as the base material. Pressure may also be used in conjunction with heat, or by itself, to produce a weld.[1]

II. ESTABLISHMENT OF WELDING

In 1800, Sir Humphrey Davy discovered the short pulse electrical arc and presented his results in 1801. In 1802, Russian scientist VasilyPetrov created the continuous electric arc, and subsequently published "News of Galvanic-Voltaic Experiments" in 1803, in which he described experiments carried out in 1802. Of great importance in this work were the description of a stable arc discharge and the indication of its possible use for many applications, one being melting metals. In 1808, Davy, who was unaware of Petrov's work, rediscovered the continuous electric arc. [2]

The advances in arc welding continued with the invention of metal electrodes in the late 1800s by a Russian, Nikolai Slavyanov (1888), and an American, C. L. Coffin(1890). Around 1900, A. P. Strohmenger released a coated metal electrode in Britain, which gave a more stable arc. In 1905, Russian scientist Vladimir Mitkevich proposed using a three-phase electric arc for welding. In 1919, alternating current welding was invented by C. J. Holslag but did not become popular for another decade. [3]

Resistance welding was also developed during the final decades of the 19th century, with the first patents going to Elihu Thomson in 1885, who produced further advances over the next 15 years. Thermite welding was invented in 1893, and around that time another process, oxyfuel welding, became well established. Acetylene was discovered in 1836 by Edmund Davy, but its use was not practical in welding until about 1900, when a suitable torch was developed.[4]

Figure 1: Types of welding

III. PROCESS OF ARC AND SPOT WELDING

A. SPOT WELDING

Spot welding involves three stages; the first of which involves the electrodes being brought to the surface of the metal and applying a slight amount of pressure.[6] The current from the electrodes is then applied briefly after which the current is removed but the electrodes remain in place for the material to cool. Weld times range from 0.01 sec to 0.63 sec depending on the thickness of the metal, the electrode force and the diameter of the electrodes themselves.[7]

The equipment used in the spot welding process consists of tool holders and electrodes. The tool holders function as a mechanism to hold the electrodes firmly in place and also support optional water hoses that cool the electrodes during welding.[8] Tool holding methods include a paddle-type, light duty, universal, and regular offset. The electrodes generally are made of a low resistance alloy, usually copper, and are designed in many different shapes and sizes depending on the application needed.[9]

The two materials being welded together are known as the workpieces and must conduct electricity. The width of the workpieces is limited by the throat length of the welding apparatus and ranges typically from 5 to 50 inches (13 to 130 cm). Workpiece thickness can range from 0.008 to 1.25 inches (0.20 to 32 mm) [10]

After the current is removed from the workpiece, it is cooled via the coolant holes in the centre of the electrodes. Both water and a brine solution may be used as coolants in spot welding mechanisms.[11]

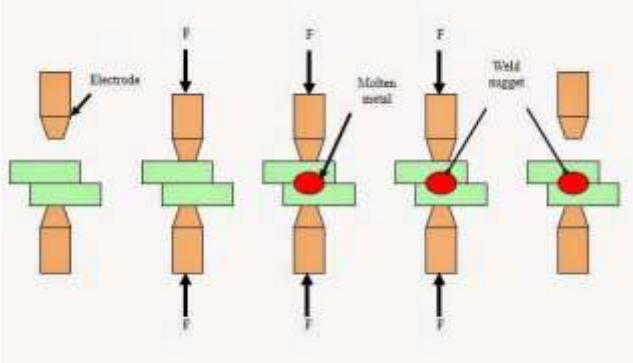

Figure 2: Process of spot welding

B. ARC WELDING

Arc welding is a type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC)

or alternating(AC) current, and consumable or non-consumable electrodes. The welding region is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated. First developed in the late part of the 19th century, arc welding became commercially important in shipbuilding during the Second World War. Today it remains an important process for the fabrication of steel structures and vehicles.[12]

To supply the electrical energy necessary for arc welding processes, a number of different power supplies can be used. The most common classification is constant current power supplies and constant voltage power supplies. In arc welding, the voltage is directly related to the length of the arc, and the current is related to the amount of heat input. Constant current power supplies are most often used for manual welding processes such as gas tungsten arc welding and shielded metal arc welding, because they maintain a relatively constant current even as the voltage varies.[11] This is important because in manual welding, it can be difficult to hold the electrode perfectly steady, and as a result, the arc length and thus voltage tend to fluctuate. Constant voltage power supplies hold the voltage constant and vary the current, and as a result, are most often used for automated welding processes such as gas metal arc welding, flux cored arc welding, and submerged arc welding. In these processes, arc length is kept constant, since any fluctuation in the distance between the wire and the base material is quickly rectified by a large change in current. For example, if the wire and the base material get too close, the current will rapidly increase, which in turn causes the heat to increase and the tip of the wire to melt, returning it to its original separation distance.[1]

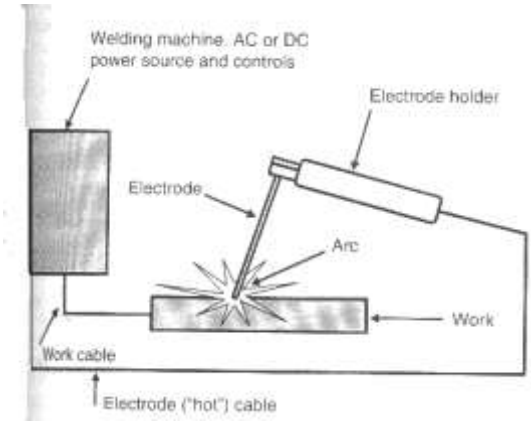

Figure 3: Arc welding process

IV. TRANSFORMER

The transformer is a static device which converts one voltage level to other voltage level without change in frequency. There are two winding primary and secondary winding. High voltage winding is primary winding. Low voltage winding is secondary winding. Source is connected with the primary winding, the source only AC because transformer is works with AC supply. The lode is connected between secondary winding.[11]

A varying current in the transformer's primary winding creates a varying magnetic flux in the transformer core and a varying magnetic field impinging on the transformer's secondary winding. This varying magnetic field at the secondary winding induces a varying electromotive force (EMF) or voltage in the secondary winding due to electromagnetic induction. Making use of Faraday's Law in conjunction with high magnetic permeability core properties, transformers can thus be designed to efficiently change AC voltages from one voltage level to another within power networks.[11]

A. STEP DOWN TRANSFORMER

This is types of transformer is low voltage and high current application. The number of primary winding is high due to secondary winding. It is used in to load side or receiving side area. It is also used in welding machine.[11]

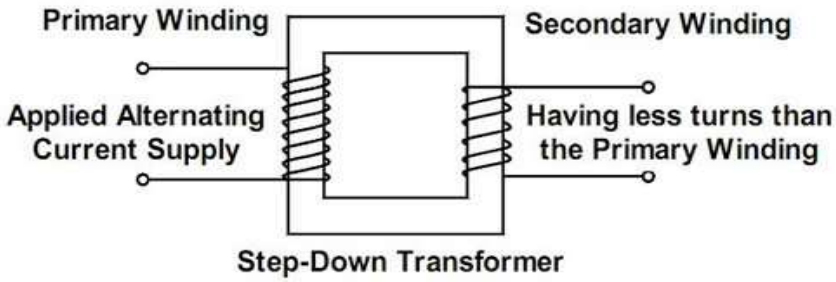

Figure 4: Step down transformer

B. SHELL TYPE TRANSFORMER

In shell-type transformers the core surrounds a considerable portion of the windings.The coils are form-wound but are multi-layer disc type usually wound in the form of pancakes. Paper is used to insulate the different layers of the multi-layer discs. The whole winding consists of discs stacked with insulation spaces between the coils. These insulation spaces form the horizontal cooling and insulating ducts. Such a transformer may have the shape of a simple rectangle or may also have a distributed form. [12]

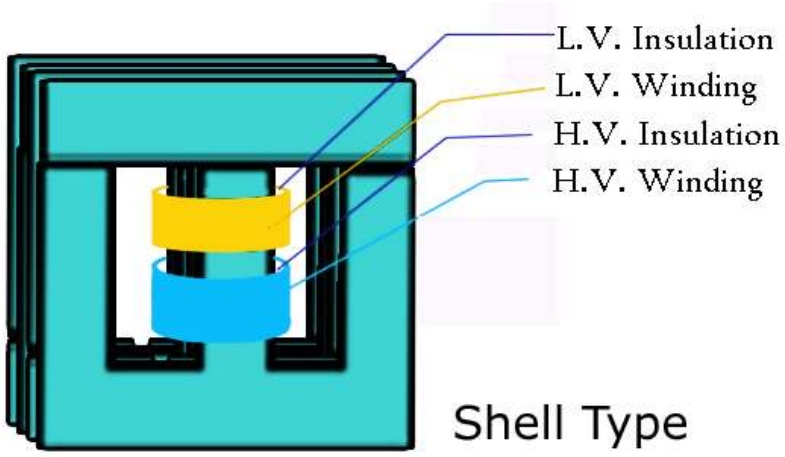

Figure 5: Shell type transformer

The main different of core type and shell type transformer is, In shell type winding is insulated on main arm of the core, It is insulated on mid-point of the arm. And In core type winding is insulated both the side of the core, It means both arm of transformer.[12]

V. ADVANTAGES

a) High Speed of welding,

b) Less skilled worker will do,

c) More general elimination of warping or distortion of parts,

d) High uniformity of product,

e) No edge preparation is needed,

f) Less space requirement,

g) Easy movable,

h) Time consuming is less.

VI. APPLICATION

a) Spot welding of two 12.5mm thick steel plates has been done satisfactorily as a replacement for riveting.

b) Many assemblies of two or more sheet metal stamping that do not required gas tight or liquid tight joint can be more economically joined by spot welding machine.

c) Spot welding finds application in automobile and aircraft industries.

d) The arc welding is used in to the joint two metallic parts of any alloys.

e) In this machine we used AC/DC both welding is used.

f) Arc welding is used in to the cooling fan, joint different parts of Mattel and makes an object.

g) Many industries use the arc welding machine.

VII. CONCLUSION

By this project we conclude that weld is possible to do by selecting high current and low time period or by selecting low current and high time period, but by this it is not possible to get good quality weld.Good welding quality can be get by selecting proper current and time period as per the material and its thickness.By this project we used change the voltage level and select the appropriate voltage by tapping of transformer.We can three welding in to this machine like AC/DC and Spot welding; we use the bridge rectifier and change the power supply. We used the reversible switch so we change the switch position and change the welding position.

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