

Types

A SPOT WELD is made by applying heat and pressure at one point, usually on overlapped parts

A SEAM WELD is a series of overlapping spot welds, spaced close enough to make a single, continuous joint

A PROJECTION WELD is a spot weld made between two parts, one or both of which have an embossment or projection, which localize the welding heat and pressure

FLASH AND UPSET WELDS are welds made by butting two parts together and forming a weld for the full cross-section of the contacting faces. In flash welding, pressure is applied after heating is substantially completed. In upset welding, pressure is maintained throughout the welding cycle

PERCUSSION WELDING is similar to flash and upset welding except that the welding heat is obtained from a rapid discharge of stored electrical energy

Resistance welding machines are operated manually, semiautomatically, and automatically (Fig 31-5). Fixed installation is most common, but portable machines are also available. They use manual, electrical, mechanical, pneumatic, or hydraulic power to apply pressure. They are often equipped with intricate control and timing devices. Modern mechanical handling devices for the work add to their efficiency. Expert maintenance is required for these welding machines, even though they may be operated by unskilled labor

Power supply

Resistance welding usually employs 60-Hertz alternating current which is fed to the primary of the water-cooled welding transformer. The input can vary from 150 to 10,000 amp, at 240, 440, or 550 volts. The output, at the secondary of the transformer is a low voltage (max 30 volts) and high current (up to 200,000 amp) used for welding

The welding current is sometimes furnished by the "stored energy" type of equipment, in which energy is built up and stored either in capacitors or in a combination transformer-reactor during the nonwelding period, and then is discharged to form the weld. This

process involves low currents and high voltages, which must be guarded against

To facilitate servicing the equipment, a safety type disconnecting switch or a circuit breaker of the correct rating for opening supply circuits should be installed near the welding machine. Permanent injuries, and several fatalities have been caused by neglecting to use the line-disconnecting switch before making adjustments. The use of single-pole primary circuit breakers and electronic contactors which leave one line to the welder "hot" makes this precaution imperative

Current and timing controls are of two types, mechanical and electronic. If worn parts throw the mechanical control out of synchronism with the current and voltage waves, transients may cause severe damage to the equipment. Synchronism should be carefully maintained, particularly on high-power equipment. The electronic controls are placed in the primary circuit and involve high voltages which must be guarded by proper insulation, lockouts, and safety switches

All electrical work should conform to applicable codes

Cables

The high current of the primary circuits (up to 10,000 amp) in resistance welding does not permit the use of plugs except for control circuits, usually 120 volts or less. Power lead terminals should be securely and permanently attached with screws or bolts for the duration of service

The magnitude of the secondary welding current is such that the cables for a portable welding machine must be heavy. Even with sizes from 200,000 to 1,000,000 circular mils, copper losses are high and in many instances water cooling is required, especially for high production portable, as well as multiple-spot station, welding machines. The length of these cables varies from 1 to 14 ft, the latter being the maximum considered reasonably economical. The covering for the cable used with a portable welding machine is thick, high tensile rubber

Abuse of the cables for resistance welding is severe. The production requirements demand the utmost of the cable materials used, and even the best cables need frequent re-