

Ultrasonic Staking Configurations

Ultrasonic staking, or riveting, is an assembly procedure used to join dissimilar materials, usually plastic to metal or dissimilar plastics. A hole in the metal part receives the plastic rivet, or stud, and a specially contoured horn contacts the stud. The stud melts and reforms to create a locking head over the metal.

As in any process involving localized heating by the dissipation of ultrasonic vibrations, an efficient system is necessary. The designer must control where and how fast a temperature rise will occur. Geometry plays an important role in determining the location of high strain which results in desirable localized heating, so an energy director is used in designs employing the ultrasonic staking technique. That is, the cross sectional area / height ratio of the material at the location where the initial dissipation is to occur is drastically reduced as compared to the adjacent segments which in this case are the body of the horn and the piece part containing the stud.

Two common designs are used to produce the needed geometry. The first (Flat Stud, see figures 1, 9) makes use of a point or line type contact by incorporating the joint design in the tip (or base) of the horn itself. The second technique (Pointed Stud, see figures 2, 10) calls for the energy director to be designed into the stud. The following lists examples and advantages of each variation to establish guidelines for the wide variety of possible applications.

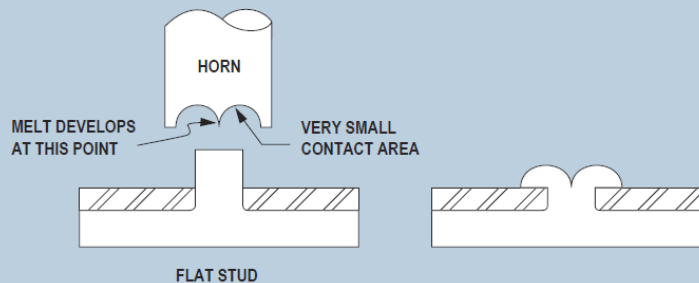


figure 1

Examples: Rosette Style (see figures 4,5); Hollow Stud (see figure 8).

Advantages: The rosette style is used primarily in press operations. This style gives better results with sharp transitional materials (e.g. nylon). However, hollow studs can also be used with hand-held units, depending on material and size. The hollow stud can easily be removed for repair, which leaves a pilot hole for a screw.

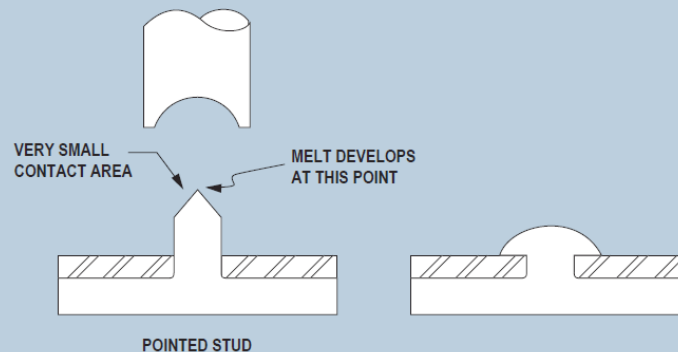


figure 2

Examples: Simple Profile (see figure 3); Flat Head Profile (see figure 6); Pan Head Profile (see figure 7).

Advantages: This is an excellent design for handgun operations involving staking. The pointed stud design yields excellent results with broad transitional materials (e.g. ABS). It provides for easier alignment of parts (looser alignment tolerances) and can be used with a wide variety of head configurations to meet special design requirements. The pointed stud design also reduces horn wear and problems with glass-filled plastics.

(continued on reverse)

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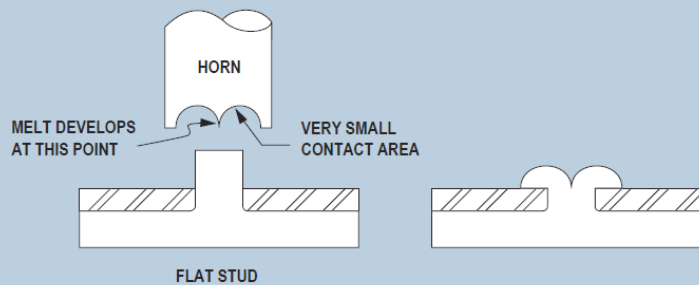
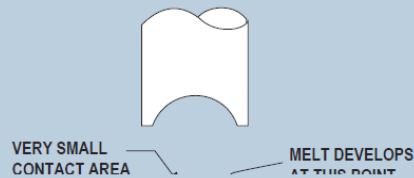


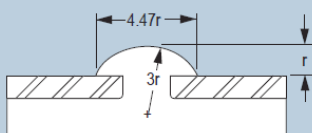
figure 1

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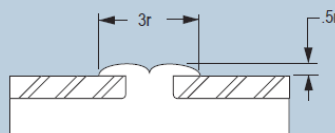
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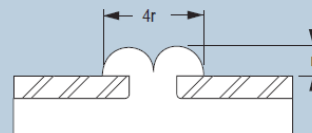
Staking Configurations



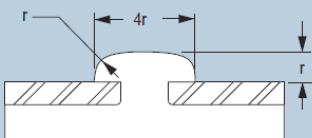
SIMPLE PROFILE
figure 3



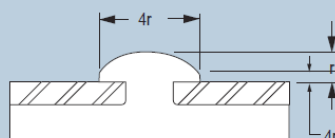
ROSETTE (LOW) PROFILE
figure 4



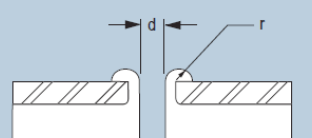
ROSETTE (STANDARD) PROFILE
figure 5



FLAT HEAD PROFILE
figure 6



PAN HEAD PROFILE
figure 7



HOLLOW PROFILE
figure 8