NASA TECH BRIEF

Langley Research Center

New Explosive Seam Welding Concepts

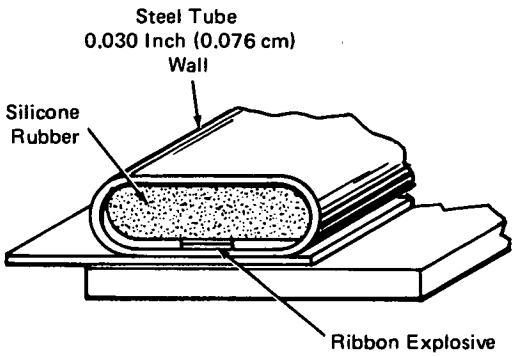

Figure 1. Setup for Explosive Weld to Confine Explosive Detonation Products

Techniques have recently been developed to provide totally-confined linear explosive seam welding and to produce a scarf joint with linear explosive seam welding. These techniques are extensions of the technology described earlier (see Notes) in which linear ribbon explosives have been utilized in making narrow, continuous, airtight joints in a variety of aluminum alloys, titanium, copper, brass, and stainless steel.

The totally confined explosive seam welding concept uses a flattened steel tube, as shown in Figure 1. The ribbon explosive is placed inside the tube against the tube wall in contact with the plate to be welded. On detonation of the explosive the pressure is transferred through the wall to produce a normal welded joint. The pressure front propagating upward is first attenuated and diffused by the silicone rubber and then confined by the tube in its expansion upward. Totally confined explosive seam welding eliminates the sound, flame, smoke, lead sheathing, and masking tape that are products of the normal explosive seam welding technique. This confinement technique permits explosive welding in areas sensitive to contamination or in close proximity to personnel and is being considered for use in the space station docking system. The confinement tubes would be placed inside and outside the concentric cylinders to be welded and, on simultaneous firing of the two explosive ribbons, would form an airtight, continuous joint.

The scarf joint (see Figure 2) permits splicing of sheet stock in thicknesses to 0.090 inch (0.229 cm) without the addition of material and produces joints

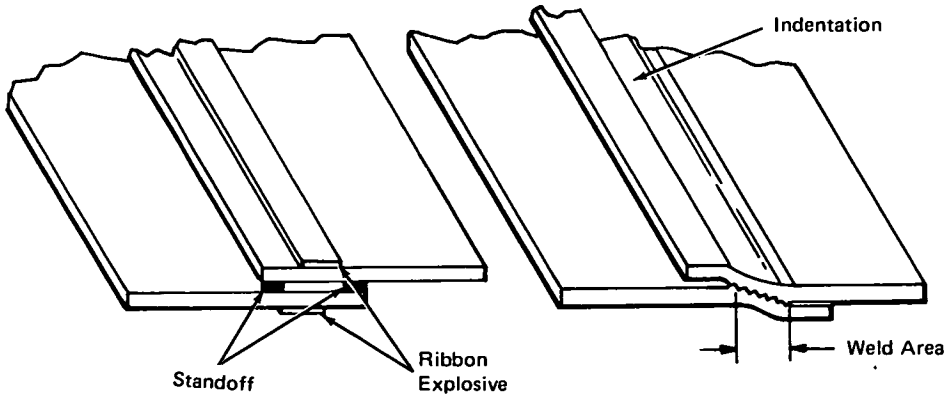

Figure 2. Setup For and Resultant Scarf Joint

(continued overleaf)

that exhibit strength up to that of the parent metal. The plates to be joined are placed in parallel planes, separated by approximately 0.015 inch (0.038 cm). The longitudinal axes of the ribbon explosive placed outside the plates to be welded are misaligned to produce forces that are not directly opposing. On simultaneous detonation of the two ribbon explosives, the plates are bent into axial alignment and welded in the same operation. This joint is particularly suited for longitudinal tankage and large diameter pipe joints which require high strength. Conventional joining techniques require the addition of material in the joint area to accomplish parent metal strength following the joining.

Notes:

1. Basic explosive welding techniques are described and illustrated in NASA Tech Brief B72-10002 and Technical Support Package TSP72-10002.
2. Requests for further information should be directed to:

   Technology Utilization Officer
   Langley Research Center
   Mail Stop 139A
   Hampton, Virginia 23665
   Reference: B73-10180

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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