Manufacturing & Prototyping

Improved Assembly for Gas Shielding During Welding or Brazing

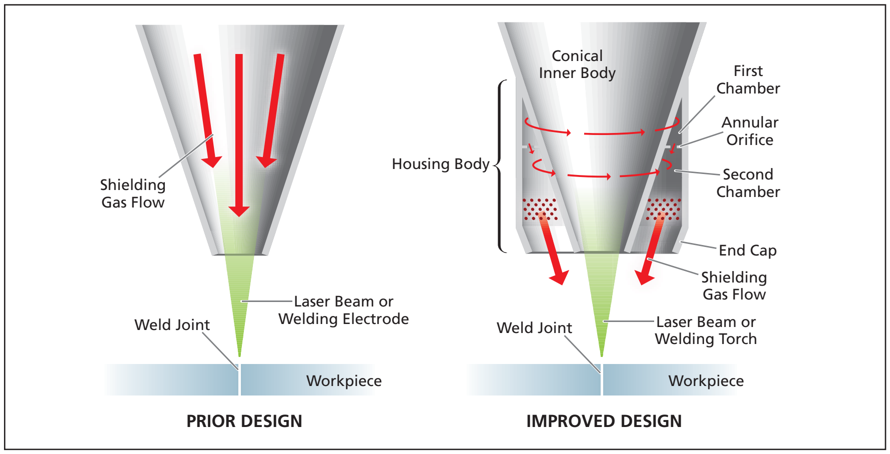
Inert gas is distributed evenly over the region surrounding the weld joint.

Marshall Space Flight Center, Alabama

An improved assembly for inert-gas shielding of a metallic joint is designed to be useable during any of a variety of both laser-based and traditional welding and brazing processes. The basic purpose of this assembly or of a typical prior related assembly is to channel the flow of a chemically inert gas to a joint to prevent environmental contamination of the joint during the welding or brazing process and, if required, to accelerate cooling upon completion of the process.

In a typical prior welding gas-shielding assembly, depicted in the left part of the figure, the inert gas is fed to the joint through a central nozzle in the welding torch. This arrangement does not always provide adequate protection against contaminants because the inert gas flows turbulently into the joint region and is not evenly distributed in the heated region surrounding the joint. The lack of inert gas in some places in the region surrounding the joint can result in oxidation, which, in turn, can lead to porosity and ultimately to cracking. Improper distribution of shielding gas can also lead to the formation of plasma and to insufficient cooling of portions of the region surrounding the joint that are meant to be protected against excessive heating.

The present improved welding gas-shielding assembly, depicted in the right part of the figure, provides a column of evenly distributed gas flow directly surrounding the pool of molten metal in the weld joint to prevent oxidation and formation of plasma.



These **Simplified Cross Sections** show the main differences between the present improved welding gas-shielding assembly and a typical prior such assembly.

The assembly includes a conical inner body and an outer shell comprising a housing body and an end cap. The outer shell contains chambers sized and shaped to act, along with the conical inner body, to distribute the inert gas evenly around the conical inner body and to encapsulate the flow of the gas and direct the flow onto the desired region surrounding the weld joint.

The gas enters the assembly through a supply tube from an external source. The passage through which the gas enters is tangential, so the gas flows in tangentially, creating a vortex flow in the chambers between the outer shell and the conical inner body. The gas circulates as it fills the first chamber, then flows through an annular orifice to fill a second chamber and then flows through a series of diffusing screens. After flowing through the screens, the gas is directed to the weld joint area by means of a nozzle. The combination of the vortex flow, chambers, and screens provides even columnar flow around the entire heated area.

This work was done by Paul Gradl and Kevin Baker of Marshall Space Flight Center and Jack Weeks of Pratt & Whitney. For further information, contact Sammy Nabors, MSFC Commercialization Assistance Lead, at sammy.a.nabors@nasa.gov. Refer to MFS-32644-1.

Two-Step Plasma Process for Cleaning Indium Bonding Bumps

This process could increase yields in the manufacture of consumer electronic products.

NASA's Jet Propulsion Laboratory, Pasadena, California

A two-step plasma process has been developed as a means of removing surface oxide layers from indium bumps used in flip-chip hybridization (bump bonding) of integrated circuits. This process has considerable commercial potential in that flip-chip hybridization is used in the manufacture of cellular telephones and other compact, portable electronic products.

The need for this or another, similar cleaning process arises as follows: Indium bonding bumps tend to oxidize during exposure to air. As the duration of exposure and the level of oxidation increase, the electrical resistances of the bonds subsequently formed via the bumps also increase. In some cases, the resistances can become so large that the bump bonds may act as open circuits, preventing proper functioning of the bump-bonded devices.

There is a patented process for removal of surface indium oxide layers by