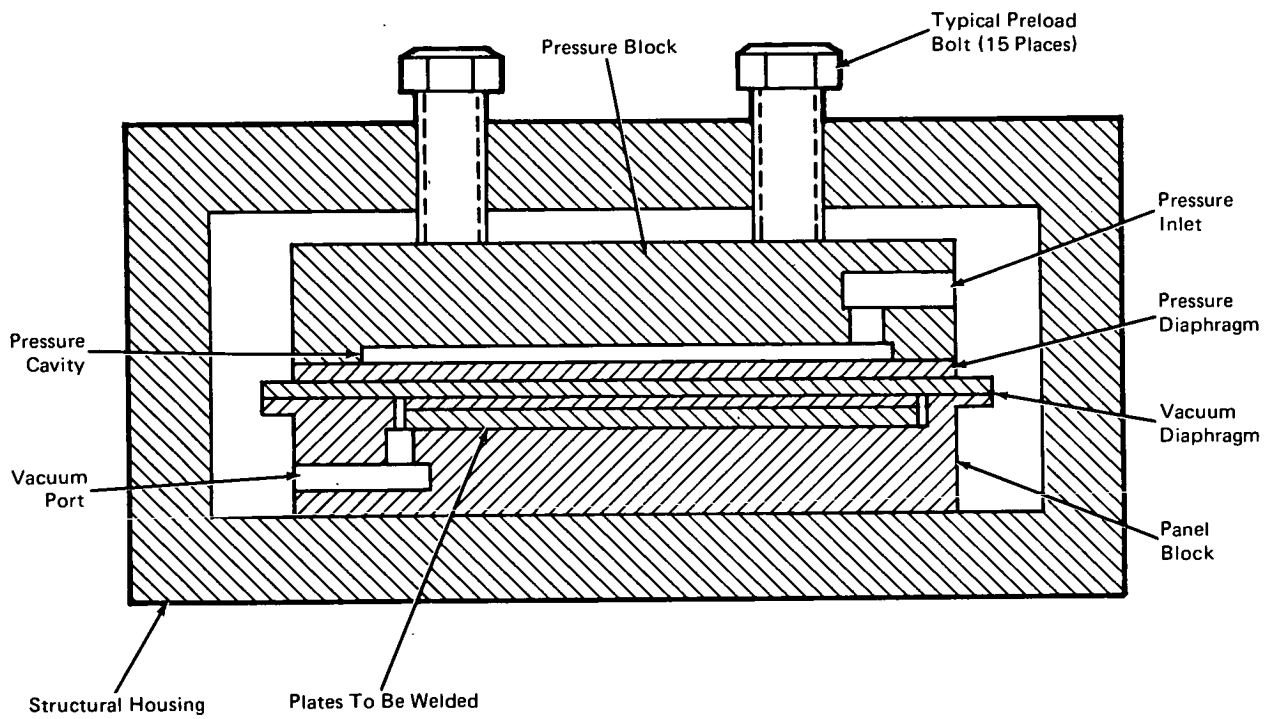
NASA TECH BRIEF

Lewis Research Center

Diffusion Welding Tool



A diffusion welding tool has been built and tested which allows flat plate diffusion welding to be done in a standard brazing furnace. The tool consists of a structural box which houses a pressurizing diaphragm block and a block for holding the plates to be welded, as shown in the figure. A thin metal diaphragm is seam welded over the plate to be bonded in order to provide a vacuum atmosphere. Another thin metal diaphragm is seam welded in place on the pressure block so that fluid pressure can be transmitted uniformly to the plates. Vacuum and pressure piping connections are provided as shown. The tool is constructed completely of a nickel-base alloy.

The plates to be welded are placed in the panel block beneath the vacuum diaphragm, and the vacuum diaphragm is seam welded in place. The panel blocks and pressurizing block are placed in the structural housing, and preloading bolts are tightened against the pressure block. The entire assembly is placed inside a standard brazing furnace having an inert or reducing atmosphere, and vacuum and pressure lines are connected. After the assembly reaches welding temperature, water at high pressure is applied to the pressure diaphragm using a hand-operated positive-displacement pump, and the plates are welded together. A coating of a commercial stop-off solution containing yttrium-oxide in methyl cellulose on the vacuum diaphragm prevents its being welded to the plates.

(continued overleaf)

At the operating temperature and pressure, some steam is generated in the pressure block and part of the supply pressure tubing, but the volume of steam is small enough that the system acts as if an incompressible fluid is being used.

Good welds have been obtained between nickel and nickel-base alloy plates during tests of the tool at a temperature of 1200 K (1700°F) and a water pressure of 13.8×10^6 N/m^2 (2000 psi).

Note:

No further documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
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Reference: B73-10072

Patent status:

NASA has decided not to apply for a patent.

Source: Thomas B. Milam of
Pratt & Whitney Aircraft Corp.
under contract to
Lewis Research Center
(LEW-11807)